CHAPTER 6
ENVIRONMENTAL MEASUREMENTS AND MONITORING PROGRAMS

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ACRONYMS AND ABBREVIATIONS

°C	degree Celsius
°F	degree Fahrenheit
ANSI/ANS	American National Standards Institute/American Nuclear Society
bgs	below ground surface
$CaCO_3$	calcium carbonate
CFBC	Cross Florida Barge Canal
CFR	Code of Federal Regulations
COLA	Combined License Application
CREC	Crystal River Energy Complex
CR-3	Crystal River Unit 3
CWIS	cooling water intake structure
D	deep (bedrock aquifer)
ER	Environmental Report
ERP	Environmental Resource Permit
FDEP	Florida Department of Environmental Protection
FFWCC	Florida Fish and Wildlife Conservation Commission
ft.	foot
$ft.^3$	cubic foot
g	gram
gal.	gallon
in.	inch
km	kilometer

ACRONYMS AND ABBREVIATIONS (CONTINUED)

l	liter
LNP	proposed Levy Nuclear Plant Units 1 and 2
LNP 1	proposed Levy Nuclear Plant Unit 1
LNP 2	proposed Levy Nuclear Plant Unit 2
m	meter
m/s	meter per second
m^3	cubic meter
mi.	mile
min.	minute
mm	millimeter
mph	mile per hour
MW	monitoring well
N/A	not applicable
NAD83	North American Datum of 1983
NAVD88	North American Vertical Datum of 1988
NEI	Nuclear Energy Institute
NIST	National Institute of Standards and Technology
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
oz.	ounce
PEF	Florida Power Corporation doing business as Progress Energy Florida, Inc.
QA	quality assurance
QC	quality control

ACRONYMS AND ABBREVIATIONS (CONTINUED)

REMP	Radiological Environmental Monitoring Program
S	shallow (surficial aquifer)
SCA	Site Certification Application
SS	sampling station
SW	stilling well
TKN	total Kjeldahl nitrogen
TLD	thermoluminescent dosimetry
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WW	raw water withdrawal

6.0 ENVIRONMENTAL MEASUREMENTS AND MONITORING PROGRAMS

This chapter evaluates the environmental measurements and monitoring related to the construction and operation of the proposed Levy Nuclear Plant Unit 1 (LNP 1), the proposed Levy Nuclear Plant Unit 2 (LNP 2) to be located in Levy County, Florida (Figure 6.0-1). This section describes the monitoring programs that were initiated for the proposed Levy Nuclear Plant Units 1 and 2 (LNP) during the preapplication phase and will be continued during construction, preconstruction, and operation phases of the LNP project. The monitoring data will be used to support the preparation of the Combined License Application (COLA) and the Florida Site Certification Application (SCA) for the LNP.

This chapter of the Environmental Report (ER) is divided into the following sections:

- ER Section 6.1 — Thermal Monitoring
- ER Section 6.2 — Radiological Monitoring
- ER Section 6.3 — Hydrological Monitoring
- ER Section 6.4 — Meteorological Monitoring
- ER Section 6.5 — Ecological Monitoring
- ER Section 6.6 — Chemical Monitoring
- ER Section 6.7 — Summary of Monitoring Programs

Information about these six environmental measurements and monitoring programs for these resource areas is summarized in ER Section 6.7. Additional information on specific permit requirements discussed throughout ER Chapter 6 is outlined in Table 1.2-1.

6.1 THERMAL MONITORING

This section describes the Thermal Monitoring Program that was initiated during the preapplication phase and will be continued during construction and operation of the LNP. The data will be used to support the preparation of the COLA for the LNP. The Thermal Monitoring Program consists of the following primary elements:

- Preapplication Thermal Monitoring: This phase of the monitoring is designed to establish background conditions and support the thermal descriptions that are presented in ER Subsection 2.3.3.

- Construction and Preoperational Thermal Monitoring: This phase of the monitoring is designed to establish a thermal baseline and document potential changes in water temperature and thermal profiles that may result from site preparation and construction activities.

- Operational Thermal Monitoring: This phase of the monitoring is used to establish changes in water temperature that may result from facility operation.

The objectives of the Thermal Monitoring Program are to identify environmental effects, including potential changes to water temperature, caused by the development and construction of the LNP, and identify alternatives or engineering measures that could be used to reduce potential adverse effects that may be identified.

6.1.1 PREAPPLICATION THERMAL MONITORING

The preapplication thermal monitoring program was performed to establish background water temperatures in groundwater, the Cross Florida Barge Canal (CFBC), the Gulf of Mexico, and the Crystal River Energy Complex (CREC) discharge canal near the proposed discharge site before development and operation of the LNP.

Much of the preapplication thermal data was obtained as part of the preliminary site characterization work for the LNP. Two surface water locations (sampling station [SS]-1 and SS-2) located on the CFBC and in Lake Rousseau (Figure 6.1-1) were sampled quarterly to establish seasonal temperature values. Monitoring data were collected at seven locations (Station 1 through Station 7) in the CFBC and the Gulf of Mexico (Figure 6.1-1) during ecological sampling. While these data were not collected quarterly, they can be used to support the preapplication thermal monitoring performed at SS-1. Sixteen groundwater monitoring wells (MW) located at the LNP site (MW-1S, MW-2S, MW-3S, MW-4S, MW-5S, MW-7S, MW-9S, MW-11S, MW-13S, MW-15S, MW-6D, MW-8D, MW-10D, MW-12D, MW-14D, and MW-16D) (Figure 6.1-2) were also sampled quarterly to establish seasonal temperature values.

Table 6.1-1 lists the surface water monitoring stations and the phases during which each is monitored. Table 6.1-2 lists the groundwater monitoring stations and the phases during which each is monitored. Details of the LNP preapplication thermal monitoring program for surface water and groundwater are described below.

6.1.1.1 Freshwater Streams

There are no freshwater streams on the LNP site (Figure 6.0-1); therefore, no thermal monitoring was performed.

6.1.1.2 Lakes and Impoundments

There are no lakes or impoundments considered to be waters of the State on the LNP site (Figure 6.0-1). In addition, no lakes or impoundments considered to be waters of the State will be used or affected by the construction or operation of the LNP. Lake Rousseau is hydrologically separated from the LNP site (See Figure 6.0-1). The lake is directly upstream of the proposed CFBC intake structure, but is hydrologically disconnected because of the presence of the Inglis Lock and associated Inglis Lock Bypass Channel (Figure 5.2-4).

However, quarterly preapplication monitoring was conducted at the surface water sampling station (SS-2) in March 2007, June 2007, September 2007, and December 2007 (Figure 6.1-1) to provide background information on thermal conditions and evaluate seasonal variations in water temperature within Lake Rousseau. Field measurements were collected concurrently with water samples, as specified in ER Section 6.6. Temperature along with dissolved oxygen, pH, conductivity, salinity, oxidation reduction potential, and turbidity measurements were collected at the surface of the lake using a YSI® Multiprobe or Multiparameter Instrument (or equivalent meter). A description of the sampling frequency is provided in Table 6.1-3.

The existing thermal database is sufficient to describe thermal conditions in Lake Rousseau, as described in ER Subsection 2.3.3.1.

6.1.1.3 Cross Florida Barge Canal

The section of the CFBC near the LNP site was constructed in the 1960s as part of a federal project to create a northern inland water route between the Gulf of Mexico and Northeast Florida. The CFBC is a straight canal with a minimum bottom width of 45.7 meters (m) (150 feet [ft.]) and a depth of 3.7 m (12 ft.) Bathymetry monitoring is described in more detail in ER Section 6.3. PEF intends to use water from the CFBC to supply makeup water for the LNP. Plant water use and cooling system design information is provided in ER Sections 3.3 and 3.4, respectively.

The preapplication thermal monitoring program included quarterly sampling at station SS-1 in March 2007, June 2007, September 2007, and December 2007 (Figure 6.1-1). This monitoring was performed to evaluate seasonal variations in water temperature and salinity within the canal at the proposed location of the LNP intake structure. Field measurements including temperature, salinity, dissolved oxygen, pH, conductivity, salinity, oxidation reduction potential, and turbidity measurements were collected at the surface of the canal using a YSI® Multiprobe or Multiparameter Instrument (or equivalent meter). Grab samples were also collected during these monitoring events to characterize other water quality parameters, as described in ER Section 6.6.

Additional thermal measurements were collected within the CFBC at three locations (Station 1, Station 2, and Station 3) as part of an ecological/water quality characterization effort (Figure 6.1-1). Measurements were collected at

Station 1 and Station 2 on October 16, 2007 and November 11, 2007 and at Station 3 on October 16, 2007, October 18, 2007, and November 19, 2007. Field measurements were collected concurrently with water samples, as specified in ER Section 6.6. At each of these stations, temperature and salinity measurements were collected at the surface and at 1-m (3.3-ft.) depth intervals to the bottom of the water body using a YSI® Multiprobe or Multiparameter Instrument (or equivalent meter). These data provide insight into the temperature and salinity structure of the CFBC. A summary of the CFBC monitoring program is provided in Table 6.1-3.

The existing database is sufficient to describe the thermal and salinity conditions in the CFBC, as described in ER Subsection 2.3.3.1.

6.1.1.4 Cross Florida Barge Canal within the Gulf of Mexico

Thermal measurements were collected in the Gulf of Mexico beyond the CFBC at four locations (Station 4, Station 5, Station 6, and Station 7) as part of an ecological/water quality characterization effort (Figure 6.1-1). Measurements were collected at all four stations on October 16, 2007, October 18, 2007, and November 19, 2007. Thermal measurements were collected concurrently with water quality samples, as specified in ER Section 6.6. At each of these stations, thermal measurements were collected at the surface and at 1-m (3.3-ft.) depth intervals to the bottom of the water body using a YSI® Multiprobe or Multiparameter Instrument (or equivalent meter). The thickness of the water column was also recorded.

Measurements at these stations were collected to support the potential discharge of plant blowdown water to a location offshore of the CFBC. Because the current plan is to route the plant discharge water to the CREC, these stations will not be monitored in future phases of the project. A description of the sampling frequency is provided in Table 6.1-3.

6.1.1.5 Crystal River Energy Complex Discharge Canal and the Gulf of Mexico

The LNP will discharge cooling and plant operation water to the Gulf of Mexico through a pipeline from the LNP site to the CREC discharge canal. Review of historical temperature data was performed. Additional sampling data are needed to establish thermal background conditions within the CREC discharge canal at the proposed point of discharge.

PEF proposes to collect thermal measurements at four locations: one station, CREC Station 1, located within an existing concrete channel used for blowdown discharge from existing coal units and three stations, CREC Station 2 (near the proposed liquid release point), CREC Station 3, and CREC Station 4, located within the CREC discharge canal and Gulf of Mexico (Figure 6.1-3). Temperature measurements will be collected on a quarterly basis concurrently with water samples, as specified in ER Section 6.6. At each of these stations, thermal measurements will be collected at the surface and at 1-m (3.3-ft.) depth intervals

to the bottom of the water body using a YSI® Multiprobe or Multiparameter Instrument (or equivalent meter). The thickness of the water column will also be recorded. A description of the parameters measured and sampling frequency at the CREC locations is provided in Table 6.1-3.

6.1.1.6 Groundwater

Quarterly groundwater monitoring was performed to evaluate seasonal variations in water temperature prior to construction of the LNP. Thermal preapplication monitoring of groundwater was conducted within monitoring wells MW-13S, MW-14D, MW-15S, and MW-16D in March 2007, June 2007, September 2007, and December 2007 (Figure 6.1-2). Monitoring well identifications with an “S” have screened intervals in the surficial aquifer at about 30 to 40 ft. below ground surface (bgs) and monitoring well identifications with a “D” have screened intervals in the upper Floridan aquifer at about 120 to 160 ft. bgs.

Temperature measurements were collected concurrently with water quality samples, as specified in ER Section 6.6. After measuring water levels and before sampling, each monitoring well was purged and measurements were recorded after water quality parameters (temperature, dissolved oxygen, pH, conductivity, salinity, oxidation reduction potential, and turbidity) stabilized. A YSI® Multiprobe or Multiparameter Instrument (or equivalent meter) was used to collect field measurements, including temperature, salinity, dissolved oxygen, pH, conductivity, salinity, oxidation reduction potential, and turbidity measurements.

The existing thermal database is sufficient to describe thermal conditions of the groundwater associated with the safety-related structures for the LNP, as described in ER Subsection 2.3.3.2.

6.1.2 CONSTRUCTION AND PREOPERATIONAL THERMAL MONITORING

The construction and preoperational thermal monitoring program is designed to continue preapplication thermal monitoring activities during the development stages (site preparation and construction) of the LNP until they are operational.

Surface water monitoring will continue at most locations and frequencies of the preapplication thermal monitoring program. Construction monitoring will begin approximately 1 year before site preparation and end when construction is complete. Preoperational monitoring will begin 1 year prior to plant operation to establish a refined baseline for water temperature at the LNP site. Specific monitoring requirements may be required as part of the National Pollutant Discharge Elimination System (NPDES) permit process. In addition, the need for modifications to the monitoring program will be assessed regularly and over the duration of the construction and preoperational thermal monitoring program.

Thermal groundwater monitoring efforts can be grouped by functional intent as follows: reactor area monitoring to establish background conditions and document changes in the immediate vicinity of the reactors, sentinel well

monitoring to establish background conditions and document changes upgradient and downgradient of the reactor units, and raw water withdrawal sentinel wells to establish background conditions and document changes in temperature and salinity due to pumping of raw water from groundwater aquifers. Thermal monitoring details for each phase are presented in Tables 6.1-4, 6.1-5, and 6.1-6, respectively.

Additional locations and more frequent measurements may be incorporated into the construction and preoperational thermal monitoring program as the engineering design progresses.

Table 6.1-1 lists the surface water stations that are monitored during each phase. Table 6.1-2 lists the groundwater stations that are monitored during each phase. The construction and preoperational thermal monitoring program for surface water and groundwater are described below.

6.1.2.1 Freshwater Streams

There are no freshwater streams on the LNP site (Figure 6.0-1); therefore, no thermal monitoring will be performed.

6.1.2.2 Lakes and Impoundments

Monitoring of water temperature at location SS-2 (Figure 6.1-1) within Lake Rousseau will be discontinued because the lake is hydrologically disconnected from the LNP site and will not be used for water supply (Figure 6.0-1).

6.1.2.3 Cross Florida Barge Canal

Temperature and salinity monitoring within the CFBC will continue quarterly during construction and preoperational activities at preapplication monitoring locations, Station 1, Station 2, and Station 3 (Figure 6.1-1) to establish a thermal baseline. Thermal measurements at the proposed intake structure monitoring locations will be collected weekly until construction activities are complete. Sampling procedures are described in ER Subsection 6.1.1.3.

6.1.2.4 Crystal River Energy Complex Discharge Canal and the Gulf of Mexico

Water temperature and salinity will continue to be monitored at locations CREC Station 1 in the existing concrete blowdown channel and CREC Station 2, CREC Station 3, and CREC Station 4 within the CREC discharge canal and Gulf of Mexico throughout the construction and preoperational phases of the work to establish a thermal baseline (Figure 6.1-3). The placement of these stations span the expected average and extreme range of the thermal plume and are expected to provide the required monitoring to determine compliance with the temperature requirements of an NPDES permit for the discharge. Sampling procedures are described in ER Subsection 6.1.1.5.

Temperature measurements at each site will be collected in conjunction with proposed biological sampling at consistent depths and at a time of day (morning) that minimizes the effect of diurnal solar warming.

6.1.2.5 Groundwater

Preapplication monitoring wells MW-5S, MW-7S, MW-9S, MW-11S, MW-13S, MW-15S, MW-6D, MW-8D, MW-10D, MW-12D, MW-14D, and MW-16D near the proposed reactor sites are assumed to be located within the proposed construction area for the LNP, and therefore, will have to be abandoned in accordance with Florida Department of Environmental Protection (FDEP) regulatory guidelines prior to construction activities. Thermal measurements will be collected quarterly within the remaining four monitoring wells, MW-1S, MW-2S, MW-3S, and MW-4S, throughout the construction and preoperational phases of the project as they are located on the periphery of the property and will not interfere with construction activities (Table 6.1-5).

A total of 43 new monitoring wells are proposed for installation immediately following construction activities and prior to plant operation. Screened interval depths will be consistent with monitoring well identifications “S” and “D” as indicated in ER Subsection 6.1.1.6. These wells include:

- Nine nested monitoring well pairs (18 total wells) installed adjacent to the reactor buildings (LNP 1 and LNP 2). Nested monitoring well pairs will be labeled MW-26S and MW-26D, MW-27S and MW-27D, MW-28S and MW-28D, MW-29S and MW-29D, MW-30S and MW-30D, MW-31S and MW-31D, MW-32S and MW-32D, MW-33S and MW-33D, and MW-34S and MW-34D as shown on Figure 6.1-4.

- Three nested monitoring well pairs (6 total wells) installed midway between the meteorological tower and reactors. These sentinel wells will serve to monitor changes in water temperature downgradient of the reactors within the exclusion area boundary of the site. Nested monitoring well pairs will be labeled MW-23S and MW-23D, MW-24S and MW-24D, and MW-25S and MW-25D as shown on Figure 6.1-4.

- Six nested monitoring well pairs (12 total wells) installed a distance of about 3600 ft. west (W), south (S), and east (E) of the center location between the reactor buildings. The sentinel wells will monitor hydrologic conditions beyond the exclusion area boundary. Nested monitoring well pairs will be labeled MW-17S and MW-17D, MW-18S and MW-18D, MW-19S and MW-19D, MW-20S and MW-20D, MW-21S and MW-21D, and MW-22S and MW-22D as shown on Figure 6.1-4.

- Three deep sentinel monitoring wells installed in the Floridan aquifer to monitor potential changes in temperature and salinity caused by the extraction of potable water from proposed LNP 1 and LNP 2 raw water wells. These wells will be labeled MW-1WW, MW-2WW, MW-3WW and

their locations are illustrated on Figure 6.1-4. Locations of the proposed raw water wells and associated monitoring wells are subject to change as the engineering design progresses.

Groundwater from LNP 1 and LNP 2 water wells will be used as a potable water source for the facility and the following processes: service water tower evaporation, service water tower drift, raw water supply, raw water to the demineralizer, fire protection, service water strainer backwash, and media filter backwash. Possible effects caused by continuous groundwater extraction include saltwater intrusion and potential decreases in water levels within the surficial and Floridan aquifers. Screen depths for the deep sentinel monitoring wells will be installed at approximately 100 to 200 ft. below the total depth of the proposed raw water wells.

- In addition to the new well pairs, deep wells (120 to 160 ft. deep) will be installed adjacent to existing shallow wells MW-1S, MW-2S, MW-3S, and MW-4S to augment the peripheral monitoring network and provide deep well control along the northern, southern, and eastern edges of the property. These wells will be labeled MW-1D, MW-2D, MW-3D, and MW-4D as shown on Figure 6.1-4.

New monitoring well locations were selected using the following rationale:

- Provide baseline data upgradient of the LNP 1 and LNP 2.
- Provide baseline data at locations encircling and near the LNP 1 and LNP 2.
- Provide baseline data at locations downgradient of the LNP 1 and LNP 2 to monitor potential releases from LNP 1 and LNP 2 or associated operations.
- Provide baseline data at the perimeter of the site to monitor potential changes resulting from facility operation.
- Monitor changes in water level and salinity due to raw water pumping from the Floridan aquifer.

Changes in water temperatures within wells surrounding the reactor units (MW-26S, MW-26D, MW-27S, MW-27D, MW-28S, MW-28D, MW-29S, MW-29D, MW-30S, MW-30D, MW-31S, MW-31D, MW-32S, MW-32D, MW-33S, MW-33D, MW-34S, MW-34D) will be monitored quarterly using automated downhole test equipment starting approximately 1 year before plant operation begins.

Water temperatures in the peripheral shallow/deep wells (MW-17S, MW-17D, MW-18S, MW-18D, MW-19S, MW-19D, MW-20S, MW-20D, MW-21S, MW-21D, MW-22S, MW-22D MW-23S, MW-23D, MW-24S, MW-24D, MW-25S, MW-25D)

will also be measured quarterly in conjunction with the chemical monitoring described in ER Section 6.6 starting approximately 1 year before plant operation begins.

Water temperatures and salinity in monitoring wells MW-1WW, MW-2WW, MW-3WW will be measured quarterly in conjunction with the chemical described in ER Section 6.6 starting approximately 1 year before plant operation begins.

Monitoring frequency and data quality objectives for groundwater monitoring stations are summarized in Tables 6.1-4, 6.1-5, and 6.1-6.

6.1.3 OPERATIONAL THERMAL MONITORING

The operational thermal monitoring program will be implemented to document water temperature and identify any changes resulting from operation of the LNP. The specific operational monitoring requirements will be developed in consultation with the FDEP relative to NPDES permit requirements and monitoring requirements for the LNP.

Although the specific procedures of the operational thermal monitoring program have not been finalized, it is anticipated that the monitoring stations will be the same as those used during the construction and preoperational thermal monitoring programs (see ER Subsection 6.1.2). Tables 6.1-1 and 6.1-2 list the surface water and groundwater monitoring stations and project phase during which each is monitored. Tables 6.1-3, 6.1-4, 6.1-5, and 6.1-6 summarize the parameters measured and the frequency at which they are collected. Figures 6.1-1 and 6.1-3 show the location of the surface water monitoring locations. Figure 6.1-2 shows the location of the proposed preoperational and operation phase monitoring well locations.

Data will be evaluated for temperature variability, as well as temporal trends. Modifications to the operational thermal monitoring program (for example, changes in monitoring stations and collection procedures) will be assessed regularly and over the duration of the monitoring program.

The operational monitoring program will be designed and approved after consultation with the appropriate resource agencies to ensure any operational effects are addressed and that the program provides statistically valid and defensible data according to PEF's quality assurance/quality control (QA/QC) program.

6.1.3.1 Freshwater Streams

There are no freshwater streams on the LNP site; therefore, no thermal monitoring will be performed during operational monitoring.

6.1.3.2 Lakes and Impoundments

No lakes or impoundments considered to be waters of the State are hydrologically connected or used by the LNP; therefore, no thermal monitoring will be performed during operational monitoring.

6.1.3.3 Cross Florida Barge Canal

The specific procedures of the operational monitoring requirements for the CFBC are anticipated to be similar to the preoperational thermal monitoring program. The program may be modified based on data collected and consultations with the FDEP. The data will be evaluated to monitor for changes resulting from the withdrawal of makeup water from the CFBC. Temperature measurements at monitoring locations, Station 1, Station 2, and Station 3 (Figure 6.1-1), established during the preapplication monitoring phase, will continue to be monitored as described in Table 6.1-3. Monitoring will be performed monthly for 2 years after operation begins, bimonthly for the next 3 years, and quarterly thereafter.

6.1.3.4 Crystal River Energy Complex Discharge Canal and the Gulf of Mexico

The specific procedures of the operational monitoring requirements for the CREC are anticipated to be similar to the preoperational thermal monitoring program. Monitoring will be performed monthly for 2 years after operation begins, bimonthly for the next 3 years, and quarterly thereafter. The program may be modified based on data collected and consultations with the FDEP. The data will be evaluated to monitor for changes resulting from the discharge of blowdown to the CREC discharge canal.

6.1.3.5 Groundwater

Specifics related to the operational monitoring are anticipated to be similar to the specifics for the preoperational thermal monitoring program. The operational thermal monitoring program will be implemented to establish the effects to the groundwater system from the operation of the LNP, and to detect any unexpected effects from facility operation. The need for modifications to the monitoring program (for example, changes in monitoring stations or frequency of collection) will be assessed regularly over the duration of the operational thermal monitoring program.

During operational monitoring, changes in water temperature and salinity will be measured at the following frequencies:

- Quarterly at the nine shallow/deep well pairs installed adjacent to LNP 1 and LNP 2 using a YSI® multiprobe or Multiparameter Instrument (or equivalent meter).

- Monthly for the first year and quarterly thereafter at the sentinel shallow/deep well pairs using a YSI® Multiprobe or Multiparameter Instrument (or equivalent meter).

- Quarterly at the three raw water withdrawal sentinel wells in conjunction with the chemical monitoring described in ER Section 6.6.

The necessity of performing the monitoring at the frequency described above will be evaluated and may be modified (increased or decreased) based on trends observed in the data. This monitoring plan may be revised based on applicable agency permit conditions may dictate monitoring requirements. A description of the frequency at which the groundwater wells are measured and the data quality objectives are provided in Tables 6.1-4, 6.1-5, and 6.1-6.

Table 6.1-1
Summary of Proposed Surface Water Non-Radiological Monitoring Programs by Phase

Location	Type	Preapplication	Construction [a]	Preoperation [b]	Operation
SS-1	Surface water	X [c]			
SS-2	Surface water	X [c]			
SW-1	Surface water			X	X
SW-2	Surface water			X	X
SW-3	Surface water			X	X
Station 1 [d]	Surface water	X [e]	X	X	X
Station 2 [d]	Surface water	X [e]	X	X	X
Station 3 [d]	Surface water	X [e]	X	X	X
Station 4	Surface water	X [e]			
Station 5	Surface water	X [e]			
Station 6	Surface water	X [e]			
Station 7	Surface water	X [e]			
CREC Station 1	Surface water	X [f]	X	X	X
CREC Station 2	Surface water	X [f]	X	X	X
CREC Station 3	Surface water	X [f]	X	X	X
CREC Station 4	Surface water	X [f]	X	X	X

Notes:

a) Beginning 1 year prior to site preparation.

b) Beginning 1 year prior to plant operation.

c) Monitoring began in March 2007.

d) Monitoring station is located within the CFBC.

e) Monitoring began in October 2007.

f) Monitoring had not begun as of January 2008.

Table 6.1-2 (Sheet 1 of 3)
Summary of Proposed Groundwater Non-Radiological Monitoring Programs by Phase

Location	Type	Preapplication	Construction [a]	Preoperation [b]	Operation
MW-1S	Groundwater	X [c]	X	X	X
MW-1D	Groundwater			X	X
MW-2S	Groundwater	X [c]	X	X	X
MW-2D	Groundwater			X	X
MW-3S	Groundwater	X [c]	X	X	X
MW-3D	Groundwater			X	X
MW-4S	Groundwater	X [c]	X	X	X
MW-4D	Groundwater			X	X
MW-5S	Groundwater	X [c]			
MW-6D	Groundwater	X [c]			
MW-7S	Groundwater	X [c]			
MW-8D	Groundwater	X [c]			
MW-9S	Groundwater	X [c]			
MW-10D	Groundwater	X [c]			
MW-11S	Groundwater	X [c]			
MW-12D	Groundwater	X [c]			
MW-13S	Groundwater	X [c]			
MW-14D	Groundwater	X [c]			
MW-15S	Groundwater	X [c]			
MW-16D	Groundwater	X [c]			
MW-17S	Groundwater			X	X
MW-17D	Groundwater			X	X
MW-18S	Groundwater			X	X
MW-18D	Groundwater			X	X
MW-19S	Groundwater			X	X
MW-19D	Groundwater			X	X
MW-20S	Groundwater			X	X
MW-20D	Groundwater			X	X

Table 6.1-2 (Sheet 2 of 3)
Summary of Proposed Groundwater Non-Radiological Monitoring Programs by Phase

Location	Type	Preapplication	Construction [a]	Preoperation [b]	Operation
MW-21S	Groundwater			X	X
MW-21D	Groundwater			X	X
MW-22S	Groundwater			X	X
MW-22D	Groundwater			X	X
MW-23S	Groundwater			X	X
MW-23D	Groundwater			X	X
MW-24S	Groundwater			X	X
MW-24D	Groundwater			X	X
MW-25S	Groundwater			X	X
MW-25D	Groundwater			X	X
MW-26S	Groundwater			X	X
MW-26D	Groundwater			X	X
MW-27S	Groundwater			X	X
MW-27D	Groundwater			X	X
MW-28S	Groundwater			X	X
MW-28D	Groundwater			X	X
MW-29S	Groundwater			X	X
MW-29D	Groundwater			X	X
MW-30S	Groundwater			X	X
MW-30D	Groundwater			X	X
MW-31S	Groundwater			X	X
MW-31D	Groundwater			X	X
MW-32S	Groundwater			X	X
MW-32D	Groundwater			X	X
MW-33S	Groundwater			X	X
MW-33D	Groundwater			X	X

Table 6.1-2 (Sheet 3 of 3)
Summary of Proposed Groundwater Non-Radiological Monitoring Programs by Phase

Location	Type	Preapplication	Construction [a]	Preoperation [b]	Operation
MW-34S	Groundwater			X	X
MW-34D	Groundwater			X	X
MW-1WW	Groundwater			X	X
MW-2WW	Groundwater			X	X
MW-3WW	Groundwater			X	X

Notes:

a) Beginning 1 year prior to site preparation.

b) Beginning 1 year prior to plant operation.

c) Monitoring begun in March 2007.

D = deep (bedrock aquifer)
MW = monitoring well
S = shallow (surficial aquifer)
WW = raw water withdrawal

Table 6.1-3 (Sheet 1 of 2)
Summary of Proposed Surface Water Thermal Monitoring Program for the LNP

Description	Preapplication	Construction	Preoperation	Operation
Objective of Sampling Program	Establish background surface water temperature and salinity in the CFBC, CREC discharge canal, and Lake Rousseau before site preparation and construction activities.	Monitor surface water temperature and salinity changes during site preparation and construction activities.	Establish baseline surface water temperature and salinity before facility operation.	Document surface water temperature and salinity changes during operation.
Stations	*CFBC*: Station 1, Station 2, Station 3, Station 4, Station 5, Station 6, Station 7, SS-1 *CREC*: CREC Station 1, CREC Station 2, CREC Station 3, CREC Station 4 *Lake Rousseau*: SS-2 (See Figure 6.1-1)	*CFBC*: Station 1, Station 2, Station 3 *CREC*: CREC Station 1, CREC Station 2, CREC Station 3, CREC Station 4 (See Figures 6.1-1 and 6.1-3)	*CFBC*: Station 1, Station 2, Station 3 *CREC*: CREC Station 1, CREC Station 2, CREC Station 3, CREC Station 4 (See Figures 6.1-1 and 6.1-3)	*CFBC*: Station 1, Station 2, Station 3 *CREC*: CREC Station 1, CREC Station 2, CREC Station 3, CREC Station 4 (See Figures 6.1-1 and 6.1-3)
Frequency	Quarterly: SS-1, SS-2, CREC Station 1 [(a)], CREC Station 2 [(a)], CREC Station 3 [(a)], CREC Station 4 [(a)] October, November, December 2007: Station 1, Station 2, Station 3, Station 4, Station 5, Station 6, Station 7 (See ER Subsection 2.3.3 for more details)	Quarterly beginning approximately 1 year before site preparation activities. (Increase frequency if notable changes occur.)	Quarterly beginning approximately 1 year before plant operation.	Monthly (for 2 years), bimonthly (for 3 years), and quarterly thereafter. (Increase frequency if notable changes occur.)

Table 6.1-3 (Sheet 2 of 2)
Summary of Proposed Surface Water Thermal Monitoring Program for the LNP

Description	Preapplication	Construction	Preoperation	Operation
Parameters	Water temperature and salinity[b]	Water temperature and salinity[b]	Water temperature and salinity[b]	Water temperature and salinity[b]
Collection Points for Field Parameters	0.5 m (1.6 ft.) below surface for all surface water samples. For CFBC and CREC monitoring stations, also measure at 1-m (3.3-ft.) depth intervals to the bottom.	0.5 m (1.6 ft.) below surface and 1-m (3.3-ft.) depth intervals to the bottom.	0.5 m (1.6 ft.) below surface and 1-m (3.3-ft.) depth intervals to the bottom.	0.5 m (1.6 ft.) below surface and 1-m (3.3-ft.) depth intervals to the bottom.
Data Analysis	Statistical trend	Statistical trend	Statistical trend	Statistical trend

Notes:

a) Monitoring had not begun as of January 2008.

b) Temperature measurements at each site are collected in conjunction with water quality sampling at consistent depths.

ft. = foot
m = meter

Table 6.1-4
Summary of Proposed Reactor Area Thermal Groundwater Monitoring Program for the LNP

Description	Preapplication	Construction	Preoperation	Operation
Objective of Sampling Program	Establish background temperature at the proposed LNP reactor sites before site preparation and construction activities.	Document groundwater temperature changes during site preparation and construction activities.	Establish baseline groundwater temperature at reactor area locations before facility operation.	Document groundwater temperature and identify changes at reactor area locations during operation.
Stations	MW-13S, MW-14D, MW-15S, MW-16D (See Figure 6.1-2)	Temporary dewatering monitoring wells located in the immediate vicinity of the proposed reactor areas (quantity and locations to be determined during construction activities)	MW-26S, MW-26D, MW-27S, MW-27D, MW-28S, MW-28D, MW-29S, MW-29D, MW-30S, MW-30D, MW-31S, MW-31D, MW-32S, MW-32D, MW-33S, MW-33D, MW-34S, MW-34D (See Figure 6.1-4)	MW-26S, MW-26D, MW-27S, MW-27D, MW-28S, MW-28D, MW-29S, MW-29D, MW-30S, MW-30D, MW-31S, MW-31D, MW-32S, MW-32D, MW-33S, MW-33D, MW-34S, MW-34D (See Figure 6.1-4)
Frequency	*Daily*: MW-13S, MW-15S *Quarterly*: MW-13S, MW-14D, MW-15S, MW-16D	*Daily*, at a minimum, and critical points may be monitored continuously	*Quarterly* beginning approximately 1 year before plant operation	*Quarterly*
Parameters	Water temperature	Water temperature	Water temperature	Water temperature
Collection method	*Daily*: Automated downhole test equipment *Quarterly*: Manual	Manual or automated downhole test equipment	Manual	Manual
Data Analysis	Statistical trend	Statistical trend	Statistical trend	Statistical trend

Notes:

D = deep (bedrock aquifer)
S = shallow (surficial aquifer)

Table 6.1-5
Summary of Proposed Sentinel Well Thermal Groundwater Monitoring Program for the LNP

Description	Preapplication	Construction	Preoperation	Operation
Objective of Sampling Program	None	Document groundwater temperature changes during site preparation and construction activities.	Establish baseline temperature upgradient and downgradient of reactor area sites before facility operation.	Document groundwater temperature and identify changes during operation upgradient and downgradient of reactor area sites.
Stations	None	MW-1S, MW-2S, MW-3S, MW-4S (See Figure 6.1-3)	MW-1S, MW-1D, MW-2S, MW-2D, MW-3S, MW-3D, MW-4S, MW-4D, MW-17S, MW-17D, MW-18S, MW-18D, MW-19S, MW-19D, MW-20S, MW-20D, MW-21S, MW-21D, MW-22S, MW-22D, MW-23S, MW-23D, MW-24S, MW-24D, MW-25S, MW-25D (See Figure 6.1-4)	MW-1S, MW-1D, MW-2S, MW-2D, MW-3S, MW-3D, MW-4S, MW-4D, MW-17S, MW-17D, MW-18S, MW-18D, MW-19S, MW-19D, MW-20S, MW-20D, MW-21S, MW-21D, MW-22S, MW-22D, MW-23S, MW-23D, MW-24S, MW-24D, MW-25S, MW-25D (See Figure 6.1-4)
Frequency	None	*Quarterly* beginning approximately 1 year before site preparation	*Quarterly* beginning approximately 1 year before plant operation	*Monthly* for first year of operation, *quarterly* thereafter
Parameters	N/A	Water temperature	Water temperature	Water temperature
Collection method	N/A	Manual	Manual	Manual
Data Analysis	N/A	Statistical trend	Statistical trend	Statistical trend

Notes:

D = deep (bedrock aquifer)
N/A = not applicable
S = shallow (surficial aquifer)

Table 6.1-6
Summary of Raw Water Withdrawal Sentinel Well Thermal Groundwater Monitoring Program for the LNP

Description	Preapplication	Construction	Preoperation	Operation
Objective of Sampling Program	None	None	Establish baseline temperature and salinity downgradient of raw water withdrawal wells before facility operation.	Document groundwater temperature and salinity to identify changes downgradient of raw water withdrawal wells during operation.
Stations	None	None	MW-1WW, MW-2WW, MW-3WW (See Figure 6.1-4)	MW-1WW, MW-2WW, MW-3WW (See Figure 6.1-4)
Frequency	None	None	*Quarterly*	*Quarterly*
Parameters	N/A	N/A	Water temperature and salinity	Water temperature and salinity
Collection method	N/A	N/A	Automated downhole test equipment	Automated downhole test equipment
Data Analysis	N/A	N/A	Statistical trend	Statistical trend

Notes:

N/A = not applicable
WW = raw water withdrawal

6.2 RADIOLOGICAL MONITORING

6.2.1 INTRODUCTION

The LNP Radiological Environmental Monitoring Program (REMP) will be designed to adequately characterize the radiological environment of the biosphere in the vicinity of the LNP site. The REMP will provide data on measurable levels of radiation and radioactive materials in the site environs and baseline data from surveillance of principal pathways of exposure to the public.

The primary objective of the REMP is to monitor for potential radiological exposures to operations and construction workers, the public, and the surrounding environment prior to and during construction and active facility operations. Where practical, PEF will use already established Crystal River Unit 3 (CR-3) monitoring or sampling locations, as applicable.

The REMP includes: (1) number and location of sample collection points and measuring devices, and the pathway sampled or measured; (2) sample collection frequency; (3) type and frequency of analysis; and (4) general types of sample collection and measuring equipment. The lower limit of detection for each analysis is provided in the LNP Off-Site Dose Calculation Manual.

Sampling of the CREC environs is performed by the State of Florida Department of Health, Bureau of Radiation Control. The State also performs the required analyses, participates in the Interlaboratory Comparison program, and performs the annual land use census. It is anticipated that the State will also perform the sampling and analysis for the LNP. Sampling locations will be adjusted by the state, as necessary, to meet its requirements.

Existing CREC sampling locations will be used where practical. Other sampling locations have been selected based on their relative location to the LNP and prevailing wind direction. Additional sampling locations may be selected from those suggested by the State. Sampling locations were selected in accordance with the requirements of Table 6.2-2 of NUREG-1555.

Effluent release points for the LNP are discussed in ER Section 3.5.

6.2.2 LNP RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

The REMP will be implemented in accordance with 10 Code of Federal Regulations (CFR) 20.1501 and Criterion 64 of 10 CFR 50, Appendix A. The program will be developed using the following guidance published by the U.S. Nuclear Regulatory Commission (NRC):

- Regulatory Guide 4.1, Revision 1, “Programs for Monitoring Radioactivity in the Environs of Nuclear Power Plants.”

- Regulatory Guide 4.13, Revision 1, "Performance, Testing, and Procedural Specifications for Thermoluminescence Dosimetry; Environmental Applications."

- Regulatory Guide 4.15, Revision 1, "Quality Assurance for Radiological Monitoring Programs (Normal Operations) – Effluent Streams and the Environment."

- Regulatory Guide 1.109, Revision 1, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR 50, Appendix I."

The REMP has the following objectives:

- Identify, measure, and evaluate existing radionuclides in the environs surrounding the LNP and fluctuations in radioactivity levels that may occur.

- Evaluate the measurements to determine the effects on proposed operations relative to the local radiological environment.

- Collect data needed to refine environmental radiation transport models used in off-site dose calculations.

- Verify that radioactive material containment systems are functioning to minimize environmental releases to levels as low as reasonably achievable.

- Demonstrate compliance with regulations.

Implicit in these objectives are the requirements to analyze trends and assess radiation exposure rates and radioactivity concentrations in the environment that may contribute to radiation exposure to plant personnel and the general public. The program will consist of two phases: preoperational and operational.

- Preoperational radiological environmental monitoring: The preoperational REMP will be used to establish the baseline for the local radiation environment. The preoperational REMP will measure background levels and their variations along the anticipated critical pathways in the area surrounding the LNP, train personnel, and evaluate procedures, equipment, and techniques. However, because the LNP will be sited near CR-3, the preoperational and operational phases of the REMP were developed from baseline data already established for the CR-3. The preoperational monitoring program, which will be implemented 2 years before scheduled full load, will monitor the radiological environment around the LNP. The duration of the preoperational program for specific media is given in Table 6.2-1.

- Operational radiological environmental monitoring: The operational REMP will include measures to document the effectiveness of procedures and processes that restrict or control releases of radioactive materials to the environment.

The elements (sampling media and analysis type) for both the preoperational and operational REMP phases will be essentially the same. Where practical, the REMP will use the same sampling locations as the CR-3's existing REMP. New sampling locations will be chosen based on the selected plant design parameters.

Figure 6.2-1 presents the basic pathways for gaseous and liquid radioactive effluent releases to the public. The "important pathways" selected are based primarily on how radionuclides move through the environment and how they could eventually expose the public, taking into consideration the public's interactions with the environment.

The scope of the program will include monitoring the media identified in Table 6.2-2. The REMP will monitor the environment by sampling air, water, sediment, fish and food products, as well as measuring radiation directly. Milk samples are also monitored, if milk-producing animals are present within 8 kilometers (km) (5 miles [mi.]) of the LNP.

6.2.3 INDICATOR AND CONTROL LOCATIONS

The REMP includes sampling indicator and control locations within a 20-mi. radius of the LNP (one control location is located outside this radius) and uses indicator locations near and around the LNP site to show any increases or buildup of radioactivity that might occur from station operation, and control locations farther away from the site to indicate the background radiation levels. Indicator results will be compared with control and preoperational results to assess any impact that the LNP operation might have had on the surrounding environment. The lower limit of detection is provided in the Off-site Dose Calculation Manual. Airborne effluents are normally released through the plant vent or the turbine building vent. The plant vent provides the release pathway for containment venting releases, auxiliary building ventilation releases, annex building releases, radwaste building releases, and gaseous radwaste system discharge. The turbine building vents provide the release path for the condenser air removal system, gland seal condenser exhaust, and the turbine building ventilation releases. Liquid effluents are mixed with and diluted by the cooling tower blowdown before being discharged to the Gulf of Mexico.

Pathways will be monitored at sampling indicator and control locations. Indicator locations were chosen for the LNP based on meteorological factors, preoperational monitoring requirements, and results of the land use surveys. A number of locations have been selected as controls. The following list provides information about the control locations, along with distances from the LNP or CR-3:

- LNP Control Location L46 (Air Sampling-Air Cartridge and Air Particulate-thermoluminescent dosimetry [TLD]) – 125.5 km (78 mi.) ESE of CR-3. **Note: CR-3 Control location C47** (Reference 6.2-001).

- LNP Control Location L46 (Broadleaf vegetation) – 125.5 km (78 mi) ESE of CR-3. **Note: CR-3 Control location C47** (Reference 6.2-001).

- LNP Control Location L48 (Fish and Oysters) – 5.4 km (3.4 mi.) WSW of CR-3 (Gulf of Mexico). **Note: CR-3 Control location C30** (Reference 6.2-001).

- LNP Control Location L54 (Drinking Water and Surface Water) – 8.5 km (5.3 mi.) north (N) of CR-3 (Withlacoochee River). **Note: CR-3 Control location C18**. (Reference 6.2-001).

- LNP Control Location L55 (Drinking Water and Surface Water) – 9.7 km (6.0 mi.) ESE of CR-3. **Note: CR-3 Control location C10** (Reference 6.2-001).

- LNP Control Location L56 (Drinking Water and Surface Water) – 11.9 km (7.4 mi.) ESE of CR-3 (Kings Bay). **Note: CR-3 Control location C07** (Reference 6.2-001).

- LNP Control Location L70 (Sea water) – 7.4 km (4.6 mi.) WSW of CR-3 (Gulf of Mexico). **Note: CR-3 Control location C13** (Reference 6.2-001).

- LNP Control Location L61 (Shoreline Sediment) – 5.2 km (3.2 mi.) South of CR-3. **Note: CR-3 Control location C09** (Reference 6.2-001).

- LNP Control Location L57 (Groundwater) – 5.8 km (3.6 mi.) East of CR-3. **Note: CR-3 Control location C40** (Reference 6.2-001).

Samples from these control locations will provide a basis for measuring background fluctuations in radioactivity at indicator locations caused by natural phenomena and fallout. By comparing radioactive material concentrations at indicator locations to these control locations, increases resulting, in part, from commercial operation will be distinguishable.

Indicator locations and control locations are described in Table 6.2-3 and are shown on Figures 6.2-2 and 6.2-3. Some indicator locations are already established for the operation of CR-3. Initially, some of these indicator locations and control locations will be used for the LNP as baseline locations and for gathering data to indicate the radiological environment before operation of the LNP. These locations were selected primarily based on where the highest predicted environmental radiological concentrations occur. Different locations may be selected once the LNP is actively operating.

A description of the LNP monitoring and sampling locations used to monitor the exposure pathways is provided on Table 6.2-3 and shown on Figures 6.2-2 and 6.2-3. Monitoring locations consist of an inner ring of TLDs in the general area of the site boundary with a TLD in each compass direction. An outer ring of TLDs is located approximately 8 km (5 mi.) from the site. In addition, particulate and airborne iodine will be monitored close to the site boundary in the direction that has the highest calculated annual average ground level deposition.

6.2.3.1 Pathways Monitored

Radiological exposure pathways are ways by which people might become exposed to radioactive material. The major pathways of concern are those that could cause the highest calculated radiological dose. The projected pathways are determined from the type and amount of radioactive material that may have been released, the environmental transport mechanism, and the use of the environment. Environmental transport mechanisms include, but are not limited to, local hydrology (water) and meteorology (weather).

The release of radioactive gaseous effluents can affect the public via pathways such as external whole-body exposure, deposition on plants and soils, and human inhalation/ingestion. The release of radioactive constituents in liquid effluents can affect the public via pathways such as drinking water, oyster and fish consumption, direct exposure from shoreline sediments, and submersion dose while swimming.

The following radiological exposure pathways are monitored:

- Direct Radiation (TLDs)
- Airborne Releases
- Liquid Releases

6.2.4 SAMPLE ANALYSIS

Concentrations of radioactivity present in the environment vary as a result of factors such as weather conditions, location, and geology.

Several types of measurements will be performed to provide information about the types of radiation and radionuclides present. Environmental samples will be analyzed for the following:

- Gross beta
- Gamma
- Tritium

- Iodine-131
- Gamma dose (TLD only)

6.2.4.1 Direct Radiation Monitoring

Radionuclides could expose humans through immersion in the atmosphere or deposition on the ground. The TLDs will be used to measure the ambient gamma radiation levels at many locations surrounding the LNP. The TLDs are crystalline devices that store energy when exposed to radiation.

The TLDs can be processed months after exposure with minimal loss of information, which makes them well suited for quarterly environmental radiation measurements. During TLD processing, stored energy is released as light and measured by a TLD reader. The light intensity is proportional to the radiation dose to which the TLD is exposed.

Some of the CR-3 TLD locations will be used that are in the W, WSW, SW, SSW, S directions from the LNP. The inner ring of TLDs will be strategically located near the LNP (site boundary) while others will be located at the 8-km (5-mi.) radius in locations representing the 16 meteorological compass sectors. Other locations have been or will be chosen to measure radiation levels at places of special interest, such as nearby residences, meeting places, and population centers.

6.2.4.2 Air Monitoring

The inhalation and ingestion of radionuclides in the air is a direct exposure pathway to humans and animals. A network of active air samplers will be used to monitor this pathway from the vent stacks, which include the plant vent stack, turbine building vent stack, and the two waste processing building vent stacks. Air sampling stations will be strategically located in areas most likely to reveal any measurable effects resulting from the release of radioactive effluents from the LNP.

Mechanical air samplers will be used to draw a continuous volume of air through a filter and charcoal cartridge, collecting any particulates and radioiodines that might be present in the atmosphere. These samplers are typically equipped with a pressure-sensing flow regulator to maintain a constant sampling rate of air flow. The total volume is calculated from the amount of time the air sampler was in operation and the flow rate. The air sampling equipment will be maintained and calibrated by facility personnel in accordance with National Institute of Standards and Technology (NIST) procedures.

Air samples will be collected and analyzed at the frequency and for the constituents specified in Table 6.2-3. Quarterly, the air particulate filters collected throughout this period will be combined and counted for gamma isotopic activity and gross beta activity. The intent of particulate sampling is to measure airborne radioactivity released from active facility operations. However, the counting of

short-lived daughters, produced by the decay of natural radon and thoron, may mask any LNP contributions. Therefore, the filters will not be analyzed for at least 5 days after collection, which will allow for the radioactive decay of short-lived daughters, thus reducing their contribution to the overall gross beta activity.

6.2.4.3 Aquatic Monitoring

The LNP will discharge cooling tower blowdown to the CREC discharge canal and then to the Gulf of Mexico. If radioactive liquid effluents were to be discharged from the LNP into the cooling water outfall, long-lived radioisotopes could be ingested by oysters and fish in the immediate area where the CREC discharge canal discharges to the Gulf of Mexico.

The Gulf of Mexico is the primary environmental exposure pathway for radioactive materials from liquid effluents that will be discharged from both the LNP and CREC. Aquatic vegetation, fish, oysters, and sediments (bottom and shoreline) will be collected and analyzed to detect the presence of any radioisotopes related to the operation of the LNP and CREC. These samples will be analyzed for naturally occurring and artificially produced radioactive materials. Both indicator and control locations will be established in the Gulf of Mexico.

6.2.4.3.1 Aquatic Vegetation

Aquatic vegetation samples will be obtained annually and analyzed as specified in Table 6.2-3. The Gulf of Mexico aquatic vegetation poses no radiological exposure risk to the public because it is not an ingestion pathway. These samples will be used for long-term trending analysis only.

6.2.4.3.2 Fish and Oysters

Various samples of fish and oysters will be collected from the Gulf of Mexico near the point where the CREC discharge canal discharges to the Gulf. Fish and oysters ingest sediments during bottom feeding, and those sediments may retain radionuclides. A radiological analysis from fish and oyster samples will provide key information on the potential ingestion of radionuclides by humans from this aquatic pathway. These samples will be collected semi-annually and analyzed, as specified in Table 6.2-3.

6.2.4.3.3 Bottom and Shoreline Sediments

Samples of bottom sediments will be collected at the CREC discharge canal point of discharge in the Gulf of Mexico. These samples will be used for tracking and trending only. Shoreline sediments will be collected on the Gulf of Mexico shoreline. Radiological analyses of sediments will provide information on any potential shoreline exposure to humans by determining long-term trends and accumulation of long-lived radionuclides from the environment. Samples will be collected semi-annually and analyzed, as specified in Table 6.2-3.

6.2.4.4 Terrestrial Monitoring

In addition to direct radiation, radionuclides present in the atmosphere expose receptors when deposited on plants and soil and subsequently consumed. To monitor this food pathway, samples of milk, if available, and broadleaf vegetation will be analyzed.

6.2.4.4.1 Milk

There is no known commercial production of milk for human consumption within the 8-km (5-mi.) radius of the LNP. Milk samples will be collected when the land use census shows there are commercial milk producing animals within an 8-km (5-mi.) radius of the plant used for human consumption.

6.2.4.4.2 Broadleaf Vegetation

Surface vegetation samples will be collected monthly during the growing season from a number of locations to monitor the potential buildup of atmospherically deposited radionuclides. The radionuclides of interest, relative to the LNP operations, are already present within our environment. These radionuclides are from several decades of worldwide fallout or from naturally occurring sources. Therefore, the presence of these radionuclides is anticipated from the samples collected. These samples will be analyzed following the requirements specified in Table 6.2-3.

Broadleaf vegetation will be collected from two sample locations and one control location. The sample locations will be in the meteorological sectors with the highest potential for surface deposition. Samples will be collected once a month during the growing season and will be analyzed following the requirements specified in Table 6.2-3.

6.2.4.4.3 Watermelon and Citrus

Watermelon and citrus samples will be collected annually from two sample locations to monitor the potential buildup of atmospherically deposited radionuclides. The sample locations will be in the meteorological sectors with the highest potential for surface deposition. These samples will be analyzed following the requirements specified in Table 6.2-3.

6.2.4.5 Water Monitoring

Water (drinking water, surface water, groundwater [well water], and sea water) will be monitored to detect the presence of any radioisotopes from LNP operations. Samples taken will be analyzed following the requirements specified in Table 6.2-3.

6.2.4.5.1 Drinking Water

A composite water sampler will be located at the service building for the LNP. In addition, samplers will be located as shown on Figure 6.2-3. Samplers will collect a small, fixed-volume of water at hourly intervals. Samplers will discharge into a common sample collection bottle for 2 weeks. This 2-week composite sample will be analyzed following the requirements listed in Table 6.2-3. A portion of these 2-week composite samples will be combined with other monthly samples collected during the calendar quarter. This quarterly composite sample will be analyzed following the requirements specified in Table 6.2-3.

6.2.4.5.2 Surface Water

Composite samplers will be installed at several locations to collect a small volume of surface water at regular intervals and discharge the sample into a large sample collection bottle. This water sample will be collected weekly and combined into a composite water sample monthly.

Surface water samples will be analyzed following the requirements listed in Table 6.2-3.

6.2.4.5.3 Groundwater

Groundwater samples will be collected quarterly at several on-site locations and analyzed as specified in Table 6.2-3. PEF is committed to compliance with the Industry Ground Water Protection Initiative (Nuclear Energy Institute [NEI] 07-07) and as such will ensure that the guidance in NEI 07-07 is followed with regard to management and response to instances where the inadvertent release of radioactive substances may result in low but detectable levels of plant-related materials in subsurface soils and water.

6.2.4.6 Sea Water

Sea water samples will be collected quarterly at several locations and analyzed as specified in Table 6.2-3.

6.2.5 QUALITY ASSURANCE PROGRAM

The standards for the QA program are established in the NRC Regulatory Guide 4.15, “Quality Assurance for Radiological Monitoring Programs.” The purpose of the QA program is to ensure the quality of the results of measurements of radioactive materials in the effluents from, and environment outside of, facilities.”

QA is made up of all those planned and systematic actions that are necessary to provide adequate confidence in the assessment of monitoring results. QC is made up of those QA actions that provide a means to measure and control the characteristics of measurement equipment and processes to meet established standards; QA includes QC.

QA is necessary to ensure that all radiological and nonradiological measurements that support the radiological monitoring program are reasonably valid and of a defined quality. These programs are needed (1) to identify deficiencies in the sampling and measurement processes and report them to those responsible for these operations so that licensees may take corrective action and (2) to obtain some measure of confidence in the results of the monitoring programs to assure the regulatory agencies and the public that the results are valid. All steps of the monitoring process should involve QA (for example, sampling, shipment of samples, receipt of samples in the laboratory, preparation of samples, radiological measurements, data reduction, data evaluation, and reporting of the measurement and monitoring results).

Examples of the activities of the QA program typically include the following:

- Perform duplicate analysis of the samples (excluding TLDs) to check laboratory precision.
- Perform regular review of sample collection and records.
- Perform regular review of laboratory procedures and methods.
- Count quality indicator and control samples routinely.
- Review analytical results provided by the laboratory monthly to validate that the required minimum sensitivities have been achieved, and the correct analyses have been performed.
- Ensure known concentrations of radioactivity are used by the laboratory in test samples to ensure consistent quality results on an ongoing basis.
- Incorporate REMP activities into the construction phase QA program established pursuant to 10 CFR 50, Appendix B, during LNP COLA activities to establish confidence and credibility that the data collected and reported are accurate and precise.
- Ensure laboratory participation in intercomparison programs, such as the U.S. Environmental Protection Agency (USEPA) QA crosscheck program.

The REMP will use QA programs and processes to accomplish the following tasks:

- Ensure personnel will be trained and qualified to perform radiological monitoring.
- Ensure laboratory processes will be documented (that is, maintenance, storage, and use of radioactivity reference standards), and calibration and checks of radiation radioactivity measurement systems and sample tracking and control will be performed.

- Ensure the processes and procedures of the REMP will be documented.
- Ensure periodic audits of analysis laboratory functions and their facilities will be conducted.

6.2.6 REFERENCES

6.2-001 Progress Energy Florida, Inc., "Crystal River Unit 3, 2006 Annual Radiological Environmental Operating Report," ITS 5.7.1.1(b), May 1, 2007.

Table 6.2-1
Duration of Preoperational Program for Specific Media

6 Months	1 Year	2 Years
Air Iodine	Airborne Particulates	Direct Radiation
Iodine in Milk (while animals are in pasture)	Milk (remaining analyses)	Fish and invertebrates
	Surface Water	Food Products
	Drinking Water	Shoreline Sediments
	Groundwater	

Table 6.2-2
Media Used to Assess Exposure Pathways to Humans

Pathway Exposure to Man	Media Sampled
External Dose	Thermoluminescent Dosimetry
	Shoreline Sediments
Ingestion	Aquatic Vegetation
	Drinking Water
	Fish and Oysters
	Groundwater
	Watermelon and Citrus
	Milk
	Broadleaf Vegetation (when milk samples are unavailable)
	Surface Water
Inhalation	Air Samples (Particulate and Iodine)

Table 6.2-3 (Sheet 1 of 4)
Radiological Environmental Sampling Locations Legend by Sample Type

Sample Type	Station Number and Location	Frequency	Sample Size	Analysis
Air Cartridge	L41[a] – 8.5 km (5.3 mi.) N of CR-3 (CR-3 sampling location C18) L42[a] – 5.6 km (5.3 mi.) E of CR-3 (CR-3 sampling location C40) L43[a] – 1.6 km (1.0 mi.) ENE of LNP L44[a] – 1.6 km (1.0 mi.) WSW of LNP L45[a] – 8.05 km (5 mi.) WSW of LNP L46 – 125.5 km (78 mi.) ESE of CR-3 (CR-3 control location C47)[b]	As required because of dust loading but at a minimum every 7 days	275 m^3 (9712 $ft.^3$)	Iodine-131
Air Particulate	L41[a] – 8.5 km (5.3 mi.) N of CR-3 (CR-3 sampling location C18) L42[a] – 5.6 km (5.3 mi.) E of CR-3 (CR-3 sampling location C40) L43[a] – 1.6 km (1.0 mi.) ENE of LNP L44[a] – 1.6 km (1.0 mi.) WSW of LNP L45[a] – 8.05 km (5 mi.) WSW of LNP L46 – 125.5 km (78 mi.) ESE of CR-3 (CR-3 control location C47)[b]	As required because of dust loading but at a minimum every 7 days	275 m^3 (9712 $ft.^3$)	Gross Beta (Weekly) Composite Gamma (Quarterly)
Fish and Oysters	L47[a] – 4.0 km (2.5 mi.) W of CR-3 (CR-3 sampling location C29) L48[a] – 5.4 km (3.4 mi.) WSW of CR-3 (CR-3 control location C30)(Gulf of Mexico)[b]	Quarterly	1 kilogram (2.2 pounds) (wet) Free Swimmers and Bottom Feeders	Gamma
Drinking Water & Surface Water	L49[a] – WELL #1, LNP 1 L50[a] – WELL #2, LNP 1 L51[a] – WELL #1, LNP 2 L52[a] – WELL #2, LNP 2 L53[a] – 4.8 km (3 mi.) S of LNP (Lake Rousseau) L54[a] – 8.5 km (5.3 mi.) N of CR-3 (CR-3 control location C18)[b] L55[a] – 9.7 km (6.0 mi.) ESE of CR-3(CR-3 control location C10)[b] L56[a] – 11.9 km (7.4 mi.) ESE of CR-3(CR-3 control location C07)[b]	2-Week Composite Monthly Composite Quarterly Composite	8 l (2.1 gal.)	Iodine-131, Gamma, Tritium, Gross Beta

Table 6.2-3 (Sheet 2 of 4)
Radiological Environmental Sampling Locations Legend by Sample Type

Sample Type	Station Number and Location	Frequency	Sample Size	Analysis
Groundwater	L49[a] – WELL #1, LNP 1 L50[a] – WELL #2, LNP 1 L51[a] – WELL #1, LNP 2 L52[a] – WELL #2, LNP 2 L57[a] – 5.8 km (3.6 mi.) East of CR-3 (CR-3 control location C40) [b]	Quarterly	4 l (1.1 gal.)	Gamma, Tritium
Milk	L58[a] – No dairies are located within 8 km (5 mi.) of the LNP. Milk samples will be collected when the land use census shows there are commercial milk producing animals within an 8-km (5-mi.) radius of the plant used for human consumption.	Semi-monthly	8 l (2.1 gal.)	Iodine-131 Strontium-90 Gamma
Shoreline Sediments	L59[a] – 0.16 km (0.1 mi.) NW of CR-3 (CR-3 sampling location C14H) L60[a] – 1.9 km (1.2 mi.) W of CR-3 (CR-3 sampling location C14M) L61[a] – 5.2 km (3.2 mi.) S of CR-3 (CR-3 control location C09[b]	Semi-annually	500 g (17.6 oz.	Gross Beta, Gamma Strontium-90
Bottom Sediments	L62[a] – 4.0 km (2.5 mi.) W of CR-3 (CR-3 sampling location C29) L48[a] – 5.4 km (3.4 mi.) WSW of CR-3 (CR-3 control location C30)(Gulf of Mexico)[b]	Semi-annually	500 g (17.6 oz.)	Gross Beta, Gamma (Tracking and Trending only)
Aquatic Vegetation	L63[a] – 4.0 km (2.5 mi.) W of CR-3 (CR-3 sampling location C29) L48[a] – 5.4 km (3.4 mi.) WSW of CR-3 (CR-3 control location C30)(Gulf of Mexico)[b]	Annually	500 g (17.6 oz.)	Gamma
Watermelon & Citrus	L64[a] – 20.9 km (13 mi.) NE of CR-3 (CR-3 sampling location C04) L65[a] – 15.5 km (9.6 mi.) ENE of CR-3 (CR-3 sampling location C19) L46 – 125.5 km (78 mi.) ESE of CR-3 (CR-3 control location C47)[b]	Annually	500 g (17.6 oz.)	Gamma

Table 6.2-3 (Sheet 3 of 4)
Radiological Environmental Sampling Locations Legend by Sample Type

Sample Type	Station Number and Location	Frequency	Sample Size	Analysis
Broadleaf Vegetation	L66[a] – 0.64 km (0.4 mi.) N of CR-3 (CR-3 sampling location C48A) L67[a] –1.5 km (0.9 mi.) NNE of CR-3 (CR-3 sampling location C48B) L46 – 125.5 km (78 mi.) ESE of CR-3 (CR-3 control location C47)[b]	Monthly	500 g (17.6 oz.)	Gamma, Iodine-131 Gross Beta.
Seawater	L68[a] – 0.16 km (0.1 mi.) NW of CR-3 (CR-3 sampling location C14H) L69[a] –4.0 km (2.5 mi.) W of CR-3 (CR-3 sampling location C14G) L70[a] – 7.4 km (4.6 mi.) WSW of CR-3 (CR-3 control location C13)[b]	Monthly	8 l (2.1 gal.)	Gamma, Tritium
TLD (Inner Ring)	L01[c] – 2.56 km (1.59 mi.) N L02[c] – 2.77 km (1.72 mi.) NNE L03[c] – 2.00 km (1.24 mi.) NE L04[c] – 1.53 km (0.95 mi.) ENE L05[c] – 1.41 km (0.89 mi.) E L06[c] – 1.53 km (0.95 mi.) ESE L07[c] – 1.63 km (1.01 mi.) SE L08[c] – 1.41 km (0.87 mi.) SSE L09[c] – 2.28 km (1.42 mi.) S L10[c] – 2.46 km (1.53 mi.) SSW L11[c] – 2.05 km (1.27 mi.) SW L12[c] – 1.57 km (0.97 mi.) WSW L13[c] – 1.45 km (0.90 mi.) W L14[c] – 1.57 km (0.97 mi.) WNW L15[c] – 2.05 km (1.27 mi.) NW L16[c] – 2.76 km (1.71 mi.) NNW L17 – Special Interest (not used) L18 – Special Interest (not used) L19 – Special Interest (not used) L20 – Special Interest (not used) L46 – 125.5 km (78 mi.) ESE of CR-3 (CR-3 Control Location C47)[b]	Quarterly	Not Applicable	TLD Reading

Table 6.2-3 (Sheet 4 of 4)
Radiological Environmental Sampling Locations Legend by Sample Type

Sample Type	Station Number and Location	Frequency	Sample Size	Analysis
TLDs (Outer Ring)	L21[c] – 8.05 km (5.0 mi.) N L22[c] – 8.05 km (5.0 mi.) NNE L23[c] – 8.05 km (5.0 mi.) NE L24[c] – 8.05 km (5.0 mi.) ENE L25[c] – 8.05 km (5.0 mi.) E L26[c] – 8.05 km (5.0 mi.) ESE L27[c] – 8.05 km (5.0 mi.) SE L28[c] – 8.05 km (5.0 mi.) SSE L29[c] – 8.05 km (5.0 mi.) S L30[c] – 8.05 km (5.0 mi.) SSW L31[c] – 8.05 km (5.0 mi.) SW L32[c] – 8.05 km (5.0 mi.) WSW L33[c] – 8.05 km (5.0 mi.) W L34[c] – 8.05 km (5.0 mi.) WNW L35[c] – 8.05 km (5.0 mi.) NW L36[c] – 8.05 km (5.0 mi.) NNW L37 – Special Interest L38 – Special Interest L39 – Special Interest L40 – Special Interest L46 – 125.5 km (78 mi.) ESE of CR-3 (CR-3 control location C47)[b]	Quarterly	Not Applicable	TLD Reading

Notes:

a) See Figure 6.2-3.
b) Control Locations.
c) See Figure 6.2-2.

E = east
ft.^{3} = cubic foot
g = gram
gal. = gallon
km = kilometer
l = liter
m^3 = cubic meter
mi. = mile
N = north
oz. = ounce
S = south
TLD = thermoluminescent dosimetry
W = west

6.3 HYDROLOGICAL MONITORING

This section describes the surface water and groundwater hydrological monitoring program that will be used to support the LNP COLA.

The objectives of the surface water and groundwater hydrological monitoring program are to identify potential adverse environmental effects, including the changes to surface water and groundwater, caused by the development and construction of the LNP, and identify alternatives or engineering measures that may be implemented to reduce those potential adverse effects. This section describes the hydrological monitoring program that was initiated during the preapplication phase and will be continued during construction and operation of the LNP.

The surface water and groundwater hydrological monitoring programs will consist of the following primary elements:

- Preapplication hydrological monitoring: This phase of the monitoring will support the background hydrologic descriptions presented in ER Section 2.3.

- Construction hydrological monitoring: This phase of the monitoring will be used as a basis to control and limit effects to surface water and groundwater that may result from site preparation and construction activities.

- Preoperational hydrological monitoring: This phase of the monitoring will establish a baseline from which the identification and assessment of environmental effects attributable to LNP operation can be made.

- Operational hydrological monitoring: This phase of the monitoring will document effects from LNP operation.

To avoid duplicating monitoring efforts, PEF will coordinate its hydrological monitoring with existing hydrological monitoring programs and efforts being performed by other groups or agencies. Any hydrological monitoring would be implemented at an appropriate time, in relation to the commencement of proposed site preparation or construction activities. Monitoring will span the period of preapplication through the operational phases of the LNP.

During each phase of the project, results of the previous monitoring program will be reviewed to ensure that the monitoring efforts are sufficient. Modifications will be made to the program, as needed, based on the data results. If outputs of a preceding program phase demonstrate no significant effects, provisions to study such effects in successive monitoring programs will be reduced or eliminated.

The following subsections present information regarding the hydrological monitoring of surface water and surficial and bedrock aquifers within the vicinity

of the LNP site that are likely to be affected by site preparation and construction activities, preoperation, and operation of the LNP. These monitoring programs may be revised based on applicable agency permit conditions may dictate monitoring requirements.

6.3.1 PREAPPLICATION HYDROLOGICAL MONITORING PROGRAM

The objective of the preapplication hydrological monitoring program is to document background conditions for surface water and groundwater before the construction and operation of the LNP. Baseline data collected during this monitoring program were used to determine the following:

- Surface water depth characteristics in the site vicinity.
- Groundwater flow characteristics in the site vicinity (ER Subsection 2.3.1.5 describes the groundwater system at the LNP).
- Effect of sanitary and chemical waste-retention methods on groundwater quality (ER Section 4.2 describes water-related effects and controls associated with construction and subsequent construction and preoperational activities).
- Alteration of sediment transport (ER Section 2.6 describes the soil characteristics at the LNP, and ER Section 4.2 describes water-related effects and controls associated with construction and subsequent construction and preoperational activities).
- Alteration of floodplains or wetlands (ER Section 4.3 describes ecological effects and controls associated with preoperational activities).

Limited hydrological and hydrogeological information is available for the LNP site. For this reason preapplication hydrological data was collected to establish the existing conditions at the site.

6.3.1.1 Freshwater Streams

There are no freshwater streams on the LNP site (Figure 6.0-1); therefore, no hydrological monitoring was performed.

6.3.1.2 Lakes and Impoundments

There are no lakes or impoundments considered to be waters of the State on the LNP site (Figure 6.0-1). In addition, no lakes or impoundments considered to be waters of the State will be used or affected by the construction or operation of the LNP. Lake Rousseau is directly upstream of the proposed CFBC makeup water intake structure but is hydrologically separated from the site by the Inglis Lock and the Inglis Lock Bypass Channel. Preapplication monitoring includes data collected quarterly at station SS-2 and the continued evaluation of stream stage

measurements in Lake Rousseau at the U.S. Geological Survey (USGS) monitoring Station USGS 03213230. The USGS monitoring supplements the existing database to support the description of background conditions in Lake Rousseau upstream of the proposed makeup water intake structure.

Water levels in Lake Rousseau have been collected at USGS Station 02313230 (Withlacoochee River at Inglis Dam near Dunnellon, Florida) since October 1, 1969. The gauge is located on the left bank at the upstream side of the Inglis Dam control structure, 5.6 km (3.5 mi.) SE of Inglis, 15.8 km (9.8 mi.) W of Dunnellon, and 17.7 km (11 mi.) upstream from mouth. The drainage area to this gauge is 5232 square kilometers (2020 square mi.). The location of the USGS gauging station is shown on Figure 2.3-8 (Reference 6.3-001).

The existing hydrologic data are sufficient to describe hydrologic conditions in Lake Rousseau.

6.3.1.3 Cross Florida Barge Canal

As described in ER Subsection 6.1.1.3, the CFBC will be used to supply makeup water for the LNP. The plant water use and cooling system design are described in ER Sections 3.3 and 3.4, respectively.

Preapplication monitoring was performed to characterize the bathymetry and hydrology of the CFBC. This monitoring, including total depth measurements at three locations (Station 1, Station 2, and Station 3) in the canal, was conducted on October 16, 2007, October 18, 2007, and November 19, 2007 (Figure 6.1-1). Total depth measurements were collected concurrently with water samples, as specified in ER Section 6.6. A detailed bathymetric survey of the entire canal length was conducted in October 2007 as part of the preapplication monitoring program, as described in ER Subsection 2.3.3.1.4. Because the CFBC is hydrologically connected to the Gulf of Mexico, variations in water level will not vary seasonally but will fluctuate with the tide.

The existing hydrologic data are sufficient to describe hydrologic conditions in the CFBC.

6.3.1.4 Cross Florida Barge Canal within the Gulf of Mexico

Monitoring was performed to characterize the bathymetry and hydrology beyond the CFBC within the Gulf of Mexico at four locations (Station 4, Station 5, Station 6, and Station 7) as part of the ecological/water quality characterization effort (Figure 6.1-1). Preapplication monitoring, including a total depth measurement at each location, was conducted on October 16, 2007, October 18, 2007, and November 19, 2007. Total depth measurements were collected concurrently with water samples, as specified in ER Section 6.6.

In addition to total depth measurements, current velocities in the water column were measured along the original proposed discharge pipeline corridor. Three acoustic Doppler current profilers were deployed in the Gulf of Mexico on

September 5, 2007, and measured currents for 32 days. This information would be used to determine current velocities and direction if the blowdown pipeline was located offshore of the CFBC. Measurements at the CFBC stations were collected to support the potential discharge of plant blowdown water at a location offshore of the CFBC. However, the current plan is to route plant discharge water to the CREC, thus, the stations in the Gulf of Mexico will not be monitored in future phases of the project.

Gage height and water temperature have also been monitored daily at the USGS gauging station 02313272 since January 2005 (Figure 2.3-8). Data from this station can be used to determine tidal fluctuations near the mouth of the CFBC.

6.3.1.5 Crystal River Energy Complex Discharge Canal and the Gulf of Mexico

The LNP will discharge cooling and plant operation water to the Gulf of Mexico through a pipeline from the LNP site to the existing CREC discharge canal. PEF proposes to collect thermal, water quality, and total depth data at four locations. CREC Station 1 will be located in the existing concrete channel that collects blowdown from existing coal plant units before it is released to the CREC discharge canal. Three additional stations, CREC Station 2, CREC Station 3, and CREC Station 4, are proposed for monitoring in the CREC discharge canal and Gulf of Mexico (Figure 6.1-3). The Gulf of Mexico is a substantial body of water that is not subject to extreme changes in volume. For this reason, only quarterly monitoring of depth will be performed. Bathymetry measurements will be collected concurrently with water samples, as specified in ER Section 6.6.

6.3.1.6 Groundwater

The preapplication hydrological monitoring program for groundwater is used to support the assessment of site acceptability and identify effects to the groundwater system that might result from construction and operation of the LNP. Hydrological monitoring for the LNP site consists of measuring water levels in monitoring wells quarterly to establish groundwater levels during the different seasons, verify the effects of hydrostatic loading on groundwater flow direction, and estimate the amount of water that might need to be controlled during excavation activities.

Sixteen monitoring wells (MW-1S, MW-2S, MW-3S, MW-4S, MW-5S, MW-7S, MW-9S, MW-11S, MW-13S, MW-15S, MW-6D, MW-8D, MW-10D, MW-12D, MW-14D, and MW-16D) were installed during the LNP site investigation to accurately characterize the potentiometric surface, gradient, and flow pathways within the vicinity of the LNP (Figure 6.1-2). Six nested well pairs (12 of the 16 wells) were installed during the investigation to determine the connectivity between the surficial and bedrock aquifers. Shallow monitoring wells (“S” in the well identification) were screened within the silt and sand of the surficial aquifer (between 30 and 40 ft. bgs) directly above the bedrock interface. Bedrock monitoring wells (“D” in the well identification) were screened completely within the limestone bedrock of the Upper Floridan aquifer between 120 to 140 ft. bgs.

Monitoring wells were surveyed to North American Datum of 1983 (NAD83) horizontal and North American Vertical Datum of 1988 (NAVD88) vertical. Groundwater gauging events were conducted quarterly (March 2007, June 2007, September 2007, and December 2007) to measure seasonal and long-term variations.

In addition, depth measurements at the proposed location of the LNP 1 and LNP 2 were collected continuously using pressure transducers installed in monitoring wells MW-13S and MW-15S. Measurements were collected once every 12 hours.

Figure 6.1-2 presents the well locations monitored during the preapplication hydrological monitoring program. Groundwater data collected for the LNP COLA are used to define site background conditions and establish groundwater-related design elevations. Groundwater monitoring at the sentinel wells established in later phases of the project will be used to determine if negative effects to groundwater quality due to LNP construction and operation occur.

6.3.2 CONSTRUCTION HYDROLOGICAL MONITORING

The objective of the construction hydrological monitoring program is to monitor and control potential effects caused by site preparation and construction. Controls for anticipated construction effects are discussed in ER Section 4.2. This subsection presents the details of the construction hydrological monitoring program

6.3.2.1 Freshwater Streams

There are no freshwater streams on the LNP site (Figure 6.0-1); therefore, no hydrological monitoring will be performed during the construction phase of the project.

6.3.2.2 Lakes and Impoundments

No lakes or impoundments considered to be waters of the State will be used or affected by the construction phase of the project. Water level data collected at USGS Station 02313230 (Withlacoochee River at Inglis Dam near Dunnellon, Florida) will continue to be used to provide any required information regarding the water level of Lake Rousseau during the preoperational phase of the project.

6.3.2.3 Cross Florida Barge Canal

Monitoring of hydrology and bathymetry within the CFBC will continue quarterly at preapplication monitoring locations Station 1, Station 2, and Station 3 (Figure 6.1-1) starting approximately 1 year before site preparations begin to establish a refined baseline. Hydrology and bathymetry measurements at temporary locations near construction activities will be collected weekly until those activities are complete. Turbidity measurements will also be taken at these locations as described in ER Section 6.6.

6.3.2.4 Crystal River Energy Complex Discharge Canal and the Gulf of Mexico

Monitoring within the CREC discharge canal will continue at preapplication monitoring locations (CREC Station 1, CREC Station 2, CREC Station 3, and CREC Station 4) (Table 6.3-1). Quarterly hydrological monitoring will start approximately 1 year before site preparation begins to establish a refined baseline. Turbidity measurements will also be taken at these locations as described in ER Section 6.6.

6.3.2.5 Groundwater

As discussed in ER Section 4.2, the major effect to the groundwater system during construction will be related to the dewatering required for site preparation and the excavation of the LNP site. During dewatering activities associated with the construction of the reactor buildings, temporary monitoring wells will be installed to monitor changes in water table elevation. Hydrological measurements at temporary monitoring wells near construction activities will be collected weekly until those activities are complete.

Preapplication monitoring wells MW-5S, MW-7S, MW-9S, MW-11S, MW-13S, MW-15S, MW-6D, MW-8D, MW-10D, MW-12D, MW-14D, and MW-16D (Figure 6.1-2) are assumed to be located within the proposed construction area for the LNP, and therefore, will have to be abandoned in accordance with FDEP regulatory guidelines prior to construction activities. Hydrological measurements will be collected quarterly in the remaining four monitoring wells (MW-1S, MW-2S, MW-3S, and MW-4S) throughout the construction phase of the project because they are located on the periphery of the property and will not interfere with construction activities.

6.3.3 PREOPERATIONAL HYDROLOGICAL MONITORING

The preoperational hydrological monitoring program will be designed to provide the baseline for evaluating hydrologic changes arising from the operation of the LNP. Baseline data collected during this monitoring program will be used to assess the following:

- Alteration of surface water and groundwater levels.
- Alteration of groundwater flow.
- Alteration of sediment transport (ER Section 4.2 describes water-related effects and controls associated with construction and subsequent preoperational activities).

- Alteration of floodplains or wetlands (ER Section 4.3 describes ecological effects and controls associated with construction and subsequent preoperational activities).

The preoperational hydrological monitoring program will begin approximately 1 year before plant operation to establish a refined baseline. Additional monitoring wells are proposed for installation immediately following construction activities and prior to plant operation. The location and purpose of these wells is described in more detail in ER Subsections 6.1.2.5 and 6.3.3.5.

6.3.3.1 Freshwater Streams

There are no freshwater streams on the LNP site (Figure 6.0-1); therefore, no hydrological monitoring will be performed during the preoperational phase of the project.

Site drainage will be maintained through a series of pipes, open ditches, culverts, and storm sewers. Stormwater runoff from the LNP site will be collected and controlled by a stormwater drainage system. After site grading, a series of stormwater drainage ditches will be constructed within the plant site to drain the stormwater to stormwater ponds located around the LNP site. These ponds will be designed to control a 25-year storm event. The ponds will be designed as infiltration ponds with the ability to pump excess stormwater collected in the ponds that may be recycled to the cooling water basins or discharged as permitted when the ponds become full. For this reason, no surface water monitoring is anticipated or planned on the LNP site.

6.3.3.2 Lakes and Impoundments

No lakes or impoundments considered to be waters of the State will be used or affected by the preoperational phase of the project. Water level data collected at USGS Station 02313230 (Withlacoochee River at Inglis Dam near Dunnellon, Florida) will continue to be used to provide any required information regarding the water level of Lake Rousseau during the preoperational phase of the project.

6.3.3.3 Cross Florida Barge Canal

Hydrology and bathymetric monitoring within the CFBC will continue at monitoring locations Station 1, Station 2, and Station 3 (Figure 6.1-1). Quarterly hydrological monitoring will start approximately 1 year prior to plant operation to establish a refined hydrological baseline. Bathymetry measurements will be collected concurrently with water samples, as specified in ER Section 6.6.

Three stilling wells (SW-1, SW-2, and SW-3) with pressure transducers will be added to monitor potential changes in water levels within the canal (Figure 6.3-1) (Table 6.3-2). Water levels will be measured daily in each stilling well beginning 1 year prior to plant operation to define a baseline for the CFBC.

Barges will use the CFBC to transport materials between the LNP site and the Gulf of Mexico. One bathymetric survey of the entire canal length will be conducted 1 year prior to plant operation to ensure that sedimentation has not occurred and that safe depths for barge traffic exist.

6.3.3.4 Crystal River Energy Complex Discharge Canal and the Gulf of Mexico

Monitoring within the CREC discharge canal will continue at all monitoring locations (CREC Station 1, CREC Station 2, CREC Station 3, and CREC Station 4) (Figure 6.1-3). Quarterly hydrological monitoring will start 1 year prior to plant operation to establish a refined baseline. Bathymetry measurements will be collected concurrently with water samples, as specified in ER Section 6.6.

6.3.3.5 Groundwater

Monitoring will be conducted to re-establish baseline conditions for groundwater levels and flow after construction is complete. Monitoring wells MW-1S, MW-2S, MW-3S, and MW-4S will continue to be monitored monthly (Figure 6.1-2). In addition, 43 new monitoring wells are proposed for installation during the preoperational phase. Monitoring well details are specified in ER Subsection 6.1.2.5.

The groundwater monitoring efforts can be grouped by functional intent as follows: reactor area monitoring to establish background conditions and document changes in the immediate vicinity of the reactors, sentinel well monitoring to establish background conditions and document changes upgradient and downgradient of the reactor units, and raw water withdrawal sentinel wells to establish background conditions and document changes due to pumping of raw water from groundwater aquifers. The hydrologic monitoring details for each function are presented in Tables 6.3-3, 6.3-4, and 6.3-5, respectively.

Changes in water levels within wells surrounding the reactor units (MW-26S, MW-26D, MW-27S, MW-27D, MW-28S, MW-28D, MW-29S, MW-29D, MW-30S, MW-30D, MW-31S, MW-31D, MW-32S, MW-32D, MW-33S, MW-33D, MW-34S, MW-34D) will be monitored quarterly using automated pressure transducers starting approximately 1 year before plant operation begins (Figure 6.1-4). Stormwater will be controlled through the use of stormwater retention ponds near the LNP. The water level monitoring near the reactors will assess the impacts of this water retention.

Water levels in the peripheral shallow/deep wells (MW-17S, MW-17D, MW-18S, MW-18D, MW-19S, MW-19D, MW-20S, MW-20D, MW-21S, MW-21D, MW-22S, MW-22D MW-23S, MW-23D, MW-24S, MW-24D, MW-25S, MW-25D) will be measured monthly using a water level indicator (Figure 6.1-4). Water levels in the raw water withdrawal sentinel wells (MW-1WW, MW-2WW, and MW-3WW) will be measured quarterly using automated pressure transducers starting approximately 1 year before plant operation begins. Monitoring frequency are summarized Tables 6.3-3, 6.3-4, and 6.3-5.

6.3.4 OPERATIONAL HYDROLOGICAL MONITORING

The operational hydrological monitoring program will be designed to document the effects of the operation of the LNP and detect any unexpected effects that arise from facility operation. The operational hydrological monitoring program is anticipated to extend preoperational monitoring for the duration of the LNP operation. Modifications to the monitoring program (for example, changes in monitoring stations or collection procedures) will be assessed regularly over the duration of the operational hydrological monitoring program.

6.3.4.1 Freshwater Streams

There are no freshwater streams on the LNP site (Figure 6.0-1); therefore, no hydrological monitoring will be performed during operational monitoring.

6.3.4.2 Lakes and Impoundments

Water level data collected at USGS Station 02313230 (Withlacoochee River at Inglis Dam near Dunnellon, Florida) (Figure 2.3-8) will continue to be used to provide information regarding the water level of Lake Rousseau.

6.3.4.3 Cross Florida Barge Canal

Specific procedures for CFBC operational monitoring requirements are anticipated to be similar to the preoperational hydrological monitoring program. The program may be modified based on data collected and consultations with the FDEP. Hydrologic data will be evaluated to monitor for changes resulting from the withdrawal of makeup water from the CFBC.

Bathymetry measurements at Station 1, Station 2, and Station 3, established during the preapplication monitoring phase, will be continued monthly for the first 2 years after operation begins, bimonthly for the next 3 years, and quarterly thereafter to provide a baseline for canal depth and to determine whether sedimentation has occurred. Flow rates and velocities are not measured due to the variable nature of the Gulf of Mexico tides. Bathymetry measurements will be collected concurrently with water samples, as specified in ER Section 6.6.

As described previously, three stilling wells (SW-1, SW-2, and SW-3) will be added during the preoperational phase to monitor water levels within the canal. Quarterly monitoring will continue at these points using automated pressure transducers during plant operation to ensure that sufficient cooling water supply is available. Stilling well locations are shown on Figure 6.3-1.

6.3.4.4 Crystal River Energy Complex Discharge Canal and the Gulf of Mexico

Specific procedures of the operational monitoring requirements for the CREC are anticipated to be similar to the preoperational hydrological monitoring program.

The program may be modified based on data collected and consultations with the FDEP. Hydrological data will be evaluated to monitor for changes in depth due to sedimentation resulting from the discharge of blowdown to the CREC discharge canal. Monitoring will be performed monthly for 2 years after operation begins, bimonthly for the next 3 years, and quarterly thereafter.

6.3.4.5 Groundwater

Specifics related to the operational monitoring are anticipated to be similar to the specifics for the preoperational hydrological monitoring program. A limited operational hydrological monitoring program will be implemented to identify changes in flow rate and groundwater velocities from the operation of the LNP, and to detect any unexpected effects from facility operation.

The groundwater level monitoring program will consist of extending preoperational monitoring for the duration of the LNP operation. The need for modifications to the monitoring program (for example, changes in monitoring stations or frequency of collection) will be assessed regularly over the duration of the operational hydrological monitoring program.

Unless modified in response to the regular assessment, the operational monitoring will include measuring water levels at the shallow/deep well pairs (MW-17S, MW-17D, MW-18S, MW-18D, MW-19S, MW-19D, MW-20S, MW-20D, MW-21S, MW-21D, MW-22S, MW-22D, MW-23S, MW-23D, MW-24S, MW-24D, MW-25S, MW-25D, MW-26S, MW-26D, MW-27S, MW-27D, MW-28S, MW-28D, MW-29S, MW-29D, MW-30S, MW-30D, MW-31S, MW-31D, MW-32S, MW-32D, MW-33S, MW-33D, MW-34S, MW-34D), well pairs MW-1S/D, MW-2S/D, MW-3S/D, and MW-4S/D), and the three deep wells completed within the Floridan aquifer.

During operational monitoring, changes in water level elevations will be measured at the following frequencies in each monitoring well:

- Quarterly at the nine shallow/deep well pairs installed adjacent to LNP 1 and LNP 2 using automated pressure transducers.
- Monthly for 1 year and quarterly thereafter at the remaining shallow deep well pairs using a YSI® multimeter (or equivalent).
- Quarterly at the three deep Floridan raw water wells using automated pressure transducers.

The necessity of performing the monitoring at the frequency described above will be evaluated and may be modified (increased or decreased) in response to trends observed in the data. A description of the frequency at which groundwater wells are measured is provided in Tables 6.3-3, 6.3-4, and 6.3-5.

6.3.5 REFERENCES

6.3-001 U.S. Geological Survey, "USGS 02313230, Withlacoochee River at Inglis Dam near Dunnellon, FL,", Website, waterdata.usgs.gov/nwis/dv/?site_no=02313230, accessed February 5, 2008.

Table 6.3-1 (Sheet 1 of 2)
Summary of Proposed Surface Water Bathymetry Monitoring Program for the LNP

Description	Preapplication	Construction	Preoperation	Operation
Objective of Sampling Program	Establish background bathymetry within the CFBC and the CREC discharge canal before site preparation and construction activities.	Document bathymetry changes during site preparation and construction activities.	Establish baseline bathymetry before facility operation.	Document bathymetry changes during operation.
Stations	*CFBC*: Station 1, Station 2, Station 3, Station 4, Station 5, Station 6, Station 7 Detailed bathymetry survey locations (See ER Subsection 2.3.3.1.4) *CREC*: CREC Station 1, CREC Station 2, CREC Station 3, CREC Station 4 (See Figures 6.1-1 and 6.1-3)	*CFBC*: Station 1, Station 2, Station 3	*CFBC*: Station 1, Station 2, Station 3, *CREC*: CREC Station 1, CREC Station 2, CREC Station 3, CREC Station 4 (See Figures 6.1-1 and 6.1-3)	*CFBC*: Station 1, Station 2, Station 3, *CREC*: CREC Station 1, CREC Station 2, CREC Station 3, CREC Station 4 (See Figures 6.1-1 and 6.1-3)
Frequency	*October, November, December 2007*: Station 1, Station 2, Station 3, Station 4, Station 5, Station 6, Station 7 (See ER Subsection 2.3.3 for more details) *October 2007*: Detailed bathymetry survey	*Quarterly* (Increase frequency if notable changes occur.)	*Quarterly*: Station 1, Station 2, Station 3, CREC Station 1, CREC Station 2, CREC Station 3, and CREC Station 4 beginning approximately 1 year before facility operation. *Once*: detailed bathymetry survey approximately 1 year before plant operation	*Monthly* (for 2 years), *bimonthly* (for 3 years), and *quarterly* thereafter. (Increase frequency if notable changes occur.)

Table 6.3-1 (Sheet 2 of 2)
Summary of Proposed Surface Water Bathymetry Monitoring Program for the LNP

Description	Preapplication	Construction	Preoperation	Operation
Frequency (continued)	*Quarterly*: CREC Station 1 [(a)], CREC Station 2 [(a)], CREC Station 3 [(a)], CREC Station 4 [(a)]			
Field Parameters	Depth-to-bottom	Depth-to-bottom	Depth-to-bottom	Depth-to-bottom
Data Analysis	None	Compare to depth established in preapplication phase	Statistical trend	Statistical trend

Notes:

a) Monitoring had not begun as of January 2008.

Table 6.3-2
Summary of Stilling Well Hydrologic Groundwater Monitoring Program for the LNP

Description	Preapplication	Construction	Preoperation	Operation
Objective of Sampling Program	None	None	Establish baseline surface water elevations within the CFBC.	Document surface water elevations within the CFBC to ensure safe levels for makeup water withdrawal.
Stations	None	None	SW-1, SW-2, SW-3 (See Figure 6.3-1)	SW-1, SW-2, SW-3 (See Figure 6.3-1)
Frequency	None	None	*Quarterly* beginning approximately 1 year before facility operation	*Quarterly*
Parameter	N/A	N/A	Water level	Water level
Collection method	N/A	N/A	Automated pressure transducers	Automated pressure transducers
Data Analysis	N/A	N/A	Statistical trend	Statistical trend

Notes:

N/A = not applicable

Table 6.3-3
Summary of Proposed Reactor Area Hydrologic Groundwater Monitoring Program for the LNP

Description	Preapplication	Construction	Preoperation	Operation
Objective of Sampling Program	Establish background groundwater levels at the proposed LNP reactor sites before site preparation and construction activities.	Document groundwater level changes during site preparation and construction activities.	Establish baseline groundwater levels at reactor area locations before facility operation.	Document groundwater level and identify changes during operation.
Stations	MW-5S, MW-6D, MW-7S, MW-8D, MW-9S, MW-10D, MW-11S, MW-12D, MW-13S, MW-14D, MW-15S, MW-16D (See Figure 6.1-2)	Temporary dewatering monitoring wells located in the immediate vicinity of the proposed reactor areas (quantity and locations to be determined during construction activities)	MW-26S, MW-26D, MW-27S, MW-27D, MW-28S, MW-28D, MW-29S, MW-29D, MW-30S, MW-30D, MW-31S, MW-31D, MW-32S, MW-32D, MW-33S, MW-33D, MW-34S, MW-34D (See Figure 6.1-4)	MW-26S, MW-26D, MW-27S, MW-27D, MW-28S, MW-28D, MW-29S, MW-29D, MW-30S, MW-30D, MW-31S, MW-31D, MW-32S, MW-32D, MW-33S, MW-33D, MW-34S, MW-34D (See Figure 6.1-4)
Frequency	*Quarterly*: MW-5S, MW-6D, MW-7S, MW-8D, MW-9S, MW-10D, MW-11S, MW-12D, MW-14D, MW-16D *Daily*: MW-13S, MW-15S	*Daily*, at a minimum, and critical points may be monitored continuously	*Quarterly* beginning approximately 1 year before facility operation	*Quarterly*
Parameter	Water level	Water level	Water level	Water level
Collection method	Quarterly: Manual Daily: Automated pressure transducers	Manual or automated pressure transducers	Automated pressure transducers	Automated pressure transducers
Data Analysis	Statistical trend	Statistical trend	Statistical trend	Statistical trend

Notes:

D = deep (bedrock aquifer)
S = shallow (surficial aquifer)

Table 6.3-4
Summary of Proposed Sentinel Well Hydrologic Groundwater Monitoring Program for the LNP

Description	Preapplication	Construction	Preoperation	Operation
Objective of Sampling Program	Establish background groundwater levels upgradient and downgradient of the proposed LNP reactor sites before site preparation and construction activities.	Document groundwater level changes during site preparation and construction activities.	Establish baseline groundwater levels upgradient and downgradient of the proposed LNP reactor sites before facility operation.	Document groundwater levels and identify changes upgradient and downgradient of the proposed LNP reactor sites during operation.
Stations	MW-1S, MW-2S, MW-3S, MW-4S (See Figure 6.1-2)	MW-1S, MW-2S, MW-3S, MW-4S (See Figure 6.1-2)	MW-1S, MW-1D, MW-2S, MW-2D, MW-3S, MW-3D, MW-4S, MW-4D, MW-17S, MW-17D, MW-18S, MW-18D, MW-19S, MW-19D, MW-20S, MW-20D, MW-21S, MW-21D, MW-22S, MW-22D, MW-23S, MW-23D, MW-24S, MW-24D, MW-25S, MW-25D (See Figure 6.1-4)	MW-1S, MW-1D, MW-2S, MW-2D, MW-3S, MW-3D, MW-4S, MW-4D, MW-17S, MW-17D, MW-18S, MW-18D, MW-19S, MW-19D, MW-20S, MW-20D, MW-21S, MW-21D, MW-22S, MW-22D, MW-23S, MW-23D, MW-24S, MW-24D, MW-25S, MW-25D (See Figure 6.1-4)
Frequency	*Quarterly*	*Quarterly* beginning approximately 1 year before site preparation	*Monthly* beginning approximately 1 year before plant operation	*Monthly* for first year of operation, *quarterly* thereafter
Parameter	Water level	Water level	Water level	Water level
Collection method	Manual	Manual	Manual	Manual
Data Analysis	Statistical trend	Statistical trend	Statistical trend	Statistical trend

Notes:

D = deep (bedrock aquifer)
S = shallow (surficial aquifer)

Table 6.3-5
Summary of Raw Water Withdrawal Sentinel Well Hydrologic Groundwater Monitoring Program for the LNP

Description	Preapplication	Construction	Preoperation	Operation
Objective of Sampling Program	None	None	Establish baseline groundwater levels downgradient of raw water withdrawal wells.	Document groundwater level and identify changes downgradient of raw water withdrawal wells during operation.
Stations	None	None	MW-1WW, MW-2WW, MW-3WW (See Figure 6.1-4)	MW-1WW, MW-2WW, MW-3WW (See Figure 6.1-4)
Frequency	None	None	*Quarterly* beginning approximately 1 year before plant operation	*Quarterly*
Parameter	N/A	N/A	Water level	Water level
Collection method	N/A	N/A	Automated pressure transducers	Automated pressure transducers
Data Analysis	N/A	N/A	Statistical trend	Statistical trend

Notes:

N/A = not applicable
WW = raw water withdrawal

6.4 METEOROLOGICAL MONITORING

6.4.1 GENERAL DESCRIPTION – ON-SITE METEOROLOGICAL MEASUREMENTS PROGRAM

The LNP on-site meteorological measurement program began in February 2007 after the installation of a 60.4-m (198-ft.) guyed, open-latticed meteorological tower. The tower has been used to monitor meteorological parameters at multiple levels above ground level, and has operated continuously since it was installed. Table 6.4-1 shows the current elevations of the operational sensors for all monitored parameters for both the lower and upper monitoring levels. Figure 2.7-2 shows a topographical map of the area and the location of the meteorological tower with respect to the LNP site. The area surrounding the tower is generally flat and covered with low-level vegetation (less than approximately 0.9 km [3 ft.] tall and indigenous to the central region of Florida) within several hundred feet of the tower in all directions. In the immediate vicinity of the tower base and within the security fence, gravel has been used to control weeds. The presence of this gravel is not extensive and is not expected influence the parameters measured on the tower. Based on the guidance provided in Regulatory Guide 1.23, Revision 1, the location of the LNP meteorological tower is ideally situated for use in support of the LNP COLA. Therefore, the monitoring results obtained from the tower are used to characterize the on-site meteorological conditions for the LNP site. The meteorological monitoring results establish baseline conditions for determining preoperational and operational environmental impacts. The topography of the area is essentially flat with no significant terrain variations that would influence or otherwise affect dispersion.

6.4.2 INSTRUMENTATION

The meteorological tower was installed and began operating in February 2007 in support of the development and licensing of the LNP. The on-site tower is located approximately 1.4 km (0.9 mi.) WSW of the proposed reactors as shown on Figure 2.7-2. There are no structures of any significance within 1 mi. of the tower. Two banks of mechanical draft cooling towers are proposed for LNP 1 and LNP 2, with each bank being approximately 17.1 m (56 ft.) high, 29.6 m (97 ft.) wide, and 181.4 m (595 ft) long. The orientation of the proposed cooling towers relative to the meteorological tower is illustrated on Figure 2.7-2. There are no structures or vegetation in the area surrounding the tower that are within 10 obstruction heights as recommended in Regulatory Guide 1.23, Revision 1. The base of the meteorological tower is at an elevation of approximately 13.7 m (45 ft.) mean sea level. A weatherproof National Electrical Manufacturers Association-type enclosure mounted to the tower houses the system datalogger and remote access equipment. The information monitored on the tower is routinely accessed, downloaded, and archived remotely. The system is powered by a self-contained solar power generator and communications with the tower are achieved through a modem via a cellular telephone network. The monitoring system is compliant with applicable requirements of Regulatory Guide 1.23, Revision 1, as summarized in Table 6.4-2. There are no additional state or

federal requirements for meteorological monitoring with which this project will have to comply.

6.4.2.1 Wind Systems

Wind speed and direction is measured at the 10-m (32.8-ft.) and 60-m (196.8-ft.) levels. Lower- and upper-level wind speeds are recorded by sensors mounted on 3.7-m (12-ft.) retractable booms to minimize tower shadow effects. Wind direction, wind speed, and wind direction variance (sigma theta) are monitored at both the lower and upper levels of the tower.

6.4.2.2 Temperature Systems

Ambient temperature and delta-T are monitored at both the 10-m (32.8-ft.) and 60-m (196.8-ft.) levels of the tower. Two channels of differential temperature are monitored simultaneously between the lower and upper levels. The temperature probes are mounted in aspirated shields attached to a 2.5-m (8-ft.) retractable boom. Dew-point temperature is measured at the 10-m (32.8-ft.) level of the tower.

6.4.2.3 Precipitation and Solar Radiation Systems

Precipitation and solar radiation are monitored by sensors located near the base of the tower at an elevation of approximately 2 m (6.6 ft.) above ground level.

6.4.2.4 Maintenance and Calibration

The equipment is routinely checked and calibrated in accordance with approved procedures. Accumulated system data are routinely analyzed for inconsistent or erratic data, including a comparison with appropriate meteorological data obtained from other local or regional meteorological observation stations. To achieve the required level of system reliability (that is, annual data recovery targets), the following maintenance program is followed:

- Calibrate datalogger input channels semiannually.
- Calibrate or replace wind sensors with NIST-traceable calibrated sensors semiannually.
- Calibrate precipitation monitoring device (rain gauge) semiannually.
- Calibrate or replace barometric pressure, dew-point temperature, and solar radiation channel sensors with NIST-traceable calibrated sensors annually.
- Check the two ambient/differential temperature channels for deviations. Temperature sensors are thermistors purchased with NIST-traceable calibration documentation. Thermistors are inherently stable (100-month

drift of less than 0.01°C) and routine sensor calibration or replacement is, therefore, not necessary. Deviation between the two ambient/differential temperature channels provides an early warning of a problem with one of these channels.

- Calibrate or replace barometric pressure, dew-point temperature, and solar radiation channel sensors with NIST-traceable calibrated sensors annually.

- Perform a general inspection of the entire system during all maintenance and calibration events.

6.4.2.5 Data Reduction

Data from the LNP datalogger system are retrieved via a remote connection via a cellular telephone link. Using a host computer, an off-site meteorological consultant retrieves the meteorological data daily (except weekends and holidays). The retrieved data are reviewed for potential problems and then checked for consistency with data obtained from an automatic weather observing station operated by the municipality of Ocala, as well as data from the nearby Crystal River plant. Erroneous data are discarded and not input to the historical site database. The edited and reviewed 15-minute (min.) averaged data are then stored on electronic media.

The routine computer outputs include the following information:

- Summaries of data listing maximum temperature, minimum temperature, average temperature, barometric pressure, precipitation, solar radiation, and dew-point temperature as daily and monthly averages.

- Totals of hourly precipitation, and hourly averages of barometric pressure, ambient temperature, differential temperature, dew-point temperature, upper- and lower-level wind direction and wind speed, upper- and lower-level wind direction variance (sigma theta), Pasquill stability classes (as calculated in accordance with a procedure outlined in NRC's Regulatory Guide 1.23, Revision 1), and accumulated solar radiation (langlies per minute).

- Averages of all parameters in 15-min. increments except precipitation, which is displayed as a 15-min. total value.

- Distributions of joint wind frequency (as outlined in NRC's Regulatory Guide 1.23, Revision 1) for both upper and lower levels showing average wind speeds and number of unrecovered data hours.

6.4.2.6 Accuracy of Measurements

Table 6.4-2 summarizes the accuracy of the measurements of the monitored parameters and the criteria upon which the accuracies are based. The accuracy of the meteorological monitoring system during the 1-year Period of Record (as described in ER Subsection 2.7.5) is consistent with the requirements of NRC Regulatory Guide 1.23, Revision 1.

Table 6.4-1
LNP Meteorological Monitoring Tower Sensor Elevations

Sensor	Approximate Elevation Above Tower Base (m)
Wind Speed and Direction	10 and 60
Dew Point	10
Solar Radiation	2.0
Ambient Temperature	10 and 60
Delta Temperature[(a)]	10 and 60
Precipitation	2.0
Barometric Pressure	2.0

Notes:

a) Used to measure differential temperature channel between these elevations.

m = meter

Table 6.4-2
LNP Meteorological Monitoring Tower Accuracy of Monitored Parameters

Monitored Parameter	Basis	Accuracy Criteria
Wind Direction	NRC Regulatory Guide 1.23, Revision 1	±5 degrees. Starting threshold <0.45 m/s (1 mph). Resolution to 1.0 degree.
Wind Speed	NRC Regulatory Guide 1.23, Revision 1	±0.2 m/s (±0.45 mph) or 5% of observed wind speed. Starting threshold <0.45 m/s (1 mph). Resolution to 0.1 m/s or 0.1 mph.
Ambient Temperature	NRC Regulatory Guide 1.23, Revision 1	±0.5°C (±0.9°F). Resolution to 0.1°C (0.1°F).
Differential Temperature	NRC Regulatory Guide 1.23, Revision 1	±0.1°C (±0.18°F). Resolution to 0.01°C (0.01°F).
Wet-Bulb Temperature	NRC Regulatory Guide 1.23, Revision 1	±0.5°C (±0.9°F). Resolution to 0.1°C (0.1°F).
Relative Humidity/Dew Point	NRC Regulatory Guide 1.23, Revision 1	Relative Humidity: ±4% Resolution to 0.1%. Dew Point: ±1.5°C (±2.7°F). Resolution to 0.1°C (0.1°F).
Total Precipitation	NRC Regulatory Guide 1.23, Revision 1	Precipitation (water equivalent). ±10% for a volume equivalent to 2.54 mm (0.1 in.) of precipitation at a rate <50 millimeters per hour (<2 inches per hour). Resolution to 0.25 mm (0.01 in.)
Solar Radiation[(a)]	ANSI/ANS 2.5-1984	Consistent with current state-of-the-art.
Barometric Pressure[(a)]	ANSI/ANS 2.5-1984	Consistent with current state-of-the-art
Datalogger Sampling Rate	NRC Regulatory Guide 1.23, Revision 1	At least once every 5 seconds
Time	NRC Regulatory Guide 1.23, Revision 1	±5 minutes. Resolution to ±1 minutes.

Notes:

a) There are no accuracies specified in NRC's Regulatory Guidance 1.23 for these parameters. American National Standards Institute/American Nuclear Society (ANSI/ANS) 2.5-1984 guidance reflects industry and regulator-accepted state-of-the-art specifications.

°C = degrees Celsius
°F = degrees Fahrenheit
in. = inch
m/s = meters per second
mm = millimeter
mph = miles per hour

6.5 ECOLOGICAL MONITORING

This section describes the monitoring programs designed to identify and evaluate ecological systems that might be affected by LNP construction and operation. ER Subsection 6.5.1 describes the monitoring program for terrestrial ecological communities, and ER Subsection 6.5.2 describes the monitoring program for aquatic ecological communities.

6.5.1 TERRESTRIAL ECOLOGY AND LAND USE

This subsection describes the monitoring program for terrestrial ecological communities that was initiated during the preapplication phase and will be continued during construction and operation of the LNP. The monitoring data will be used to support the preparation of the COLA and the Florida SCA for the LNP. The terrestrial ecology monitoring program consists of the following primary elements:

- Preapplication terrestrial ecology monitoring: This phase of the monitoring is designed to identify background terrestrial community conditions, and support the ecological descriptions that are presented in ER Section 2.4.

- Construction terrestrial ecology monitoring: This phase of the monitoring is designed to evaluate changes in terrestrial communities that could result from site preparation and construction activities.

- Preoperational terrestrial ecology monitoring. This phase of the monitoring will be used to establish a baseline from which the identification and assessment of environmental effects attributable to facility operation can be made.

- Operational terrestrial ecology monitoring. This phase of the monitoring will be used to document changes in terrestrial communities that might result from facility operation.

The objectives of the terrestrial ecology monitoring program are to identify effects on the terrestrial community caused by the development, construction, and operation of LNP 1 and LNP 2, and identify alternatives or engineering measures that could be used to reduce potential adverse effects.

6.5.1.1 Preapplication Terrestrial Ecology Monitoring

Preapplication monitoring of terrestrial ecological communities was initiated in October 2006 to identify and characterize habitats on the LNP site and in areas of the associated facilities. These habitats are described in ER Subsection 2.4.1. The ongoing monitoring program consists of literature and regulatory agency database reviews and pedestrian surveys.

6.5.1.1.1 Important Species

Important species that might occur on the LNP site or in the areas of the associated facilities are identified in ER Subsection 2.4.1.1.3 and include recreationally important species such as white-tail deer (*Odocoileus virginianus*) and bobwhite quail (*Colinus virginianus*); and threatened and endangered species such as gopher tortoise (*Gopherus polyphemus*), eastern indigo snake (*Drymarchon corais couperi*), and bald eagle (*Haliaeetus leucocephalus)* (Reference 6.5-001). Most of the LNP site will remain undeveloped following construction of the LNP and available to wildlife species.

Pedestrian surveys for threatened and endangered species were conducted as part of habitat characterization and wetland delineation activities. In addition, CH2M HILL ecologists conducted field surveys for gopher tortoise burrows on the LNP site and in the vicinity of the proposed heavy haul road between December 4, 2007, and January 28, 2008. The presence of gopher tortoise burrows is useful in assessing the possible presence of listed commensal species, such as the eastern indigo snake. Survey crews made up of two to three ecologists conducted pedestrian surveys along representative transects, with one GPS orienteer guiding the surveys and documenting burrow locations. Relevant data including canopy closure, shrub density, forage vegetation, estimated groundwater depth, level of disturbance, soil type, and land use were collected along each transect.

No threatened or endangered plant species have been identified on the LNP site or within the areas of the associated facilities.

6.5.1.1.2 Important Habitats

Important habitats on and in the vicinity of the LNP site are described in ER Subsection 2.4.1.1.5. No unique or rare habitats or habitats with priority for protection were identified on the LNP site; however, some of these areas occur in the vicinity of the associated facilities, such as the Goethe State Forest located immediately north of the LNP site.

Wetlands on and in the vicinity of the LNP site and associated facilities were identified and characterized through review of agency databases, aerial photographs, published documents, and subsequently through field delineation by CH2M HILL ecologists. State jurisdictional boundaries for wetlands on the LNP site will also be confirmed through a formal jurisdictional determination process by FDEP Wetlands Evaluation and Delineation Service biologists.

The Unified Mitigation Assessment Method is a wetland functional analysis method used by the FDEP and the Jacksonville District of the U.S. Army Corps of Engineers (USACE) to evaluate wetland functions and estimate associated mitigation requirements (Reference 6.5-002). This analysis was conducted for representative wetlands on the LNP site and in the areas of the associated facilities, and the results will be submitted to both the FDEP and USACE as part of the Environmental Resource Permit (ERP) Joint Application package.

6.5.1.2 Construction Terrestrial Monitoring

The construction terrestrial monitoring is designed to identify terrestrial resources that could be affected by construction activities, and to support measures to minimize potentially adverse effects on these resources resulting from construction of the LNP facilities.

6.5.1.2.1 Important Species

As discussed in ER Subsection 2.4.1.1.3.1, the recreationally important species identified on and in the vicinity of the LNP site and associated facilities are locally common. During construction these species are expected to avoid the construction areas in favor of similar habitats that are abundant in the vicinity, and monitoring is not anticipated.

As part of Preapplication terrestrial ecological monitoring, gopher tortoise surveys were conducted on those portions of the LNP site and associated facilities that were identified as appropriate habitat based on State Fish and Wildlife Conservation Commission guidelines (Reference 6.5-003). Approximately 4 to 6 months prior to construction, those areas and any additional areas identified as appropriate gopher tortoise habitat will be surveyed in accordance with Florida Fish and Wildlife Conservation Commission (FFWCC) guidelines. A gopher tortoise relocation plan will be developed in accordance with FFWCC guidelines (Reference 6.5-003). All gopher tortoise burrows identified will be flagged and the location of each burrow will be depicted on a site plan, which will be provided to construction contractors. Any gopher tortoise burrow identified within 25 ft. of construction will be subject to monitoring and gopher tortoise relocation, as described in the gopher tortoise relocation plan.

As discussed in ER Subsection 2.4.1.1.3.2.3, one active bald eagle nest was identified south of the LNP site, resulting in the relocation by LNP engineers of the proposed heavy haul road to the east. LNP construction activities are anticipated to occur beyond 660 ft., the guidance distance identified by the U.S. Fish and Wildlife Service (USFWS) within which monitoring is required; and activities in the vicinity of the nest will be conducted in accordance with current USFWS guidance (Reference 6.5-004)

Construction staff will be educated about the potential presence of listed species on-site, their appearance, and appropriate response if an individual is observed.

6.5.1.2.2 Important Habitats

Important habitats in the vicinity of the LNP site and associated facilities are discussed in ER Subsection 2.4.1.1.5. Wetlands comprise the primary important terrestrial habitat type that will be affected by construction activities. Potential impacts to wetlands on the LNP site and associated facilities are described in ER Subsection 4.3.1 and ER Section 5.6. Construction monitoring of wetlands will be conducted in accordance with conditions of the ERP permit established by the

FDEP and the USACE. Where possible, buffer areas will be established between construction areas and wetlands to minimize effects on wetlands. Potentially adverse impacts to wetlands in the vicinity of the construction areas will also be minimized through implementation of best management practices and compliance with the site's stormwater pollution prevention plan.

6.5.1.3 Preoperational Terrestrial Monitoring

Preoperational terrestrial monitoring activities will track changes in terrestrial communities that might result from facility operation. Some of these activities will be conducted as part of regulatory controls in conjunction with permitting, and other monitoring activities may be conducted as needed.

6.5.1.3.1 Important Species

As discussed in ER Subsection 2.4.1.1.3.1, the recreationally valuable species identified for the LNP site and associated facilities are regionally common and are expected to inhabit the abundant habitat that will remain undisturbed following construction. Cessation of silviculture activities is likely to enhance habitat areas for some wildlife species on-site, and no monitoring is proposed. Protected species that occur in the vicinity will be monitored as required by applicable permit conditions, for instance, relocation areas for gopher tortoises, if needed.

6.5.1.3.2 Important Habitats

The preoperational terrestrial monitoring activities will be conducted in accordance with conditions established by the FDEP and USACE as part of the ERP and other permitting processes. These conditions may include monitoring of on-site wetlands and terrestrial habitats, both wetland and upland, associated with mitigation

6.5.1.4 Operational Terrestrial Monitoring

Operational terrestrial monitoring will be conducted as a continuation of preoperational monitoring, to track changes in terrestrial communities. The monitoring program will be developed based on environmental permit conditions and needs identified in previous monitoring phases.

6.5.1.4.1 Important Species

Protected species that occur in the vicinity of the LNP will be monitored in accordance with permit conditions established during the pre-construction period by the Florida Fish and Wildlife Conservation Commission. If, during any of the monitoring phases, important species are identified on or in the vicinity of the LNP that may be affected by plant operation and that are not already part of a monitoring plan, these species will be incorporated into the monitoring program.

6.5.1.4.2 Important Habitats

The operational terrestrial monitoring activities will be conducted in accordance with conditions established by the FDEP and USACE as part of the ERP and other permitting processes. These conditions may include monitoring of on-site wetlands and terrestrial habitats, both wetland and upland, associated with mitigation.

6.5.2 AQUATIC ECOLOGY

This subsection describes the aquatic ecology monitoring program that was initiated during the preapplication phase and will be continued during construction and operation of the LNP. The data will be used to support the preparation of COLA for the LNP 1 and LNP 2. The aquatic ecology monitoring program consists of the following primary elements:

- Preapplication aquatic ecology monitoring: This phase of the monitoring is designed to establish background aquatic community conditions and support the ecological descriptions that are presented in ER Subsection 2.2.4.

- Construction aquatic ecology monitoring: This phase of the monitoring is designed to establish an aquatic community baseline and document potential changes in aquatic communities that might result from site preparation and construction activities.

- Preoperational aquatic ecology monitoring: This phase of the monitoring will be used to establish a baseline from which the identification and assessment of environmental effects attributable to facility operation can be made.

- Operational aquatic ecology monitoring: This phase of the monitoring will be used to establish changes in aquatic communities that might result from facility operation.

The objectives of the aquatic ecology monitoring program are to identify effects caused by the development, construction, and operation of LNP 1 and LNP 2, and identify alternatives or engineering measures that could be used to reduce those potential adverse effects. Aquatic ecology monitoring data collected during each of these elements will be made available to state and federal agencies, though no specific ongoing reviews during data collection are required.

Aquatic habitats considered included streams, lakes, impoundments, the CFBC, and the nearshore Gulf of Mexico in the vicinity of the CFBC and CREC. There are no streams, lakes, or impoundments that will be used or affected by the construction or operation of the LNP. The CFBC will be used as a source of cooling water for the LNP, and will be the site of construction for the cooling water intake structure (CWIS) and burial of two cooling tower blow-down

pipelines that will cross the CFBC. The nearshore Gulf of Mexico is located west and just outside the mouth of the CFBC, and is an area that will receive discharge cooling water from the LNP via the existing CREC discharge canal.

Stormwater runoff from the LNP site will be collected and controlled by a stormwater drainage system, which will include stormwater ponds located around the LNP site. Although small plant and animal communities may become established in these ponds, these ecological communities will not be monitored because they would occur within a stormwater conveyance system designed to manage stormwater, and not maintain aquatic communities.

6.5.2.1 Preapplication Aquatic Ecology Monitoring

Preapplication aquatic ecology monitoring was initiated in late 2007 in the CFBC to establish the existing diversity of aquatic fish and invertebrate communities that occur there. Aquatic community data were collected at four locations (Station 1 through Station 4) in the CFBC (Figure 6.1-1).

Continued pre-application aquatic ecology monitoring will be conducted in the CFBC at Station 1 through Station 4, and three new locations in the old Withlachochee River channel that connects the CFBC with Inglis Dam. Sampling locations in the old Withlachochee River channel include just below the Lake Rousseau Dam, approximately half the distance from the dam to confluence with the CFBC and just above the confluence of the channel with the CFBC. Two sampling events will be conducted at these seven stations, one sampling event in late spring/early summer 2008 and the second sampling event in mid-summer (July/August) 2008.

Additional pre-application aquatic ecology monitoring will be conducted in the vicinity of the CREC proposed discharge of cooling water from LNP 1 and LNP 2. Monitoring will be conducted at two locations, one near the mouth of the CREC discharge canal, and one in the seagrass habitat in the nearshore Gulf of Mexico.

Table 6.5-1 lists the surface water monitoring stations and the phases during which each is monitored. Details of the LNP pre-application aquatic ecology monitoring program for fish and invertebrates are described below.

6.5.2.1.1 Freshwater Streams

There are no freshwater streams on the LNP site; therefore, no aquatic ecology monitoring was performed.

6.5.2.1.2 Lakes and Impoundments

There are no lakes or impoundments considered to be waters of the State on the LNP site. In addition, no lakes or impoundments considered to be waters of the State will be used or affected by the construction or operation of the LNP. Lake Rousseau is hydrologically separated from the LNP site. The lake is directly upstream of the proposed CFBC intake structure but is hydrologically

disconnected because of the presence of the Inglis Lock and associated Inglis Lock Bypass Channel.

6.5.2.1.3 Cross Florida Barge Canal and Nearshore Gulf of Mexico

The preapplication aquatic ecology monitoring program began with the sampling of aquatic fish and invertebrate communities, and associated physicochemical parameters at three stations in the CFBC and one station in the nearshore Gulf of Mexico. Stations 1, 2, and 3 are located approximately 0.5, 3.5, and 7.0 miles west of Inglis Lock, respectively. Station 4 is located 0.5 mile west of the CFBC mouth, in the nearshore environment of the Gulf of Mexico. Sampling at these stations was initiated in October (Event 1) and December (Event 2), 2007.

The types of ecological data collected at these four stations included fish, benthic, and plankton community data, and co-located water and sediment quality data.

The fish community was sampled during Events 1 and 2 with techniques including beach seining, gill netting, trawling, cast netting, and minnow traps. Event 1 fish sampling was conducted between October 29 and November 7, 2007, and Event 2 sampling was conducted between December 3 and 11, 2007.

The benthic community was sampled using an otter trawl and crab traps to capture motile crustaceans (Events 1 and 2), and using a Petite Ponar dredge to capture benthic infaunal macroinvertebrates (Event 1). Event 1 sampling was conducted between October 11 and November 2, 2007, and Event 2 sampling was conducted between December 6 and 11, 2007.

The icthyoplankton and meroplankton community was sampled using a plankton net. During each event, plankton tows were performed between low-slack and high-slack tides during the daytime. On the same day, two more plankton tows were conducted at each station after sunset and between low-slack and high-slack tides. Each plankton tow represented organisms occurring at the surface, middle, and bottom of the water column. Event 1 and Event 2 sampling was conducted on October 18 and December 7, 2007, respectively.

Field water quality included water column measurements of salinity, conductivity, dissolved oxygen, pH, temperature, and water clarity. Laboratory water quality parameters included chlorophyll *a*, total suspended solids, total dissolved solids, total phosphorous, nitrate plus nitrite, ammonia, and total Kjeldahl nitrogen (TKN). Laboratory sediment parameters included particle size and total organic carbon, and were analyzed once in Event 1. Field and laboratory parameters were collected on October 16 and November 19, 2007. Sediment samples were collected November 11, 2007.

One additional aquatic ecology sampling event in the CFBC and nearshore Gulf of Mexico will be conducted in late spring/early summer 2008 to provide an extension of the period of record for ecological and physicochemical data. Sampling will be conducted again at Stations 1 through 4, and will include the

one-time sampling of fish communities, invertebrate communities, water quality, and sediment quality, and will employ the sampling techniques applied during Events 1 and 2. Plankton sampling will also be conducted at Stations 1 through 4, but will be conducted 12 times during 2008, including once in February/March, biweekly from mid-March through June (seven events), and biweekly August through September (four events).

In addition, one aquatic ecology sampling event will be conducted at three new stations in the old Withlacoochee River channel (connecting the CFBC with Inglis Dam) to establish a biological baseline for the old channel. These stations will be labeled Station 8, Station 9, and Station 10. The fish community, benthic community, water quality, and sediment quality will be sampled at these three stations, and will include the same sampling techniques and analytical parameters described for Stations 1 through 4. However, plankton sampling will not be conducted at Stations 8 through 10.

Aquatic ecology data will be evaluated to determine community characteristics at each station, and compared to other stations or areas as appropriate. These characteristics will include, but not be limited to, species diversity, species abundance, dominant species, and graphical (spatial) trends of important species between stations and over time.

Sediment samples will be collected concurrently with the benthic infaunal macroinvertebrate samples. Field and laboratory water quality parameters will be analyzed twice at all seven stations during the late spring/early summer, and field parameters will be sampled during each of the 12 plankton events.

A description of the parameters measured and sampling frequency at the CFBC locations is provided in Table 6.5-2.

6.5.2.1.4 Crystal River Energy Complex Discharge Canal and the Gulf of Mexico

The LNP will discharge cooling and plant operation water to the Gulf of Mexico through a pipeline from the site to the CREC discharge canal. This phase of the aquatic ecology monitoring is designed to establish an aquatic community baseline and document potential changes in aquatic communities that might result from site preparation and construction activities.

Historical aquatic ecology data were collected at the CREC to support a thermal effluent and intake demonstration (316[a] and 316[b]) study, and are summarized in Subsection 2.4.2.5. Study components included benthos, entrainment, impingement, fisheries, and physical studies.

PEF collected aquatic ecology data at two stations (CREC Stations 3 and 4) and physicochemical data at four stations (CREC Stations 1 through 4). Station 1 is located within an existing concrete channel used for blowdown discharge from existing coal units. CREC Station 2 is located near the proposed liquid release point within the discharge canal. CREC Station 3 is near the mouth of the CREC

discharge canal. CREC Station 4 is located in seagrass beds near the discharge point (Figure 6.1-3).

Sampling for all parameters was conducted quarterly (winter, spring, summer, and fall) in 2008. The results were provided as supplemental information in response to an NRC request for additional information.

Sampling of biological and physicochemical parameters was conducted using the same methods applied at the CFBC. The fish community was sampled with beach seining, gill netting, trawling, cast netting, and minnow traps. The benthic community was sampled using an otter trawl and crab traps to capture motile crustaceans, and a Petite Ponar dredge to capture benthic infaunal macroinvertebrates. The icthyoplankton and meroplankton community was sampled using a plankton net.

Field and laboratory water quality parameters were measured twice during each quarterly biological sampling event. Field parameters included temperature, pH, dissolved oxygen, salinity, and water clarity (secchi depth). Laboratory parameters included chlorophyll *a*, total suspended solids, total dissolved solids, total phosphorous, nitrate plus nitrite, ammonia, TKN, biochemical oxygen demand, chemical oxygen demand, orthophosphate, alkalinity, chlorides, sulfate, sodium, potassium, calcium, magnesium, mercury, and lead.

A description of the parameters measured and sampling frequency at the CREC locations is provided in Table 6.5-2.

6.5.2.2 Construction Aquatic Ecology Monitoring

The construction aquatic ecology monitoring program is designed to assess potential affects to benthic infaunal macroinvertebrate communities in the CFBC in the vicinity of the construction zone where underground pipes will be installed.

Table 6.5-1 lists the aquatic ecology monitoring stations and the phases during which each is monitored. Details of the LNP construction aquatic ecology monitoring program are described below.

6.5.2.2.1 Freshwater Streams

There are no freshwater streams on the LNP site; therefore, no aquatic ecology monitoring will be performed.

6.5.2.2.2 Lakes and Impoundments

There are no lakes or impoundments considered to be waters of the State on the LNP site. In addition, no lakes or impoundments considered to be waters of the State will be used or affected by the construction of the LNP. No aquatic ecology monitoring will be performed.

6.5.2.2.3 Cross Florida Barge Canal and Nearshore Gulf of Mexico

Cooling tower blow-down from a series of mechanical draft cooling towers, including dissipated waste heat, will be transported in two pipelines (one for each unit) from the LNP. The blowdown lines will run south to the CFBC and then west along the northern edge of the CFBC. They will then cross the CFBC just north of CREC, run south, and will discharge into the CREC discharge canal and ultimately into the Gulf of Mexico.

In addition, the CWIS will be located approximately 11.1 km (6.9 mi.) from the Gulf of Mexico on the berm that forms the north side of the canal and within 0.8 km (0.5 mi.) downstream of the Inglis Lock. While much of the supporting structure will be located on the side of the berm, the intake structure itself will extend a short distance into the waters of the barge canal and will likely involve the dredging of sediments to allow for the construction of the concrete structure on the bottom.

Construction of the pipeline corridor through the CFBC, and construction of the CWIS along the berm, will involve dredging of sediments, and therefore, result in the temporary suspension and redeposition of sediment, and the removal of those benthic organisms living in or on the removed sediments. The proposed construction monitoring is designed to establish the baseline benthic infaunal macroinvertebrate community that occurs in the sediment at these construction locations, as well as monitor post-construction benthic community recovery.

Construction monitoring for both structures is proposed to be conducted during three events. The first event will be conducted approximately 6 months before site construction to determine existing benthic infaunal macroinvertebrate communities. At 1 year after construction, and 3 years after construction, monitoring will be repeated to determine benthic community recovery.

Benthic community samples at the pipeline crossing construction area will be collected along three transects, one transect directly within the pipeline dredging corridor, a second transect approximately 500 ft. upstream of the pipeline dredging corridor, and a third transect approximately 500 ft. downstream of the pipeline dredging corridor. Along each transect, one Ponar dredge sample will be collected from the canal center, and one between the center and shoreline in each direction, for a total of three samples per transect, and nine samples total for the pipeline construction area. Each Ponar dredge sample will be a single grab of sediment that is field sieved and sent to the taxonomic laboratory. At 1 year and 3 years following completion of pipeline construction activities, these same stations will be resampled for benthic community analysis. The purpose of the transects upstream and downstream of the pipeline dredging corridor is to provide benthic community data from nearby reference locations that are undisturbed by dredging activities, but otherwise affected by natural environmental conditions.

Benthic community samples at the CWIS construction area will be collected at three locations, one within the nearshore area of dredging activities associated

with construction of the CWIS, a second at approximately 500 ft. upstream of the CWIS location, and a third at approximately 500 ft. downstream of the CWIS. Each benthic sample location will be placed at the same distance from the northern shoreline, and will be based on the placement of the one sample within the dredging area directly associated with the CWIS. At each location, three replicate Ponar dredge sample will be collected for a total of nine samples for the CWIS construction area. Each Ponar dredge sample will be a single grab of sediment that is field sieved and sent to the taxonomic laboratory. At 1 year and 3 years following completion of the CWIS construction activities, these same stations will be resampled for benthic community analysis. The purpose of the locations upstream and downstream of the CWIS is to provide benthic community data from nearby reference locations that are undisturbed by dredging activities, but otherwise affected by natural environmental conditions.

Aquatic ecology data will be evaluated to determine community characteristics at each station, and compared to other stations or areas as appropriate. These characteristics will include, but not be limited to, species diversity, species abundance, dominant species, and graphical (spatial) trends of important species between stations and over time.

Threatened and endangered species will be monitored during all construction activities in the CFBC. Manatees and sea turtles, for example, might approach the construction sites during construction activities, and therefore, could be directly harmed if there is contact with machinery. The Florida Fish and Wildlife Conservation Commission will be notified of the planned construction activities in the CFBC. At a minimum, the manatee protection recommendations provided in Standard Manatee Protection Construction Conditions (Reference 6.5-005), which outlines conditions intended to protect manatees from direct project effects, will be implemented. A biologist familiar with the protected aquatic species in the region will be at the construction sites in the CFBC at all times during on-water construction activities, and will be allowed to temporarily halt construction should a protected species be observed near hazardous conditions. The biologist will have a boat available at all times to allow thorough viewing of waters at and near construction sites. The biologist will keep records of all sightings and actions taken to avoid manatee contact.

A description of the parameters measured and sampling frequency at the CFBC locations is provided in Table 6.5-2.

6.5.2.2.4 Crystal River Energy Complex Discharge Canal and Nearshore Gulf of Mexico

There are no construction activities proposed in the CREC discharge canal, thus no construction aquatic ecology monitoring is required.

6.5.2.3 Preoperational Aquatic Ecology Monitoring

A preoperational aquatic ecology monitoring program will be designed to provide a baseline for evaluating changes to aquatic fish and invertebrate communities

arising from the operation of the LNP. It will provide for the collection of data to support environmental descriptions of the location and value of commercial and sport fisheries, distribution and abundance of fish and invertebrates, occurrence of protected species, physical, chemical, and biological factors affecting aquatic species, and other location characteristics affecting aquatic communities and nuisance species. It will also include literature reviews to support the interpretation of data results.

Table 6.5-1 lists the aquatic ecology monitoring stations and the phases during which each is monitored. Details of the LNP preoperational aquatic ecology monitoring program are described below.

6.5.2.3.1 Freshwater Streams

There are no freshwater streams on the LNP site; therefore, no aquatic ecology monitoring will be performed during preoperational monitoring.

6.5.2.3.2 Lakes and Impoundments

No lakes or impoundments considered to be waters of the State are hydrologically connected to or used by the LNP; therefore, no aquatic ecology monitoring will be performed during preoperational monitoring.

6.5.2.3.3 Cross Florida Barge Canal and Nearshore Gulf of Mexico

Preoperational aquatic ecology monitoring will be conducted at the CFBC to establish a baseline for assessing changes to aquatic fish and invertebrate communities arising from the operation of the LNP.

The preoperational aquatic ecology monitoring program will include the sampling of aquatic fish and invertebrate communities, and associated physicochemical parameters at three stations in the CFBC (Stations 1, 2, and 3), one station in the nearshore Gulf of Mexico (Station 4), and at three stations in the old Withlachochee River channel (Stations 8, 9, and 10). Stations 1, 2, and 3 are located approximately 0.5, 3.5, and 7.0 miles west of Inglis Lock, respectively. Station 4 is located 0.5 mile west of the CFBC mouth, in the nearshore environment of the Gulf of Mexico. In the old Withlachochee River channel, Station 8 will be located near the confluence of the river with the CFBC, Station 9 approximately mid-way between the Inglis Dam and the CFBC, and Station 10 near the Inglis Dam.

The types of ecological data collected at these seven stations will include fish, benthic, and plankton community data, threatened and endangered species, and co-located water and sediment quality data.

The fish community will be sampled quarterly with techniques including beach seining, gill netting, trawling, cast netting, and minnow traps. The benthic community will be sampled quarterly using an otter trawl and crab traps to capture motile crustaceans, and using a Petite Ponar dredge to capture benthic

infaunal macroinvertebrates. The icthyoplankton and meroplankton community will be sampled using a plankton net at Stations 1, 2, 3, and 4, and will be conducted 12 times during the one year preoperational period, including once in February/March, biweekly from mid-March through June (seven events), and biweekly August through September (four events). Threatened and endangered species observed in the CFBC sampling area will be documented.

Aquatic ecology data will be evaluated to determine community characteristics at each station, and compared to other stations or areas as appropriate. These characteristics will include, but not be limited to, species diversity, species abundance, dominant species, and graphical (spatial) trends of important species between stations and over time.

Field water quality will include water column measurements of salinity, conductivity, dissolved oxygen, pH, temperature, and water clarity. Laboratory water quality parameters will include chlorophyll *a*, total suspended solids, total dissolved solids, total phosphorous, nitrate plus nitrite, ammonia, and TKN. Laboratory sediment parameters will include particle size and total organic carbon. Sediment samples will be collected concurrently with the benthic infaunal macroinvertebrate samples.

Future NPDES permit conditions could modify this proposed sampling program and LNP will follow the established NPDES permit monitoring conditions.

A description of the parameters measured and sampling frequency at the CFBC locations is provided in Table 6.5-2.

6.5.2.3.4 Crystal River Energy Complex Discharge Canal and the Gulf of Mexico

The LNP will discharge cooling and plant operation water to the Gulf of Mexico through a pipeline from the site to the CREC discharge canal. This preoperational phase of the aquatic ecology monitoring is designed to establish an aquatic community baseline in the vicinity of the CREC discharge canal.

PEF proposes to collect aquatic ecology data at two stations (CREC Stations 3 and 4), and physicochemical data at four stations (CREC Stations 1 through 4). Station 1 will be located within an existing concrete channel used for blowdown discharge from existing coal units. CREC Station 2 will be located near the proposed liquid release point within the discharge canal. CREC Station 3 will be near the mouth of the CREC discharge canal. CREC Station 4 will be located in seagrass beds near the discharge point (Figure 6.1-3).

Sampling for all parameters is proposed to be conducted quarterly (winter, spring, summer, and fall).

Sampling of biological and physicochemical parameters will be conducted using the same methods applied at the CFBC. The fish community will be sampled with beach seining, gill netting, trawling, cast netting, and minnow traps. The benthic

community will be sampled using an otter trawl and crab traps to capture motile crustaceans, and a Petite Ponar dredge to capture benthic infaunal macroinvertebrates. The icthyoplankton and meroplankton community will be sampled using a plankton net. Threatened and endangered species observed in the CREC sampling area will be documented.

Aquatic ecology data will be evaluated to determine community characteristics at each station, and compared to other stations or areas as appropriate. These characteristics will include, but not be limited to, species diversity, species abundance, dominant species, and graphical (spatial) trends of important species between stations and over time.

Field and laboratory water quality parameters will be measured twice during each quarterly biological sampling event. Field parameters will include temperature, pH, dissolved oxygen, salinity, and water clarity (secchi depth). Laboratory parameters will include chlorophyll *a*, total suspended solids, total dissolved solids, total phosphorous, nitrate plus nitrite, ammonia, TKN, biochemical oxygen demand, chemical oxygen demand, orthophosphate, alkalinity, chlorides, sulfate, sodium, potassium, calcium, magnesium, mercury, and lead.

Future NPDES permit conditions could modify this proposed sampling program and LNP will follow the established NPDES permit monitoring conditions.

A description of the parameters measured and sampling frequency at the CREC locations is provided in Table 6.5-2.

6.5.2.4 Operational Aquatic Ecology Monitoring

An operational aquatic ecology monitoring program will be implemented following full operation of the LNP to assess the potential for impacts to aquatic fish and invertebrate communities.

Table 6.1-1 lists the aquatic ecology monitoring stations and the phases during which each is monitored. Details of the LNP operational aquatic ecology monitoring program are described below.

6.5.2.4.1 Freshwater Streams

There are no freshwater streams on the LNP site; therefore, no aquatic ecology monitoring will be performed during operational monitoring.

6.5.2.4.2 Lakes and Impoundments

No lakes or impoundments considered to be waters of the State are hydrologically connected to or used by the LNP; therefore, no aquatic ecology monitoring will be performed during operational monitoring.

6.5.2.4.3 Cross Florida Barge Canal

Operational aquatic ecology monitoring will be conducted to assess the potential for impingement of fish and motile macroinvertebrates at the CWIS, and the potential for entrainment of ichthyoplankton and meroplankton in cooling water drawn from the CFBC.

Impingement will be evaluated through the collection of fish and motile invertebrates in the vicinity of the CWIS and from the CWIS screen wash collection basket. A single sampling location will be identified in the immediate vicinity of the working CWIS. Fish will be sampled using gill netting, trawling, cast netting, and minnow traps. Motile crustaceans will be sampled using an otter trawl and crab traps. The field sampling of fish and macroinvertebrates will be conducted once per month for 1 year following full operation of the LNP and impingement samples will be collected twice per month for 1 year following full operation of the LNP. The fish and invertebrate data will be evaluated to determine diversity and abundance of species potentially entrained. Issued NPDES permit conditions could modify this proposed sampling program and LNP will follow the established NPDES permit monitoring conditions.

Entrainment will be evaluated through the collection of icthyoplankton and meroplankton in the CFBC. Sampling stations will include one in front of the CWIS, a second at half the distance between the CWIS and the mouth of the CFBC, and a third at the mouth of the CFBC. Replicate plankton samples will be collected at each station during the daytime (between low-slack and high-slack tides), and again during the nighttime, identical to the methodology applied during the preapplication aquatic ecology monitoring program. The sampling of icthyoplankton and meroplankton will be conducted twice per month for 1 year following full operation of the LNP. The icthyoplankton and meroplankton data will be evaluated to determine diversity and abundance of species potentially entrained. NPDES permit conditions could modify this proposed sampling program and LNP will follow the established NPDES permit monitoring conditions.

A description of the parameters measured and sampling frequency at the CFBC locations is provided in Table 6.5-2.

6.5.2.4.4 Crystal River Energy Complex Discharge Canal and Nearshore Gulf of Mexico

This phase of the aquatic ecology monitoring is designed to evaluate potential effects of operational discharge to aquatic communities in the vicinity of the CREC discharge canal. The specific biological and physicochemical sampling parameters and procedures of this operational monitoring are anticipated to be identical to the preapplication aquatic ecology monitoring program.

The monitoring program would include collection of aquatic community data at two stations (CREC Stations 3 and 4), and physicochemical data at four stations (CREC Stations 1 through 4). Sampling for all parameters is proposed to be

conducted quarterly (spring, summer, fall, and winter) for the first full year of operation. The aquatic ecology data will be evaluated to determine community characteristics at each station, and compared to other stations or areas as appropriate. These characteristics will include, but not be limited to, species diversity, species abundance, dominant species, and graphical (spatial) trends of important species between stations and over time.

A description of the parameters measured and sampling frequency at the CREC locations is provided in Table 6.5-2.

6.5.3 REFERENCES

6.5-001 Florida Natural Areas Inventory, Response to Information Request, Database Summary Package – Letter to Martha Klein, CH2M HILL, June 5, 2007.

6.5-002 Florida Department of Environmental Protection, "Uniform Mitigation Assessment Methodology," Website, www.dep.state.fl.us/water/wetlands/mitigation/umam.htm, accessed March 7, 2008.

6.5-003 Florida Fish and Wildlife Conservation Commission, "Available Options to Address the Presence of Gopher Tortoises on Lands Slated for Development," October 26, 2007.

6.5-004 U.S. Fish and Wildlife Service, "Bald Eagle Monitoring Guidelines," September 2007.

6.5-005 Florida Fish and Wildlife Conservation Commission, "FWC Permit Review for Potential Impacts to Manatees," Website, www.myfwc.com/manatee/permits/, accessed March 6, 2008.

Table 6.5-1 (Sheet 1 of 2)
Summary of Proposed Aquatic Ecology Monitoring Program by Phase

Location	Type	Preapplication	Construction	Preoperation	Operation
Station 1 [a]	Ecological/Environmental [h]	X [k]		X	
Station 2 [a]	Ecological/Environmental [h]	X [k]		X	
Station 3 [a]	Ecological/Environmental [h]	X [k]		X	
Station 4 [b]	Ecological/Environmental [h]	X [k]		X	
Station 8 [c]	Ecological/Environmental [h]	X [l]		X	
Station 9 [c]	Ecological/Environmental [h]	X [l]		X	
Station 10 [c]	Ecological/Environmental [h]	X [l]		X	
CWIS vicinity [d]	Ecological [i]		X		X
Pipeline Crossing [e]	Ecological [i]		X		
CREC Station 1 [f]	Environmental [j]	X [l]		X	X
CREC Station 2 [f]	Environmental [j]	X [l]		X	X
CREC Station 3 [g]	Ecological/Environmental [h]	X [l]		X	X
CREC Station 4 [g]	Ecological/Environmental [h]	X [l]		X	X

Notes:

a) Monitoring station is located within the CFBC.

b) Monitoring station is located within the nearshore Gulf of Mexico.

c) Monitoring station is located within the old Withlacoochee River channel.

d) Cooling water intake structure stations located within approximately 0.5 miles downstream of Inglis Lock.

e) Dredged crossing in CFBC for blow-down water pipelines. Exact location undetermined.

Table 6.5-1 (Sheet 2 of 2)
Summary of Proposed Aquatic Ecology Monitoring Program by Phase

Notes (continued):

f) Monitoring station is located within CREC facility.

g) Monitoring station is located outside the CREC discharge.

h) Parameters include fish, invertebrate, and plankton community data, and co-located water and sediment quality data.

i) Parameters include benthic macroinvertebrate community during construction monitoring, and fish, motile macroinvertebrate, and plankton community data during operational monitoring.

j) Parameters include water quality data.

k) Monitoring began in October 2007.

l) Monitoring planned to begin in March 2008.

Table 6.5-2 (Sheet 1 of 2)
Summary of Proposed Aquatic Ecology Monitoring Program for LNP 1 and LNP 2

Description	Preapplication	Construction	Preoperation	Operation
Objective of Sampling Program	Establish background data on aquatic fish, ichthyoplankton/meroplankton, and invertebrate communities, and associated physicochemical parameters, in the CFBC and vicinity of the CREC discharge canal, before site construction and operation activities.	Monitor benthic infaunal macroinvertebrate community impacts and recovery in the CFBC pipeline construction zone, and CWIS construction area. Monitor protected species during aquatic construction activities to support avoidance.	Establish a baseline for evaluating changes to aquatic fish, ichthyoplankton/meroplankton, and invertebrate communities, and associated physicochemical parameters, in the CFBC and vicinity of the CREC discharge canal, before LNP operation	Assess potential for impingement of fish and motile macroinvertebrates, and entrainment of ichthyoplankton and meroplankton at the CWIS. Assess potential impacts to aquatic communities in vicinity of CREC discharge canal.
Stations	*CFBC*: Station 1, Station 2, Station 3, Station 4, Station 8, Station 9, Station 10 Old Withlacoochee River channel: Station 1, Station 2, Station 3 *CREC*: CREC Station 1, CREC Station 2, CREC Station 3, CREC Station 4	*CFBC*: CWIS construction area – one station in construction area, and 1 upstream and 1 downstream station. Pipeline construction zone - three stations in construction area, and three upstream and three downstream stations.	*CFBC*: Station 1, Station 2, Station 3, Station 4, Station 8, Station 9, Station 10 Old Withlacoochee River channel: Station 1, Station 2, Station 3 *CREC*: CREC Station 1, CREC Station 2, CREC Station 3, CREC Station 4	*CFBC*: CWIS vicinity. *CREC*: CREC Station 1, CREC Station 2, CREC Station 3, CREC Station 4
Frequency	October (Event 1), December (Event 2) 2007: Station 1, Station 2, Station 3, Station 4 Late Spring/Early Summer; Mid-Summer (July/August): Station 1, Station 2, Station 3, Station 4, Station 8, Station 9, Station 10 Quarterly in 2008: CREC Station 1 [(a)], CREC Station 2 [(a)], CREC Station 3, CREC Station 4	Six months prior to construction, 1 and 3 years after construction.	Quarterly for the first full year prior to operation.	CFBC: CWIS – Twice per month for 1 year following startup of operations. CREC: Quarterly for the first full year of operation.

Table 6.5-2 (Sheet 2 of 2)
Summary of Proposed Aquatic Ecology Monitoring Program for LNP 1 and LNP 2

Description	Preapplication	Construction		Operation
Parameters	Fish, invertebrate, and plankton community data, and co-located water [(b)] and sediment [(c)] quality data.	Benthic macroinvertebrate community. Protected species observations during construction.	Fish, invertebrate, and plankton community data, and co-located water [(b)] and sediment [(c)] quality data. Protected species observations.	CFBC: CWIS – Fish and motile macroinvertebrates, ichthyoplankton and meroplankton. CREC: Fish, invertebrate, and plankton community data, and co-located water [(b)] and sediment [(c)] quality data.
Data Analysis	Taxonomic diversity, abundance, and trends.	Taxonomic diversity, abundance, and trends.	Taxonomic diversity, abundance, and trends.	Taxonomic diversity, abundance, and trends.

Notes:

a) Physicochemical parameters only.

b) Surface water – Field-measured salinity, conductivity, dissolved oxygen, pH, temperature, water clarity. Laboratory-measured chlorophyll *a*, total suspended solids, total dissolved solids, total phosphorous, nitrate plus nitrite, ammonia, and total Kjeldahl nitrogen.

c) Sediment – Laboratory-measured total organic carbon and particle size.

6.6 CHEMICAL MONITORING

The non-radiological chemical monitoring program for the COLA for LNP 1 and LNP 2 will include the following primary elements:

- Preapplication chemical monitoring: This phase of the monitoring will establish background non-radiological water quality conditions and support the chemical descriptions presented in ER Subsection 2.3.3.

- Construction and preoperational chemical monitoring: This phase of the monitoring will identify non-radiological chemical changes in water resulting from developmental activities (site preparation and construction) and establish baseline conditions for identification and assessment of environmental effects before facility operation.

- Operational chemical monitoring: This phase of the monitoring will establish any non-radiological chemical effects to surface water and groundwater that could result from facility operation.

The objective of the chemical monitoring program is to identify potential environmental effects, including the changes in water quality, caused by the development, construction, and operation of the LNP. In addition, evaluation of the monitoring data will allow PEF to identify alternatives and/or engineering measures that could be used to reduce any adverse effects. This section describes the non-radiological chemical monitoring program that was initiated during the preapplication phase and will be continued during construction and operation of the LNP. Radiological monitoring is described in ER Section 6.2.

6.6.1 PREAPPLICATION CHEMICAL MONITORING

The objective of the preapplication chemical monitoring program is to establish background conditions for surface water and groundwater before the construction and operation of the LNP. Data collected during this monitoring program will be used to determine the following:

- Surface water chemistry characteristics in the site vicinity (described in detail in ER Section 2.3).

- Groundwater characteristics in the site vicinity (ER Subsection 2.3.1.5 describes the groundwater system at the LNP).

The data collected during this monitoring can also be used to support the evaluation of the following:

- Alteration of sediment transport (ER Section 2.6 describes the soil characteristics at the LNP, and ER Section 4.2 describes water-related effects and controls associated with subsequent construction and preoperational activities).

- Alteration of floodplains or wetlands (ER Section 4.3 describes ecological effects and controls associated with preoperational activities).

Because limited chemical information is available, a preapplication chemical monitoring program was developed to document existing conditions at the LNP site.

Much of the preapplication chemical data were obtained as part of the preliminary site characterization work for the LNP. Two surface water locations (SS-1 and SS-2) at the CFBC and Lake Rousseau, respectively (Figure 6.1-1), were sampled quarterly to document seasonal water quality characteristics. Monitoring data were also collected at seven locations (Station 1 through Station 7) in the CFBC and the Gulf of Mexico (Figure 6.1-1) during ecological sampling. These data provide additional information regarding the spatial variability of water quality constituents in the CFBC. Four groundwater monitoring wells located at the LNP site (MW-13S, MW-14D, MW-15S, and MW-16D) (Figure 6.1-2) were also sampled quarterly to document seasonal water quality characteristics.

Table 6.1-1 lists the surface water monitoring stations and the phases during which each is monitored. Table 6.1-2 lists the groundwater monitoring stations and the phases during which each will be monitored. A summary of analytical parameters collected as part of the preliminary site characterization are provided in Tables 6.6-1, 6.6-2, 6.6-3, and 6.6-4.

6.6.1.1 Freshwater Streams

There are no freshwater streams on the LNP site (Figure 6.0-1); therefore, no chemical monitoring was performed.

6.6.1.2 Lakes and Impoundments

There are no lakes or impoundments considered to be waters of the State on the LNP site (Figure 6.0-1). In addition, no lakes or impoundments considered to be waters of the State will be used or affected by the construction or operation of the LNP. Lake Rousseau is directly upstream of the proposed CFBC intake but is hydrologically disconnected from the lake by the Inglis Lock and the Inglis Lock Bypass Channel (Figure 6.0-1). The lake is hydrologically separated from the LNP site.

However, preapplication monitoring was conducted at surface water sampling station SS-2 in March 2007, June 2007, September 2007, and December 2007 (Figure 6.1-1). This monitoring was performed to evaluate seasonal variations in water quality within Lake Rousseau. Field measurements for temperature, dissolved oxygen, pH, conductivity, salinity, oxidation reduction potential, and turbidity were collected at the surface of the lake using a YSI® Multiprobe or Multiparameter Instrument (or equivalent meter).

Grab samples were also collected and submitted to a certified laboratory for detailed analytical analysis of the parameters specified. Analytical methods followed the analytical laboratory's QA/QC program and included standard and analytical protocols, such as those listed in the "Standard Methods for the Examination of Water and Wastewater" (Reference 6.6-001) or "Methods for Chemical Analysis of Water and Wastes" (Reference 6.6-002). Samples were preserved in the field, as specified by the analytical method. A summary of the parameters and collection frequency is provided in Table 6.6-1.

The existing database is sufficient to describe water quality conditions in Lake Rousseau, as described in ER Subsection 2.3.3.1.

6.6.1.3 Cross Florida Barge Canal

Water quality monitoring was performed at three locations (Station 1, Station 2, and Station 3) within the CFBC (Figure 6.1-1) in conjunction with the ecological/ water quality characterization effort. Measurements were collected at Station 1 and Station 2 on October 16, 2007 and November 11, 2007, and at Station 3 on October 16, 2007, October 18, 2007, and November 19, 2007. Monitoring was also performed quarterly at SS-1 (March 2007, June 2007, September 2007, and December 2007) as part of the preapplication monitoring efforts near the proposed makeup water intake location (Figure 6.1-1).

Field parameters including temperature, dissolved oxygen, salinity, pH, and conductivity were monitored at all four locations using a YSI® Multiprobe (or equivalent meter). Grab samples were also collected and submitted to a certified laboratory for detailed analytical analysis.

Sample collection, handling, and QA procedures are described in the "COLA Aquatic Sampling Workplan for Levy County Site". Analytical methods followed the analytical laboratory's QA/QC program and included standard and analytical protocols, such as those listed in the "Standard Methods for the Examination of Water and Wastewater" (Reference 6.6-001) or "Methods for Chemical Analysis of Water and Wastes" (Reference 6.6-002). Samples were preserved in the field, as specified by the analytical method.

The data collected during the preapplication monitoring program and statistical analyses of these data are described in more detail in ER Subsection 2.3.3.1. A summary of the parameters and collection frequency is provided in Table 6.6-1.

The existing database is sufficient to describe the water quality conditions in the CFBC, as described in ER Subsection 2.3.3.1.

6.6.1.4 Cross Florida Barge Canal within the Gulf of Mexico

Water quality measurements were collected beyond the CFBC at four locations (Station 4, Station 5, Station 6, and Station 7) as part of the ecological/water quality characterization effort (Figure 6.1-1). Measurements were collected at all four stations on October 16, 2007, October 18, 2007, and November 19, 2007.

Field measurements were collected at the surface and at 1-m (3.3-ft.) depth intervals to the bottom of the water body using a YSI® Multiprobe or Multiparameter Instrument (or equivalent meter). Grab samples are also collected at each station and submitted to a certified laboratory for detailed analytical analysis.

Sample collection, handling, and QA procedures are described in the "COLA Aquatic Sampling Workplan for Levy County Site". Analytical methods followed the analytical laboratory's QA/QC program and included standard and analytical protocols, such as those listed in the "Standard Methods for the Examination of Water and Wastewater" (Reference 6.6-001) or "Methods for Chemical Analysis of Water and Wastes" (Reference 6.6-002). Samples were preserved in the field, as specified by the analytical method.

The data collected during the preapplication monitoring program and statistical analyses of this data are described in more detail in ER Subsection 2.3.3.1. A summary of the parameters and collection frequency is provided in Table 6.6-1.

Measurements at these stations were collected to support the potential discharge of plant blowdown water to a location offshore of the CFBC. Because the current plan is to route the plant discharge water to the CREC, these stations will not be monitored in future phases of the project. A description of the parameters measured and sampling frequency is provided in Table 6.6-1.

6.6.1.5 Crystal River Energy Complex Discharge Canal and the Gulf of Mexico

The LNP will discharge cooling and plant operation water to the Gulf of Mexico. This discharge will be routed from the LNP site to the CREC discharge canal and ultimately to the Gulf of Mexico. Review of historical monitoring data indicates that, with the exception of most recent impingement data collected at the intake screens and data collected from a recent study of sea grasses in and adjacent to the existing discharge canal, the most relevant water quality data for the discharge canal date from the mid-1980s. Therefore, additional sampling data will be required to establish background water quality conditions within the CREC discharge canal.

PEF proposes to collect thermal, water quality, and total depth data at four locations. CREC Station 1 will be located in the concrete channel that collects blowdown from the existing coal plant units before it is released to the CREC discharge canal. Three additional stations, CREC Station 2 (located near the proposed liquid release point), CREC Station 3, and CREC Station 4, are proposed for monitoring in the CREC discharge canal and Gulf of Mexico (Figure 6.1-3). Water quality samples will be collected quarterly at these locations. Field measurements will be taken at the surface and at 1-m (3.3-ft.) depth intervals to the bottom of the water body using a YSI® Multiprobe or Multiparameter Instrument (or equivalent meter). Grab samples will be collected and submitted to a certified laboratory for detailed analytical analysis of the parameters specified.

A description of the parameters and frequency at which they will be sampled is provided in Table 6.6-1.

6.6.1.6 Groundwater

The preapplication chemical monitoring program was implemented to define background groundwater quality conditions near LNP 1 and LNP 2. Selected monitoring wells (MW-13S, MW-14D, MW-15S, and MW-16D) screened within the surficial and bedrock aquifers were sampled during March 2007, June 2007, September 2007, and December 2007 in the immediate vicinity of LNP 1 and LNP 2. Monitoring well identifications with an "S" have screened intervals in the surficial aquifer at about 30 to 40 ft. bgs and monitoring well identifications with a "D" have screened intervals in the Upper Floridan aquifer at about 120 to 160 ft. bgs. Quarterly groundwater monitoring was performed to evaluate seasonal variations in water quality prior to construction and operation of the LNP.

Groundwater sampling methods followed standard purging and sampling protocols, such as those listed in the "Project Instructions for Field Activities Related to Well Installation, Aquifer testing and Groundwater Sampling at the PEF COL Site" and the "Environmental Investigations Standard Operating Procedures and Quality Assurance Manual" (Reference 6.6-003). Temperature, dissolved oxygen, pH, conductivity, salinity, oxidation reduction potential, and turbidity were measured during sampling activities using a YSI® Multiprobe or Multiparameter Instrument (or equivalent meter) equipped with a flow-through cell.

Tables 6.6-2, 6.6-3, and 6.6-4 summarize the analytical parameters included in the groundwater chemical monitoring program. Analytical methods followed the analytical laboratory's QA/QC program and included standard and analytical protocols, such as those listed in the "Standard Methods for the Examination of Water and Wastewater" (Reference 6.6-001) or "Methods for Chemical Analysis of Water and Wastes" (Reference 6.6-002). Samples were preserved in the field, as specified by the analytical method. Field and laboratory QA/QC samples were also collected at a frequency of 10 percent. The samples were tracked using chain-of-custody protocols. The data collected during the preapplication monitoring program are described in more detail in ER Subsection 2.3.3.2.

The existing chemical database is sufficient to support the description of the groundwater system characteristics associated with the safety-related structures for the LNP, as described in ER Subsection 2.3.3.2.

6.6.2 CONSTRUCTION AND PREOPERATIONAL CHEMICAL MONITORING

The chemical monitoring of surface water and groundwater will be conducted to provide data necessary to evaluate potential changes in water quality that might result from construction and operation of the LNP. The objective of the construction and preoperational monitoring is to characterize the water quality at

the site and to provide a baseline for the identification and measurement of water quality changes from operation of the LNP.

Surface water monitoring will continue at most locations established during the preapplication chemical monitoring program. Construction monitoring will begin approximately 1 year before site preparation and end when construction is complete. Preoperational monitoring will begin 1 year prior to plant operation to establish a refined baseline for water quality at the LNP site.

The frequency of surface water chemical monitoring will be modified to quarterly events beginning approximately 1 year before operation to establish a refined baseline for water quality at the LNP site. Groundwater monitoring at the preapplication chemical monitoring program locations will be sampled quarterly. In addition, the need for modifications to the monitoring program will be assessed regularly over the duration of the construction and preoperational chemical monitoring program.

Additional locations and more frequent measurements may be incorporated into the construction and preoperational chemical monitoring program as the engineering design progresses; although, the exact locations (for example, some locations may be monitored remotely) and procedures may be modified.

Tables 6.6-1, 6.6-2, 6.6-3, and 6.6-4 summarize the parameters measured and the frequency at which they are collected. The Construction and preoperational chemical monitoring program for surface water and groundwater are described below.

6.6.2.1 Freshwater Streams

There are no freshwater streams on the LNP site (Figure 6.0-1); therefore, no chemical monitoring will be performed.

6.6.2.2 Lakes and Impoundments

Monitoring of water chemistry at location SS-2 (Figure 6.1-1) within Lake Rousseau will be discontinued because the lake is hydrologically disconnected from the LNP site and will not be used for water supply.

6.6.2.3 Cross Florida Barge Canal

The construction and preoperational monitoring of the CFBC at monitoring locations Station 1, Station 2, and Station 3 will be an extension of the preapplication monitoring until LNP 1 and LNP2 are operational. During this period, the frequency of chemical monitoring will be quarterly beginning approximately 1 year before site preparation activities to establish a baseline for water quality.

Temporary monitoring locations will also need to be established to evaluate impacts from construction activities. Field parameter measurements at temporary

locations near construction of the proposed intake structure will be collected weekly until construction activities are complete.

The need for changes to the monitoring program (for example, changes in monitoring stations, parameters, collection, or analytical procedures) will be assessed regularly over the duration of the construction and preoperational chemical monitoring program. The chemical parameters and sampling frequency are listed in Table 6.6-1.

6.6.2.4 Cross Florida Barge Canal within the Gulf of Mexico

Because the current plan is to route the plant discharge water to the CREC, the construction and preoperational monitoring at Station 4, Station 5, Station 6, and Station 7 will be discontinued.

6.6.2.5 Crystal River Energy Complex Discharge Canal and the Gulf of Mexico

The construction and preoperational monitoring of the CREC discharge canal at monitoring locations CREC Station 1, CREC Station 2, CREC Station 3, and CREC Station 4 will be an extension of the preapplication monitoring until LNP 1 and LNP 2 are operational. During this period, the frequency of chemical monitoring will be quarterly beginning approximately 1 year before site preparation activities to establish a baseline for water quality. The need for changes to the monitoring program (for example, changes in monitoring stations, parameters, collection, or analytical procedures) will be assessed regularly over the duration of the construction and preoperational chemical monitoring program. A description of the water quality analytical parameters and sampling frequency is provided in Table 6.6-1.

6.6.2.6 Groundwater

The chemical monitoring of groundwater will be conducted to provide data necessary to assess water quality changes that could result from the construction dewatering and operation of the LNP. The objective of construction and preoperational monitoring is to characterize the quality of groundwater at the site and provide a basis from which to identify changes in groundwater quality from the facility operation.

The chemical groundwater monitoring efforts can be grouped by functional intent as follows: reactor area monitoring to establish background conditions and document changes in the immediate vicinity of the reactors, sentinel well monitoring to establish background conditions and document changes upgradient and downgradient of the reactor units, and raw water withdrawal sentinel wells to establish background conditions and document changes due to pumping of raw water from groundwater aquifers. Chemical monitoring details for each function are presented in Tables 6.6-2, 6.6-3, and 6.6-4, respectively.

Preapplication monitoring wells MW-5S, MW-7S, MW-9S, MW-11S, MW-13S, MW-15S, MW-6D, MW-8D, MW-10D, MW-12D, MW-14D, and MW-16D are assumed to be located within the proposed construction area for the LNP, and therefore, will have to be abandoned in accordance with FDEP regulatory guidelines prior to construction activities. Chemical measurements will be collected quarterly within monitoring wells MW-1S, MW-2S, MW-3S, and MW-4S throughout the construction and preoperational phases of the project as they are located on the periphery of the property and will not interfere with construction activities. A total of 43 new monitoring wells are proposed for installation immediately following construction activities and prior to plant operation. Screened interval depths will be consistent with monitoring well identifications "S" and "D" as indicated in ER Subsection 6.6.1.6. These wells include:

- Nine nested monitoring well pairs (18 total wells) installed adjacent to the reactor buildings (LNP 1 and LNP 2). Nested monitoring well pairs will be labeled MW-26S and MW-26D, MW-27S and MW-27D, MW-28S and MW-28D, MW-29S and MW-29D, MW-30S and MW-30D, MW-31S and MW-31D, MW-32S and MW-32D, MW-33S and MW-33D, and MW-34S and MW-34D as shown on Figure 6.1-4.

- Three nested monitoring well pairs (6 total wells) installed midway between the meteorological tower and reactors. These wells will serve to monitor changes in water chemistry downgradient of the reactors within the exclusion area boundary of the site. Nested monitoring well pairs will be labeled MW-23S and MW-23D, MW-24S and MW-24D, and MW-25S and MW-25D as shown on Figure 6.1-4.

- Six nested monitoring well pairs (12 total wells) installed a distance of about 3600 ft. W, S, and E of the center location between the reactor buildings. The wells will monitor hydrologic conditions beyond the exclusion area boundary. Nested monitoring well pairs will be labeled MW-17S and MW-17D, MW-18S and MW-18D, MW-19S and MW-19D, MW-20S and MW-20D, MW-21S and MW-21D, and MW-22S and MW-22D as shown on Figure 6.1-4.

- Three deep sentinel monitoring wells installed in the Floridan aquifer to monitor potential changes in water quality caused by the extraction of potable water from LNP 1 and LNP 2 water wells. These wells will be labeled MW-1WW, MW-2WW, MW-3WW and their locations are illustrated on Figure 6.1-4. Locations of the proposed raw water wells and associated monitoring wells are subject to change as the engineering design progresses.

  Groundwater will be used as a potable water source for the LNP and the following processes: service water tower evaporation, service water tower drift, raw water supply, raw water to the demineralizer, fire protection, service water strainer backwash, and media filter backwash. Possible effects caused by continuous groundwater extraction include

saltwater intrusion and decreases in water levels within the surficial and Floridan aquifers. The deep sentinel monitoring wells will be screened at approximately 100 to 200 ft. below the total depth of the proposed raw water wells.

In addition to the new well pairs, deep wells (120 to 160 ft. bgs) will be installed adjacent to existing shallow wells MW-1S, MW-2S, MW-3S, and MW-4S to augment the peripheral monitoring network and provide deep well control along the northern, southern, and eastern edges of the property. These wells will be labeled MW-1D, MW-2D, MW-3D, and MW-4D as shown on Figure 6.1-4. The new monitoring well locations were selected using the following rationale:

- Provide background data upgradient of the LNP 1 and LNP 2.
- Provide background data at locations encircling and in proximity to the LNP 1 and LNP 2.
- Provide background data at locations downgradient of the LNP 1 and LNP 2 to monitor potential releases from the units or associated operations.
- Provide background data at the perimeter of the site to monitor potential changes resulting from facility operation.
- Monitor changes in water level and salinity due to raw water pumping from the Floridan aquifer.

Water chemistry at the 43 groundwater wells will be monitored quarterly during the construction and preoperational phase of the project as summarized Tables 6.6-2, 6.6-3, and 6.6-4.

6.6.3 OPERATIONAL CHEMICAL MONITORING

An operational chemical monitoring program will be implemented to identify changes in water quality that could result from the operation of LNP 1 and LNP 2.

The operational chemical monitoring program will be designed to document effects from the operation of the LNP and detect any unexpected effects that arise from facility operation. The operational chemical monitoring program is anticipated to extend preoperational monitoring for the duration of LNP operation. Modifications to the monitoring program (for example, changes in monitoring stations or collection procedures) will be assessed regularly over the duration of the operational hydrological monitoring program.

Adjustments to the program will be made after discussions with FDEP and take into consideration any NPDES permit requirements. If water quality trends for specific parameters demonstrate no significant changes throughout the

monitoring project, analysis of those parameters will be reduced or deleted from the monitoring program, as necessary.

6.6.3.1 Freshwater Streams

There are no freshwater streams on the LNP site (Figure 6.0-1); therefore, no chemical monitoring will be performed.

6.6.3.2 Lakes and Impoundments

No monitoring within Lake Rousseau will be performed during LNP operation because the lake is hydrologically disconnected from the LNP site and will not be used for water supply (Figure 5.2-4).

6.6.3.3 Cross Florida Barge Canal

The specific procedures of the operational monitoring requirements for the CFBC are anticipated to be similar to the preoperational chemical monitoring program. The program may be modified in response to data collected and consultations with the FDEP. The data will be evaluated to monitor for changes resulting from the withdrawal of makeup water from the CFBC. The frequency of chemical monitoring will be monthly for 2 years, bimonthly for the next 3 years, and quarterly thereafter.

6.6.3.4 Crystal River Energy Complex Discharge Canal and the Gulf of Mexico

The specific procedures of the operational monitoring requirements for the CREC are anticipated to be similar to the preoperational chemical monitoring program. The program may be modified in response to data collected and consultations with the FDEP. The data will be evaluated to monitor for changes resulting from the discharge of blowdown to the CREC discharge canal. The frequency of chemical monitoring will be monthly for 2 years, bimonthly for the next 3 years, and quarterly thereafter.

6.6.3.5 Groundwater

The objective of the groundwater operational chemical monitoring program is to identify any changes in water quality that could result from the operation of the LNP. The operational chemical monitoring program is anticipated to be an extension of the construction and preoperational chemical monitoring program. Thus, chemical changes that result from facility operations can be evaluated.

The frequency of groundwater chemical monitoring will be monthly for 1 year after plant operation begins and quarterly thereafter. The need for changes to the monitoring program (for example, changes in monitoring stations, parameters, collection, or analytical procedures) will be assessed regularly over the duration of the construction and preoperational chemical monitoring program.

The operational monitoring program will be designed and approved after consultation with the appropriate resource agencies to ensure any operational effects are addressed and that the program provides statistically valid and defensible data in accordance with PEF's QA/QC program.

6.6.4 REFERENCES

6.6-001 Water Environment Federation, "Standard Methods for the Examination of Water and Wastewater," 21st edition, 2005.

6.6-002 U.S. Environmental Protection Agency, "Methods for Chemical Analysis of Water and Wastes," EPA/600/4-79/020, March 1983.

6.6-003 U.S. Environmental Protection Agency, "Environmental Investigations Standard Operating Procedures and Quality Assurance Manual," November 2001.

Table 6.6-1 (Sheet 1 of 3)
Summary of Proposed Surface Water Chemical Monitoring Program for the LNP

Description	Preapplication	Construction	Preoperation	Operational
Objective of Sampling Program	Establish background surface water quality in the CFBC, CREC discharge canal, and Lake Rousseau before site preparation and construction activities.	Document surface water quality changes during site preparation and construction activities.	Establish baseline and document surface water quality changes during before facility operation.	Document surface water quality changes during operation.
Stations	*CFBC*: Station 1, Station 2, Station 3, Station 4, Station 5, Station 6, Station 7, SS-1 *CREC*: CREC Station 1, CREC Station 2, CREC Station 3, CREC Station 4 *Lake Rousseau*: SS-2 (See Figures 6.1-1 and 6.1-3)	*CFBC*: Station 1, Station 2, Station 3 *CREC*: CREC Station 1, CREC Station 2, CREC Station 3, CREC Station 4 Temporary locations near construction activities as needed (field parameters only) (See Figures 6.1-1 and 6.1-3)	*CFBC*: Station 1, Station 2, Station 3 *CREC*: CREC Station 1, CREC Station 2, CREC Station 3, CREC Station 4 (See Figures 6.1-1 and 6.1-3)	*CFBC*: Station 1, Station 2, Station 3 *CREC*: CREC Station 1, CREC Station 2, CREC Station 3, CREC Station 4 (See Figures 6.1-1 and 6.1-3)
Frequency	*Quarterly*: SS-1, SS-2, CREC Station 1 [(a)], CREC Station 2 [(a)], CREC Station 3 [(a)], CREC Station 4 [(a)] *October, November, December 2007*: Station 1 [(b)], Station 2 [(b)], Station 3 [(b)], Station 4 [(b)], Station 5 [(b)], Station 6 [(b)], Station 7 [(b)]	*Quarterly* beginning approximately 1 year before site preparation. *Weekly* at temporary locations near construction activities (field parameters only). (Increase frequency if notable changes occur.)	*Quarterly* beginning approximately 1 year before plant operation.	*Monthly* (for 2 years), *bimonthly* (for 3 years), and *quarterly* thereafter. (Increase frequency if notable changes occur.)

Table 6.6-1 (Sheet 2 of 3)
Summary of Proposed Surface Water Chemical Monitoring Program for the LNP

Description	Preapplication	Construction	Preoperation	Operation
Field Parameters	Water temperature Dissolved oxygen pH Salinity Conductivity Turbidity Water clarity Depth-to-bottom	Water temperature Dissolved oxygen pH Salinity Conductivity Turbidity Water clarity Depth-to-bottom	Water temperature Dissolved oxygen pH Salinity Conductivity Turbidity Water clarity Depth-to-bottom	Water temperature Dissolved oxygen pH Salinity Conductivity Turbidity Water clarity Depth-to-bottom
Collection Points for Field Parameters	0.5 m (1.6 ft.) below surface for all surface water samples. For CFBC and CREC monitoring stations, also measure at 1-m (3.3-ft.) depth intervals to the bottom.	0.5 m (1.6 ft.) below surface and 1-m (3.3-ft.) depth intervals to the bottom.	0.5 m (1.6 ft.) below surface and 1-m (3.3-ft.) depth intervals to the bottom.	0.5 m (1.6 ft.) below surface and 1-m (3.3-ft.) depth intervals to the bottom.
Water Quality Parameters	**General Water Chemistry** Alkalinity, total (as $CaCO_3$) Ammonia-N Chloride Hardness (as $CaCO_3$) Nitrate + Nitrite-N TKN Orthophosphate Phosphorous, total Sulfate Sulfide Total dissolved solids Total organic carbon Total suspended solids	**General Water Chemistry** Alkalinity, total (as $CaCO_3$) Ammonia-N Chloride Hardness (as $CaCO_3$) Nitrate + Nitrite-N TKN Orthophosphate Phosphorous, total Sulfate Sulfide Total dissolved solids Total organic carbon Total suspended solids	**General Water Chemistry** Alkalinity, total (as $CaCO_3$) Ammonia-N Chloride Hardness (as $CaCO_3$) Nitrate + Nitrite-N TKN Orthophosphate Phosphorous, total Sulfate Sulfide Total dissolved solids Total organic carbon Total suspended solids	**General Water Chemistry** Alkalinity, total (as $CaCO_3$) Ammonia-N Chloride Hardness (as $CaCO_3$) Nitrate + Nitrite-N TKN Orthophosphate Phosphorous, total Sulfate Sulfide Total dissolved solids Total organic carbon Total suspended solids
	Biological Chlorophyll *a* Biological Oxygen Demand Chemical Oxygen Demand	**Biological** Chlorophyll *a* Biological Oxygen Demand Chemical Oxygen Demand	**Biological** Chlorophyll *a* Biological Oxygen Demand Chemical Oxygen Demand	**Biological** Chlorophyll *a* Biological Oxygen Demand Chemical Oxygen Demand

Table 6.6-1 (Sheet 3 of 3)
Summary of Proposed Surface Water Chemical Monitoring Program for the LNP

Description	Preapplication	Construction	Preoperation	Operation
Water Quality Parameters (continued)	**Metals** Arsenic Boron Calcium Chromium Copper Iron Lead Magnesium Manganese Mercury Nickel Potassium Sodium Zinc	**Metals** Arsenic Boron Calcium Chromium Copper Iron Lead Magnesium Manganese Mercury Nickel Potassium Sodium Zinc	**Metals** Arsenic Boron Calcium Chromium Copper Iron Lead Magnesium Manganese Mercury Nickel Potassium Sodium Zinc	**Metals** Arsenic Boron Calcium Chromium Copper Iron Lead Magnesium Manganese Mercury Nickel Potassium Sodium Zinc
Collection Points for Water Quality Parameters	0.5 m (1.6 ft.) below surface for all surface water samples.	0.5 m (1.6 ft.) below surface for all surface water samples.	0.5 m (1.6 ft.) below surface for all surface water samples.	0.5 m (1.6 ft.) below surface for all surface water samples.
Data Analysis	Statistical trend	Statistical trend	Statistical trend	Statistical trend

Notes:

a) Monitoring had not begun as of January 2008

b) Limited water quality parameters as indicated in ER Subsection 2.3.3 were collected from CFBC sampling locations: Station 1, Station 2, Station 3, Station 4, Station 5, Station 6, and Station 7.

$CaCO_3$ = calcium carbonate
ft. = foot
m = meter
TKN = total Kjeldahl nitrogen

Table 6.6-2 (Sheet 1 of 3)
Summary of Proposed Reactor Area Chemical Groundwater Monitoring Program for the LNP

Description	Preapplication	Construction	Preoperation	Operation
Objective of Sampling Program	Establish background water quality in groundwater at the proposed LNP reactor sites before site preparation and construction activities.	None	Establish baseline water quality in groundwater at reactor area locations before facility operation.	Document water quality in groundwater and identify changes during operation.
Stations	MW-13S, MW-14D, MW-15S, MW-16D (See Figure 6.1-3)	None	MW-26S, MW-26D, MW-27S, MW-27D, MW-28S, MW-28D, MW-29S, MW-29D, MW-30S, MW-30D, MW-31S, MW-31D, MW-32S, MW-32D, MW-33S, MW-33D, MW-34S, MW-34D (See Figure 6.1-4)	MW-26S, MW-26D, MW-27S, MW-27D, MW-28S, MW-28D, MW-29S, MW-29D, MW-30S, MW-30D, MW-31S, MW-31D, MW-32S, MW-32D, MW-33S, MW-33D, MW-34S, MW-34D (See Figure 6.1-4)
Frequency	*Quarterly*	N/A	*Quarterly* beginning approximately 1 year before plant operation	*Monthly* for first year of operation, *quarterly* thereafter
Field Parameters	Groundwater level Total well depth Water temperature Dissolved oxygen pH Salinity Conductivity Turbidity Oxidation reduction potential	None	Groundwater water level Total well depth Water temperature Dissolved oxygen pH Salinity Conductivity Turbidity Oxidation reduction potential	Groundwater water level Total well depth Water temperature Dissolved oxygen pH Salinity Conductivity Turbidity Oxidation reduction potential
Collection of Field Parameters	With a flow-through cell after purging activities.	N/A	With a flow-through cell after purging activities.	With a flow-through cell after purging activities.

Table 6.6-2 (Sheet 2 of 3)
Summary of Proposed Reactor Area Chemical Groundwater Monitoring Program for the LNP

Description	Preapplication	Construction	Preoperation	Operation
Water Quality Parameters	**General Water Chemistry**	None	**General Water Chemistry**	**General Water Chemistry**
	Alkalinity, total (as $CaCO_3$)		Alkalinity, total (as $CaCO_3$)	Alkalinity, total (as $CaCO_3$)
	Alkalinity, bicarbonate (as $CaCO_3$)		Alkalinity, bicarbonate (as $CaCO_3$)	Alkalinity, bicarbonate (as $CaCO_3$)
	Ammonia-N		Ammonia-N	Ammonia-N
	Carbon Dioxide		Carbon Dioxide	Carbon Dioxide
	Chloride		Chloride	Chloride
	Hardness (as $CaCO_3$)		Hardness (as $CaCO_3$)	Hardness (as $CaCO_3$)
	Nitrate + Nitrite-N		Nitrate + Nitrite-N	Nitrate + Nitrite-N
	TKN		TKN	TKN
	Orthophosphate		Orthophosphate	Orthophosphate
	Phosphorous, total		Phosphorous, total	Phosphorous, total
	Sulfate		Sulfate	Sulfate
	Sulfide		Sulfide	Sulfide
	Total dissolved solids		Total dissolved solids	Total dissolved solids
	Total organic carbon		Total organic carbon	Total organic carbon
	Total suspended solids		Total suspended solids	Total suspended solids
	Biological		**Biological**	**Biological**
	Biological Oxygen Demand		Biological Oxygen Demand	Biological Oxygen Demand
	Chemical Oxygen Demand		Chemical Oxygen Demand	Chemical Oxygen Demand
	Metals		**Metals**	**Metals**
	Arsenic		Arsenic	Arsenic
	Boron		Boron	Boron
	Calcium		Calcium	Calcium
	Chromium		Chromium	Chromium
	Copper		Copper	Copper
	Iron		Iron	Iron
	Lead		Lead	Lead
	Magnesium		Magnesium	Magnesium
	Manganese		Manganese	Manganese
	Mercury		Mercury	Mercury
	Nickel		Nickel	Nickel
	Potassium		Potassium	Potassium
	Silica		Silica	Silica
	Sodium		Sodium	Sodium
	Zinc		Zinc	Zinc

Table 6.6-2 (Sheet 3 of 3)
Summary of Proposed Reactor Area Chemical Groundwater Monitoring Program for the LNP

Description	Preapplication	Construction	Preoperation	Operation
Sample Collection for Water Quality Parameters	Purged groundwater within screened interval of well.	N/A	Purged groundwater within screened interval of well.	Purged groundwater within screened interval of well.
Data Analysis	Statistical trend	N/A	Statistical trend	Statistical trend

Notes:

D = deep (bedrock aquifer)
N/A = not applicable
S = shallow (surficial aquifer)
TKN = total Kjeldahl nitrogen

Table 6.6-3 (Sheet 1 of 3)
Summary of Proposed Sentinel Well Chemical Groundwater Monitoring Program for the LNP

Description	Preapplication	Construction	Preoperation	Operation
Objective of Sampling Program	None	Document groundwater chemistry changes during site preparation and construction activities.	Document groundwater chemistry at reactor area locations.	Document groundwater chemistry and identify changes during operation.
Stations	None	MW-1S, MW-2S, MW-3S, MW-4S (See Figure 6.1-2)	MW-1S, MW-1D, MW-2S, MW-2D, MW-3S, MW-3D, MW-4S, MW-4D, MW-17S, MW-17D, MW-18S, MW-18D, MW-19S, MW-19D, MW-20S, MW-20D, MW-21S, MW-21D, MW-22S, MW-22D, MW-23S, MW-23D, MW-24S, MW-24D, MW-25S, MW-25D (See Figure 6.1-4)	MW-1S, MW-1D, MW-2S, MW-2D, MW-3S, MW-3D, MW-4S, MW-4D, MW-17S, MW-17D, MW-18S, MW-18D, MW-19S, MW-19D, MW-20S, MW-20D, MW-21S, MW-21D, MW-22S, MW-22D, MW-23S, MW-23D, MW-24S, MW-24D, MW-25S, MW-25D (See Figure 6.1-4)
Frequency	N/A	*Quarterly* beginning approximately 1 year before site preparation	*Quarterly* beginning approximately 1 year before plant operation	*Monthly* for first year of operation, *quarterly* thereafter
Field Parameters	None	Groundwater water level Total well depth Water temperature Dissolved oxygen pH Salinity Conductivity Turbidity Oxidation reduction potential	Groundwater water level Total well depth Water temperature Dissolved oxygen pH Salinity Conductivity Turbidity Oxidation reduction potential	Groundwater water level Total well depth Water temperature Dissolved oxygen pH Salinity Conductivity Turbidity Oxidation reduction potential
Collection of Field Parameters	N/A	With a flow-through cell after purging activities.	With a flow-through cell after purging activities.	With a flow-through cell after purging activities.

Table 6.6-3 (Sheet 2 of 3)
Summary of Proposed Sentinel Well Chemical Groundwater Monitoring Program for the LNP

Description	Preapplication	Construction	Preoperation	Operation
Water Quality Parameters	None	**General Water Chemistry** Alkalinity, total (as $CaCO_3$) Alkalinity, bicarbonate (as $CaCO_3$) Ammonia-N Carbon Dioxide Chloride Hardness (as $CaCO_3$) Nitrate + Nitrite-N TKN Orthophosphate Phosphorous, total Sulfate Sulfide Total dissolved solids Total organic carbon Total suspended solids **Biological** Biological Oxygen Demand Chemical Oxygen Demand **Metals** Arsenic Boron Calcium Chromium Copper Iron Lead Magnesium Manganese Mercury Nickel Potassium Silica Sodium Zinc	**General Water Chemistry** Alkalinity, total (as $CaCO_3$) Alkalinity, bicarbonate (as $CaCO_3$) Ammonia-N Carbon Dioxide Chloride Hardness (as $CaCO_3$) Nitrate + Nitrite-N TKN Orthophosphate Phosphorous, total Sulfate Sulfide Total dissolved solids Total organic carbon Total suspended solids **Biological** Biological Oxygen Demand Chemical Oxygen Demand **Metals** Arsenic Boron Calcium Chromium Copper Iron Lead Magnesium Manganese Mercury Nickel Potassium Silica Sodium Zinc	**General Water Chemistry** Alkalinity, total (as $CaCO_3$) Alkalinity, bicarbonate (as $CaCO_3$) Ammonia-N Carbon Dioxide Chloride Hardness (as $CaCO_3$) Nitrate + Nitrite-N TKN Orthophosphate Phosphorous, total Sulfate Sulfide Total dissolved solids Total organic carbon Total suspended solids **Biological** Biological Oxygen Demand Chemical Oxygen Demand **Metals** Arsenic Boron Calcium Chromium Copper Iron Lead Magnesium Manganese Mercury Nickel Potassium Silica Sodium Zinc

Table 6.6-3 (Sheet 3 of 3)
Summary of Proposed Sentinel Well Chemical Groundwater Monitoring Program for the LNP

Description	Preapplication	Construction	Preoperation	Operation
Sample Collection for Water Quality Parameters	N/A	With a flow-through cell after purging activities.	With a flow-through cell after purging activities.	With a flow-through cell after purging activities.
Data Analysis	N/A	Statistical trend	Statistical trend	Statistical trend

Notes:

D = deep (bedrock aquifer)
N/A = not applicable
S = shallow (surficial aquifer)

Table 6.6-4 (Sheet 1 of 3)
Summary of Raw Water Withdrawal Sentinel Well Chemical Groundwater Monitoring Program for the LNP

Description	Preapplication	Construction	Preoperation	Operation
Objective of Sampling Program	None	None	Document groundwater chemistry downgradient of raw water withdrawal wells.	Document groundwater chemistry and identify changes downgradient of raw water withdrawal wells during operation.
Stations	None	None	MW-1WW, MW-2WW, MW-3WW (See Figure 6.1-4)	MW-1WW, MW-2WW, MW-3WW (See Figure 6.1-4)
Frequency	N/A	N/A	*Daily*: Salinity *Quarterly*: Sampling for water quality parameters beginning approximately 1 year before facility operation	*Daily*: Salinity *Quarterly*: Sampling for water quality parameters
Field Parameters	None	None	Groundwater water level Total Depth Water temperature Dissolved oxygen pH Salinity Conductivity Turbidity Oxidation reduction potential	Groundwater water level Total Depth Water temperature Dissolved oxygen pH Salinity Conductivity Turbidity Oxidation reduction potential
Collection of Field Parameters	N/A	N/A	*Daily*: Automated downhole test equipment *Quarterly*: With a flow-through cell after purging activities.	*Daily*: Automated downhole test equipment *Quarterly*: With a flow-through cell after purging activities.
Data Analysis	N/A	N/A	Statistical trend	Statistical trend

Table 6.6-4 (Sheet 2 of 3)
Summary of Raw Water Withdrawal Sentinel Well Chemical Groundwater Monitoring Program for the LNP

Description	Preapplication	Construction	Preoperation	Operation
Water Quality Parameters	None	None	**General Water Chemistry** Alkalinity, total (as $CaCO_3$) Alkalinity, bicarbonate (as $CaCO_3$) Ammonia-N Carbon Dioxide Chloride Hardness (as $CaCO_3$) Nitrate + Nitrite-N TKN Orthophosphate Phosphorous, total Sulfate Sulfide Total dissolved solids Total organic carbon Total suspended solids **Biological** Biological Oxygen Demand Chemical Oxygen Demand **Metals** Arsenic Boron Calcium Chromium Copper Iron Lead Magnesium Manganese Mercury Nickel Potassium Silica Sodium Zinc	**General Water Chemistry** Alkalinity, total (as $CaCO_3$) Alkalinity, bicarbonate (as $CaCO_3$) Ammonia-N Carbon Dioxide Chloride Hardness (as $CaCO_3$) Nitrate + Nitrite-N TKN Orthophosphate Phosphorous, total Sulfate Sulfide Total dissolved solids Total organic carbon Total suspended solids **Biological** Biological Oxygen Demand Chemical Oxygen Demand **Metals** Arsenic Boron Calcium Chromium Copper Iron Lead Magnesium Manganese Mercury Nickel Potassium Silica Sodium Zinc

Table 6.6-4 (Sheet 3 of 3)
Summary of Raw Water Withdrawal Sentinel Well Chemical Groundwater Monitoring Program for the LNP

Description	Preapplication	Construction	Preoperation	Operation
Sample Collection for Water Quality Parameters	N/A	N/A	With a flow-through cell after purging activities.	With a flow-through cell after purging activities.
Data Analysis	N/A	N/A	Statistical trend	Statistical trend

Notes:

N/A = not applicable
WW = raw water withdrawal

6.7 SUMMARY OF MONITORING PROGRAMS

This section summarizes the individual environmental monitoring programs for thermal monitoring, radiological monitoring, hydrological monitoring, meteorological monitoring, ecological monitoring including terrestrial and aquatic communities, and chemical monitoring for LNP 1 and LNP 2. As appropriate, the summary covers: (1) preapplication monitoring (2) project construction monitoring, (3) preoperational monitoring, and (4) operational monitoring.

6.7.1 THERMAL MONITORING

6.7.1.1 Preapplication Thermal Monitoring

This phase of the monitoring is designed to establish background conditions and support the thermal descriptions that are presented in ER Subsection 2.3.3. The LNP preapplication thermal monitoring program was performed to establish background water temperatures in groundwater, the CFBC, the Gulf of Mexico, and the CREC discharge canal near the proposed discharge site before development and operation of the LNP. There are no freshwater streams, lakes, or impoundments on the LNP site. In addition, no lakes or impoundments considered to be waters of the State will be used or affected by the construction or operation of the LNP. ER Section 6.1 contains detailed sampling program information.

6.7.1.2 Construction and Preoperational Thermal Monitoring

The construction and preoperational thermal monitoring program is designed to continue preapplication thermal monitoring activities during the development stages (site preparation and construction) of the LNP until they are operational. Surface water monitoring will continue at most locations and frequencies of the preapplication thermal monitoring program. Construction monitoring will begin approximately 1 year before site preparation and end when construction is complete. Preoperational monitoring will begin 1 year prior to plant operation to establish a refined baseline for water temperature at the LNP site. Specific monitoring may be required as part of the NPDES permit process. In addition, the need for modifications to the monitoring program will be assessed regularly and over the duration of the construction and preoperational thermal monitoring program. Thermal groundwater monitoring efforts can be grouped by functional intent as follows: reactor-area monitoring to establish background conditions and document changes in the immediate vicinity of the reactors, sentinel well monitoring to establish background conditions and document changes upgradient and downgradient of the reactor units, and raw water withdrawal sentinel wells to establish background conditions and document changes in temperature and salinity due to pumping of raw water from groundwater aquifers. Thermal monitoring details for each phase are presented in Tables 6.1-4, 6.1-5, and 6.1-6, respectively. Additional locations and more frequent measurements may be incorporated into the construction and preoperational thermal monitoring program as the project progresses.

6.7.1.3 Operational Thermal Monitoring

The operational thermal monitoring program will be implemented to document water temperature and identify any changes resulting from operation of the LNP. The specific operational monitoring requirements will be developed in consultation with the FDEP relative to NPDES permit requirements and monitoring requirements for the LNP. Although the specific procedures of the operational thermal monitoring program have not been finalized, it is anticipated that the monitoring stations will be the same as those used during the construction and preoperational thermal monitoring programs (see ER Subsection 6.1.2). Tables 6.1-1 and 6.1-2 list the surface water and groundwater monitoring stations and project phase during which each will be monitored. Tables 6.1-3, 6.1-4, 6.1-5, and 6.1-6 summarize the parameters measured and the frequency at which they are collected. Figures 6.1-1 and 6.1-3 show the surface water monitoring locations. Figure 6.1-2 shows the proposed preoperational and operation phase monitoring well locations. Data will be evaluated for temperature variability, as well as temporal trends. Modifications to the operational thermal monitoring program (for example, changes in monitoring stations and collection procedures) will be assessed regularly and over the duration of the monitoring program.

6.7.2 RADIOLOGICAL MONITORING

The REMP will be implemented in accordance with 10 CFR 20.1501 and Criterion 64 of 10 CFR 50, Appendix A. The program will be developed using the following guidance published by the NRC:

- Regulatory Guide 4.1, Revision 1, “Programs for Monitoring Radioactivity in the Environs of Nuclear Power Plants.”
- Regulatory Guide 4.13, Revision 1, “Performance, Testing, and Procedural Specifications for Thermoluminescence Dosimetry; Environmental Applications.”
- Regulatory Guide 4.15, Revision 1, “Quality Assurance for Radiological Monitoring Programs (Normal Operations) – Effluent Streams and the Environment.”
- Regulatory Guide 1.109, Revision 1, “Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR 50, Appendix I.”

Figure 6.2-1 presents the basic pathways for gaseous and liquid radioactive effluent releases to the public. The “important pathways” selected are based primarily on how radionuclides move through the environment and how they could eventually expose the public, taking into consideration people’s use of the environment. The scope of the program will include monitoring the media identified in Table 6.2-2. The REMP will monitor the environment by sampling air, water, sediment, fish and food products, as well as measuring radiation directly.

Milk samples are also monitored, if milk-producing animals are present within 8 km (5 mi.) of the plant.

6.7.2.1 Preoperational Radiological Environmental Monitoring

The preoperational REMP will be used to establish the baseline for the local radiation environment. The preoperational REMP will measure background levels and their variations along the anticipated critical pathways in the area surrounding the LNP, train personnel, and evaluate procedures, equipment, and techniques. However, because the LNP will be sited near CR-3, the preoperational and operational phases of the REMP were developed from baseline data already established for the CR-3. The preoperational monitoring program, which will be implemented 2 years before commercial operation, will monitor the radiological environment around the LNP. The duration of the preoperational program for specific media is given in Table 6.2-1.

6.7.2.2 Operational Radiological Environmental Monitoring

The operational REMP will include measures to document the effectiveness of procedures and processes that restrict or control releases of radioactive materials to the environment. The elements (sampling media and analysis type) for both the preoperational and operational REMP phases will be essentially the same. To the greatest extent practical, the REMP will use the same sampling locations as the CR-3's existing REMP. New sampling locations will be chosen based on the selected plant design parameters.

6.7.3 HYDROLOGICAL MONITORING

6.7.3.1 Preapplication Hydrological Monitoring

This phase of the monitoring will support the background hydrologic descriptions presented in ER Section 2.3. The objective of the preapplication hydrological monitoring program is to document background conditions for surface water and groundwater before the construction and operation of the LNP. Limited hydrological and hydrogeological information is available for the LNP site. For this reason, preapplication hydrological data were collected to establish the existing conditions at the site. Baseline data collected during this monitoring program were used to determine the following:

- Surface water depth characteristics in the site vicinity.
- Groundwater flow characteristics in the site vicinity (ER Subsection 2.3.1.5 describes the groundwater system at the LNP).
- Effect of sanitary and chemical waste-retention methods on groundwater quality (ER Section 4.2 describes water-related effects and controls associated with construction and subsequent construction and preoperational activities).

- Alteration of sediment transport (ER Section 2.6 describes the soil characteristics at the LNP, and ER Section 4.2 describes water-related effects and controls associated with construction and subsequent construction and preoperational activities).

- Alteration of floodplains or wetlands (ER Section 4.3 describes ecological effects and controls associated with preoperational activities).

6.7.3.2 Construction Hydrological Monitoring

The objective of the construction hydrological monitoring program is to monitor and control potential effects caused by site preparation and construction. Controls for anticipated construction effects are discussed in ER Section 4.2.

6.7.3.2.1 Surface Water

Monitoring of hydrology and bathymetry within the CFBC will continue quarterly at preapplication monitoring locations Station 1, Station 2, and Station 3 (Figure 6.1-1) starting approximately 1 year before site preparations begin to establish a refined baseline. Hydrology and bathymetry measurements at temporary locations near construction activities will be collected weekly until those activities are complete. Turbidity measurements will also be taken at these locations as described in ER Section 6.6.

Monitoring within the CREC discharge canal will continue at preapplication monitoring locations (CREC Station 1, CREC Station 2, CREC Station 3, and CREC Station 4) (Table 6.3-1). Quarterly hydrological monitoring will start approximately 1 year before site preparation begins to establish a refined baseline. Turbidity measurements will also be taken at these locations as described in ER Section 6.6.

6.7.3.2.2 Groundwater

As discussed in ER Section 4.2, the major effect to the groundwater system during construction will be related to the dewatering required for site preparation and the excavation of the LNP site. During dewatering activities associated with the construction of the reactor buildings, temporary monitoring wells will be installed to monitor changes in water table elevation. Hydrological measurements at temporary monitoring wells near construction activities will be collected weekly until those activities are complete.

Preapplication monitoring wells MW-5S, MW-7S, MW-9S, MW-11S, MW-13S, MW-15S, MW-6D, MW-8D, MW-10D, MW-12D, MW-14D, and MW-16D (Figure 6.1-2) are assumed to be located within the proposed construction area for the LNP, and therefore, will have to be abandoned in accordance with FDEP regulatory guidelines prior to construction activities. Hydrological measurements will be collected quarterly in the remaining four monitoring wells (MW-1S, MW-2S, MW-3S, and MW-4S) throughout the construction phase of the project

because they are located on the periphery of the property and will not interfere with construction activities.

6.7.3.3 Preoperational Hydrological Monitoring

The preoperational hydrological monitoring program will be designed to provide the baseline for evaluating hydrologic changes arising from the operation of the LNP. Baseline data collected during this monitoring program will be used to assess the following:

- Alteration of surface water and groundwater levels.
- Alteration of groundwater flow.
- Alteration of sediment transport (ER Section 4.2 describes water-related effects and controls associated with construction and subsequent preoperational activities).
- Alteration of floodplains or wetlands. (ER Section 4.3 describes ecological effects and controls associated with construction and subsequent preoperational activities).

The preoperational hydrological monitoring program will begin approximately 1 year before plant operation to establish a refined baseline. Additional monitoring wells are proposed for installation immediately following construction activities and prior to plant operation. The location and purpose of these wells is described in more detail in ER Subsections 6.1.2.5 and 6.3.3.5.

6.7.3.3.1 Surface Water

There are no freshwater streams on the LNP site (Figure 6.0-1). Site drainage will be maintained through a series of pipes, open ditches, culverts, and storm sewers. Stormwater runoff from the LNP site will be collected and controlled by a stormwater drainage system. After site grading, a series of stormwater drainage ditches will be constructed within the plant site to drain the stormwater to stormwater ponds located around the LNP site. The ponds will be designed as infiltration ponds with the ability to pump excess stormwater collected in the ponds that may be recycled to the cooling water basins or discharged as permitted when the ponds become full. For this reason, no surface water monitoring is anticipated or planned on the LNP site.

Hydrological and bathymetric monitoring within the CFBC will continue at monitoring locations Station 1, Station 2, and Station 3 (Figure 6.1-1). Quarterly hydrological monitoring will start approximately 1 year prior to plant operation to establish a refined hydrological baseline. Bathymetry measurements will be collected concurrently with water samples, as specified in ER Section 6.6. Three stilling wells (SW-1, SW-2, and SW-3) with pressure transducers will be added to monitor potential changes in water levels within the canal (Figure 6.3-1)

(Table 6.3-2). Water levels will be measured daily in each stilling well beginning 1 year prior to plant operation to define a baseline for the CFBC. Barges will use the CFBC to transport materials between the LNP site and the Gulf of Mexico. One bathymetric survey of the entire canal length will be conducted 1 year prior to plant operation to ensure that sedimentation has not occurred and that safe depths for barge traffic are maintained.

Monitoring within the CREC discharge canal will continue at all monitoring locations (CREC Station 1, CREC Station 2, CREC Station 3, and CREC Station 4) (Figure 6.1-3). Quarterly hydrological monitoring will start 1 year prior to plant operation to establish a refined baseline. Bathymetry measurements will be collected concurrently with water samples, as specified in ER Section 6.6.

6.7.3.3.2 Groundwater

Monitoring will be conducted to re-establish baseline conditions for groundwater levels and flow after construction is complete. Monitoring wells MW-1S, MW-2S, MW-3S, and MW-4S will continue to be monitored monthly (Figure 6.1-2). In addition, 43 new monitoring wells are proposed for installation during the preoperational phase. Monitoring well details are specified in ER Subsection 6.1.2.5. The groundwater monitoring efforts can be grouped by functional intent as follows: reactor area monitoring to establish background conditions and document changes in the immediate vicinity of the reactors, sentinel well monitoring to establish background conditions and document changes upgradient and downgradient of the reactor units, and raw water withdrawal sentinel wells to establish background conditions and document changes due to pumping of raw water from groundwater aquifers. The hydrologic monitoring details for each function are presented in Tables 6.3-3, 6.3-4, and 6.3-5, respectively. Changes in water levels within wells surrounding the reactor units (MW-26S, MW-26D, MW-27S, MW-27D, MW-28S, MW-28D, MW-29S, MW-29D, MW-30S, MW-30D, MW-31S, MW-31D, MW-32S, MW-32D, MW-33S, MW-33D, MW-34S, MW-34D) will be monitored quarterly starting approximately 1 year before plant operation begins (Figure 6.1-4). Stormwater will be controlled through the use of stormwater retention ponds near the LNP. The water level monitoring near the reactors will assess the impacts of this water retention. Water levels in the peripheral shallow/deep wells (MW-17S, MW-17D, MW-18S, MW-18D, MW-19S, MW-19D, MW-20S, MW-20D, MW-21S, MW-21D, MW-22S, MW-22D MW-23S, MW-23D, MW-24S, MW-24D, MW-25S, MW-25D) will be measured monthly using a water level indicator (Figure 6.1-4). Water levels in the raw water withdrawal sentinel wells (MW-1WW, MW-2WW, and MW-3WW) will be measured quarterly starting approximately 1 year before plant operation begins. Monitoring frequencies are summarized in Tables 6.3-3, 6.3-4, and 6.3-5.

6.7.3.4 Operational Hydrological Monitoring

This phase of the monitoring will document effects from LNP operation. The operational hydrological monitoring program will be designed to document the effects of the operation of the LNP and detect any unexpected effects that arise from facility operation. The operational hydrological monitoring program is

anticipated to extend preoperational monitoring for the duration of the LNP operation. Modifications to the monitoring program (for example, changes in monitoring stations or collection procedures) will be assessed regularly over the duration of the operational hydrological monitoring program.

6.7.3.4.1 Surface Water

Specific procedures for CFBC operational monitoring requirements are anticipated to be similar to the preoperational hydrological monitoring program. The program may be modified based on data collected and consultations with the FDEP. Hydrologic data will be evaluated to monitor for changes resulting from the withdrawal of makeup water from the CFBC. Bathymetry measurements at Station 1, Station 2, and Station 3, established during the preapplication monitoring phase, will be continued monthly for the first 2 years after operation begins, bimonthly for the next 3 years, and quarterly thereafter to provide a baseline for canal depth and to determine whether sedimentation has occurred. Flow rates and velocities are not measured due to the variable nature of the Gulf of Mexico tides. Bathymetry measurements will be collected concurrently with water samples, as specified in ER Section 6.6. As described previously, three stilling wells (SW-1, SW-2, and SW-3) will be added during the preoperational phase to monitor water levels within the canal. Quarterly monitoring will continue at these points during plant operation to ensure that sufficient cooling water supply is available. Stilling well locations are shown on Figure 6.3-1.

Specific procedures of the operational monitoring requirements for the CREC are anticipated to be similar to the preoperational hydrological monitoring program. The program may be modified based on data collected and consultations with the FDEP. Hydrological data will be evaluated to monitor for changes in depth due to sedimentation resulting from the discharge of blowdown to the CREC discharge canal. Monitoring will be performed monthly for 2 years after operation begins, bimonthly for the next 3 years, and quarterly thereafter.

6.7.3.4.2 Groundwater

Specifics related to the operational monitoring are anticipated to be similar to the specifics for the preoperational hydrological monitoring program. A limited operational hydrological monitoring program will be implemented to identify changes in flow rate and groundwater velocities from the operation of the LNP, and to detect any unexpected effects from facility operation. The monitoring program will also be used to determine if the distance from the water table elevation to the safety-related facility floor elevation is reduced to levels that are unsafe for operation of the reactor units. The groundwater level monitoring program will consist of extending preoperational monitoring for the duration of the LNP operation. The need for modifications to the monitoring program (for example, changes in monitoring stations or frequency of collection) will be assessed regularly over the duration of the operational hydrological monitoring program. A description of the frequency at which groundwater wells are measured is provided in Tables 6.3-3, 6.3-4, and 6.3-5.

6.7.4 METEOROLOGICAL MONITORING

The LNP on-site meteorological measurement program began in February 2007 after the installation of a 60.4-m (198-ft.) guyed, open-latticed meteorological tower. The tower has been used to monitor meteorological parameters at multiple levels above ground level, and has operated continuously since it was installed. Table 6.4-1 shows the current elevations of the operational sensors for all monitored parameters for both the lower and upper monitoring levels. Figure 2.7-2 shows a topographical map of the area and the location of the meteorological tower with respect to the LNP site. Based on the guidance provided in Regulatory Guide 1.23, Revision 1, the location of the LNP meteorological tower is ideally situated for use in support of the LNP COLA. Therefore, the monitoring results obtained from the tower are used to characterize the on-site meteorological conditions for the LNP site. The topography of the area is essentially flat with no significant terrain variations that would influence or otherwise affect dispersion. The base of the meteorological tower is at an elevation of approximately 13.7 m (45 ft.) mean sea level. A weatherproof National Electrical Manufacturers Association type enclosure mounted to the tower houses the system data logger and remote access equipment. The information monitored on the tower is routinely accessed, downloaded, and archived remotely. The system is powered by a self-contained solar power generator and communications with the tower are achieved through a modem via a cellular telephone network. The monitoring system is compliant with applicable requirements of Regulatory Guide 1.23, Revision 1, as summarized in Table 6.4-2.

Wind speed and direction is measured at the 10-m (32.8-ft.) and 60-m (196.8-ft.) levels. Lower- and upper-level wind speeds are recorded by sensors mounted on 3.7-m (12-ft.) retractable booms to minimize tower shadow effects. Wind direction, wind speed, and wind direction variance (sigma theta) are monitored at both the lower and upper levels of the tower.

Ambient temperature and delta-T are monitored at both the 10-m (32.8-ft.) and 60-m (196.8-ft.) levels of the tower. Two channels of differential temperature are monitored simultaneously between the lower and upper levels. The temperature probes are mounted in aspirated shields attached to a 2.5-m (8-ft.) retractable boom. Dew-point temperature is measured at the 10-m (32.8-ft.) level of the tower. Precipitation and solar radiation are monitored near ground level by sensors near the base of the tower.

Data from the LNP datalogger system are retrieved via a remote connection via a cellular telephone link. Using a host computer, an off-site meteorological consultant retrieves the meteorological data daily (except weekends and holidays). The retrieved data are reviewed for potential problems and then checked for consistency with data obtained from an automatic weather observing station operated by the municipality of Ocala, as well as data from the nearby CREC.

6.7.5 ECOLOGICAL MONITORING

6.7.5.1 Terrestrial Ecology And Land Use

This subsection summarizes elements of the monitoring program for terrestrial ecological communities. The objectives of the terrestrial ecology monitoring program are to identify effects on the terrestrial community caused by the development, construction, and operation of the LNP, and to identify alternatives or engineering measures to reduce potential adverse effects. The terrestrial ecology monitoring program has three phases: preapplication terrestrial ecology monitoring, construction terrestrial ecology monitoring, and operational terrestrial ecology monitoring.

6.7.5.1.1 Preapplication Terrestrial Ecology Monitoring

The preapplication phase of the monitoring identifies existing terrestrial community conditions. Preapplication monitoring of terrestrial ecological communities was initiated in October 2006 to identify and characterize habitats on and in the vicinity of the LNP site and the associated facilities, providing a baseline evaluation of conditions to be used in the development and application of subsequent monitoring and mitigation programs. The ongoing preapplication monitoring program consists of literature and regulatory agency database reviews and pedestrian surveys conducted by CH2M HILL ecologists.

Recreationally important and threatened and endangered species that might occur on and in the vicinity of the LNP site and associated facilities were identified. Most of the site will remain undeveloped and available as wildlife habitat following construction of the LNP. No threatened or endangered plant species have been identified on the LNP site or within the areas of the associated facilities.

Important habitats on and in the vicinity of the LNP site and associated facilities were identified. Wetlands were delineated and characterized in accordance with FDEP and USACE ERP requirements.

6.7.5.1.2 Construction Terrestrial Monitoring

The construction terrestrial monitoring program is designed to identify terrestrial resources that might be affected by construction activities, and to support measures to minimize potentially adverse effects on these resources resulting from construction of the LNP facilities.

During construction, recreationally important species are expected to avoid the construction areas in favor of similar habitats that are abundant in the vicinity, and therefore, monitoring is not anticipated. Prior to construction, areas identified in the preconstruction terrestrial monitoring program as appropriate habitat for threatened and endangered species that might occur on-site will be surveyed for those species in accordance with applicable state and federal regulatory guidelines. Construction staff will be educated about the potential presence of

listed species on-site, their appearance, and appropriate response if an individual is observed.

Wetlands comprise the primary important terrestrial habitat type that will be affected by construction activities. Construction monitoring of wetlands will be conducted in accordance with conditions established by the FDEP and the USACE as part of the ERP. Potentially adverse impacts to wetlands in the vicinity of the construction areas will also be minimized through implementation of best management practices and compliance with the site's stormwater pollution prevention plan.

6.7.5.1.3 Preoperational Terrestrial Monitoring

Preoperational terrestrial monitoring activities will track changes in terrestrial communities that might result from facility operation. Some of these activities will be conducted as part of regulatory controls associated with permit conditions, and other monitoring activities may be conducted as needed.

Recreationally valuable species identified for the LNP site and associated facilities are regionally common and no monitoring is expected to be required for these species. Protected species that occur in the vicinity will be monitored as required by applicable state and federal permit conditions.

6.7.5.1.4 Operational Terrestrial Monitoring

Operational terrestrial monitoring will be conducted as a continuation of the preoperational monitoring. Protected species that occur in the vicinity will be monitored as required by applicable state and federal permit conditions. Important habitats will be monitored in accordance with conditions and mitigation requirements established by the FDEP and USACE as part of the ERP and other permitting processes.

6.7.5.2 Aquatic Ecology

This subsection describes the aquatic ecology monitoring program that was initiated during the preapplication phase and will be continued during construction and operation of the LNP.

6.7.5.2.1 Preapplication Aquatic Ecology Monitoring

This monitoring phase is designed to establish background aquatic community conditions and support the ecological descriptions that are presented in ER Subsection 2.4.2. Preapplication aquatic ecology monitoring was initiated in late 2007 in the CFBC to establish the existing diversity of aquatic fish and invertebrate communities that occur there. Aquatic community data were collected at four locations (Station 1 through Station 4) in the CFBC (Figure 6.1-1). Continued preapplication aquatic ecology monitoring was conducted in the CFBC at Station 1 through Station 4, as well as three locations in the old Withlachochee River channel that connects the CFBC with the Inglis

Dam. One sampling event was conducted in late spring/early summer 2008 at each of these seven stations. Additional preapplication aquatic ecology monitoring occurred in 2008 at the CREC in the vicinity of the proposed discharge structure for LNP 1 and LNP 2. Monitoring was conducted at two locations: one near the mouth of the CREC discharge canal and one in the seagrass habitat in the nearshore Gulf of Mexico. Table 6.5-1 lists the surface water monitoring stations and the phases during which each is monitored.

6.7.5.2.2 Construction Aquatic Ecology Monitoring

This monitoring phase is designed to establish an aquatic community baseline and document potential changes in aquatic communities that may result from site preparation and construction activities. Table 6.6-1 lists the aquatic ecology monitoring stations and the phases during which each is monitored. Construction of the pipeline corridor through the CFBC, and construction of the CWIS along the berm, will involve dredging of sediments, and therefore, result in the temporary suspension and re-deposition of sediment, and the removal of those benthic organisms living in or on the removed sediments. The proposed construction monitoring is designed to establish the baseline benthic infaunal macroinvertebrate community occurring within sediment at construction locations, as well as monitor post-construction benthic community recovery. Benthic community samples at the CWIS construction area will be collected at three locations: one within the nearshore area of dredging activities, a second at approximately 500 ft. upstream of the CWIS location, and a third at approximately 500 ft. downstream of the CWIS. At 1 year and 3 years following completion of the CWIS construction activities, these same stations will be re-sampled for benthic community analysis. The purpose of the locations upstream and downstream of the CWIS is to provide benthic community data from nearby reference locations that are undisturbed by dredging activities, but otherwise affected by natural environmental conditions.

Threatened and endangered species monitoring will be conducted during all construction activities in the CFBC. Manatees and sea turtles, for example, might approach the construction sites during construction activities, and therefore, could be directly harmed if there is contact with machinery. A biologist familiar with the protected aquatic species in the region will be at the CFBC construction sites at all times during on-water construction activities, and will be allowed to temporarily halt construction should a protected species be observed near hazardous conditions. The biologist will have a boat available at all times to allow thorough viewing of waters at and near the construction sites. Records will be kept of all sightings.

6.7.5.2.3 Preoperational Aquatic Ecology Monitoring

The preoperational aquatic ecology monitoring program is designed to provide a baseline for evaluating changes to aquatic fish and invertebrate communities arising from the operation of the LNP. The biological and physicochemical data collected will support descriptions of the location and value of commercial and sport fisheries, distribution and abundance of fish and invertebrates, occurrence

of protected species, physical, chemical, and biological factors affecting aquatic species, and other location characteristics.

The preoperational aquatic ecology monitoring program will include the sampling of aquatic fish and invertebrate communities, and associated physicochemical parameters at three stations in the CFBC (Stations 1, 2, and 3), one station in the nearshore Gulf of Mexico (Station 4), and three stations in the old Withlachochee River channel (Stations 8, 9, and 10). These stations represent the aquatic system from which cooling water will be drawn for the LNP. Additional monitoring will be conducted in the vicinity of the cooling water discharge at the CREC where cooling tower blow-down water will be released, and will include two stations (CREC Stations 3 and 4) for sampling of aquatic fish and invertebrate communities, and four stations (CREC Stations 1 through 4) for physicochemical data.

The types of ecological data collected will include fish, benthic, and plankton community data, threatened and endangered species, and co-located water and sediment quality data. The fish community will be sampled quarterly with techniques including beach seining, gill netting, trawling, cast netting, and minnow traps. The benthic community will be sampled quarterly using an otter trawl and crab traps to capture motile crustaceans, and using a Petite Ponar dredge to capture benthic infaunal macroinvertebrates. The icthyoplankton and meroplankton community will be sampled 12 times during the one year preoperational period at Stations 1, 2, 3, and 4, and CREC Stations 3 and 4. Threatened and endangered species observed in the CFBC sampling area will be documented.

Field water quality will include water column measurements of salinity, conductivity, dissolved oxygen, pH, temperature, and water clarity. Laboratory water quality parameters will include chlorophyll *a*, total suspended solids, total dissolved solids, total phosphorous, nitrate plus nitrite, ammonia, and total Kjeldahl nitrogen (TKN). Laboratory sediment parameters will include particle size and total organic carbon. Sediment samples will be collected concurrently with the benthic infaunal macroinvertebrate samples.

Future NPDES permit conditions could modify this proposed sampling program and LNP will follow the established NPDES permit monitoring conditions.

6.7.5.2.4 Operational Aquatic Ecology Monitoring

This phase of the monitoring is used to establish changes in aquatic communities that may result from facility operation. An operational aquatic ecology monitoring program will be implemented following full operation of the LNP to assess the potential for impacts to aquatic fish and invertebrate communities. Table 6.6-1 lists the aquatic ecology monitoring stations and the phases during which each is monitored.

Impingement will be evaluated through the collection of fish and motile invertebrates at the CWIS. In addition, a single sampling location will be identified

in the immediate vicinity of the working CWIS. Fish will be sampled at this location using gill netting, trawling, cast netting, and minnow traps. Motile crustaceans will be sampled using an otter trawl and crab traps. The sampling of fish and macroinvertebrates and the monitoring of impingement will be conducted twice per month for 1 year following full operation of the LNP. Entrainment will be evaluated through the collection of icthyoplankton and meroplankton in the CFBC. Sampling stations will include one in front of the CWIS, a second station at half the distance between the CWIS and the mouth of the CFBC, and a third station at the mouth of the CFBC. Replicate plankton samples will be collected at each station during the daytime (between low slack and high slack tides), and again during the night time, identical to the methodology applied during the preapplication aquatic ecology monitoring program. The sampling of icthyoplankton and meroplankton will be conducted twice per month for 1 year following full operation of the LNP.

Aquatic ecology monitoring will be conducted in the vicinity of the CREC discharge canal to evaluate potential impacts of operational discharge to aquatic communities in the vicinity of the CREC discharge canal. The specific biological and physicochemical sampling parameters and procedures of this operational monitoring are anticipated to be identical to the preapplication aquatic ecology monitoring program. The monitoring program would include collection of aquatic community data at two stations (CREC Stations 3 and 4), and physicochemical data at four stations (CREC Stations 1 through 4). Sampling for all parameters is proposed to be conducted quarterly (spring, summer, fall, and winter) in the one year prior to operation, and for the first full year of operation. A description of the parameters measured and sampling frequency at the CREC locations is provided in Table 6.5-2.

6.7.6 CHEMICAL MONITORING

6.7.6.1 Preapplication Chemical Monitoring

The objective of the preapplication chemical monitoring program is to establish background non-radiological water quality conditions and support the chemical descriptions presented in ER Subsection 2.3.3. Much of the preapplication chemical data were obtained as part of the preliminary site characterization work for the LNP. Two surface water locations (SS-1 and SS-2) at the CFBC and Lake Rousseau, respectively (Figure 6.1-1), were sampled quarterly to document seasonal water quality characteristics. Monitoring data were also collected at seven locations (Station 1 through Station 7) in the CFBC and the Gulf of Mexico (Figure 6.1-1) during ecological sampling. These data provide additional information regarding the spatial variability of water quality constituents in the CFBC. Table 6.1-1 lists the surface water monitoring stations and the phases during which each is monitored. Table 6.1-2 lists the groundwater monitoring stations and the phases during which each will be monitored. A summary of analytical parameters collected as part of the preliminary site characterization are provided in Tables 6.6-1, 6.6-2, 6.6-3, and 6.6-4.

6.7.6.1.1 Surface Water

Water quality monitoring was performed at three locations (Station 1, Station 2, and Station 3) within the CFBC (Figure 6.1-1) in conjunction with the ecological/ water quality characterization effort. Measurements were collected at Station 1 and Station 2 on October 16, 2007 and November 11, 2007, and at Station 3 on October 16, 2007, October 18, 2007, and November 19, 2007. Monitoring was also performed quarterly at SS-1 (March 2007, June 2007, September 2007, and December 2007) as part of the preapplication monitoring efforts near the proposed makeup water intake location (Figure 6.1-1). Water quality measurements were collected beyond the CFBC at four locations (Station 4, Station 5, Station 6, and Station 7) as part of the ecological/water quality characterization effort (Figure 6.1-1). Measurements were collected at all four stations on October 16, 2007, October 18, 2007, and November 19, 2007.

In addition, preapplication monitoring was conducted at surface water sampling station SS-2 in March 2007, June 2007, September 2007, and December 2007 (Figure 6.1-1). This monitoring was performed to evaluate seasonal variations in water quality within Lake Rousseau.

Field measurements were collected at the surface and at 1-m (3.3-ft.) depth intervals to the bottom of the water body using a YSI® Multiprobe or Multiparameter Instrument (or equivalent meter). Grab samples were also collected at each station and submitted to a certified laboratory for detailed analytical analysis.

The LNP will discharge cooling and plant operation water to the Gulf of Mexico. This discharge will be routed from the LNP site to the CREC discharge canal and ultimately to the Gulf of Mexico. Review of historical monitoring data indicate that, with the exception of most recent impingement data collected at the intake screens and data collected from a recent study of sea grasses in and adjacent to the existing discharge canal, the most relevant water quality data for the discharge canal date from the mid-1980s. Therefore, additional sampling data will be required to establish background water quality conditions within the CREC discharge canal.

6.7.6.1.2 Groundwater

Tables 6.6-2, 6.6-3, and 6.6-4 summarize the analytical parameters included in the groundwater chemical monitoring program. The preapplication chemical monitoring program was implemented to define background groundwater quality conditions near LNP 1 and LNP 2. Selected monitoring wells (MW-13S, MW-14D, MW-15S, and MW-16D) screened within the surficial and bedrock aquifers were sampled during March 2007, June 2007, September 2007, and December 2007 in the immediate vicinity of LNP 1 and LNP 2. Monitoring wells were screened in the surficial aquifer at about 30 to 40 ft. bgs and monitoring wells in the Upper Floridan aquifer were screened at about 120 to 160 ft. bgs. Quarterly groundwater monitoring was performed to evaluate seasonal variations in water quality prior to construction and operation of the LNP.

6.7.6.2 Construction and Preoperational Chemical Monitoring

The chemical monitoring of surface water and groundwater will be conducted to provide data necessary to evaluate potential changes in water quality that might result from construction and operation of the LNP. The objective of the construction and preoperational monitoring is to characterize the water quality at the site and to provide a baseline for the identification and measurement of water quality changes from operation of the LNP. Tables 6.6-1, 6.6-2, 6.6-3, and 6.6-4 summarize the parameters measured and the frequency at which they are collected.

6.7.6.2.1 Surface Water

Surface water monitoring will continue at most locations established during the preapplication chemical monitoring program. Construction monitoring will begin approximately 1 year before site preparation and end when construction is complete. Temporary monitoring locations will need to be established to evaluate impacts from construction activities. Field parameter measurements at temporary locations near construction of the proposed intake structure will be collected weekly until construction activities are complete.

Preoperational monitoring will begin 1 year prior to plant operation to establish a refined baseline for water quality at the LNP site.

The need for changes to the monitoring program (for example, changes in monitoring stations, parameters, collection, or analytical procedures) will be assessed regularly over the duration of the construction and preoperational chemical monitoring program. A description of the water quality analytical parameters and sampling frequency is provided in Table 6.6-1.

6.7.6.2.2 Groundwater

The chemical monitoring of groundwater will be conducted to provide data necessary to assess water quality changes that could result from the construction dewatering and operation of the LNP. The objective of construction and preoperational monitoring is to characterize the quality of groundwater at the site and provide a basis from which to identify changes in groundwater quality from the facility operation.

The chemical groundwater monitoring efforts can be grouped by functional intent as follows: reactor area monitoring to establish background conditions and document changes in the immediate vicinity of the reactors, sentinel well monitoring to establish background conditions and document changes upgradient and downgradient of the reactor units, and raw water withdrawal sentinel wells to establish background conditions and document changes due to pumping of raw water from groundwater aquifers. Chemical monitoring details for each function are presented in Tables 6.6-2, 6.6-3, and 6.6-4, respectively.

Preapplication monitoring wells MW-5S, MW-7S, MW-9S, MW-11S, MW-13S, MW-15S, MW-6D, MW-8D, MW-10D, MW-12D, MW-14D, and MW-16D are assumed to be located within the proposed construction area for the LNP, and therefore, will have to be abandoned in accordance with FDEP regulatory guidelines prior to construction activities. Chemical measurements will be collected quarterly within monitoring wells MW-1S, MW-2S, MW-3S, and MW-4S throughout the construction and preoperational phases of the project as they are located on the periphery of the property and will not interfere with construction activities. A total of 43 new monitoring wells are proposed for installation immediately following construction activities and prior to plant operation. Screened interval depths will be consistent with monitoring well identifications "S" and "D" as indicated in ER Subsection 6.6.1.6.

Water chemistry at the 43 groundwater wells will be monitored quarterly during the construction and preoperational phase of the project. In addition, the need for modifications to the monitoring program will be assessed regularly over the duration of the construction and preoperational chemical monitoring program. Additional locations and more frequent measurements may be incorporated into the construction and preoperational chemical monitoring program as the project progresses; although, the exact locations (some locations may be monitored remotely) and procedures may be modified.

6.7.6.3 Operational Chemical Monitoring

The operational chemical monitoring program will be designed to document effects from the operation of the LNP and detect any unexpected effects that arise from facility operation. The operational chemical monitoring program is anticipated to extend preoperational monitoring for the duration of LNP operation. Modifications to the monitoring program (for example, changes in monitoring stations or collection procedures) will be assessed regularly over the duration of the operational hydrological monitoring program. Adjustments to the program will be made after discussions with FDEP and take into consideration any NPDES permit requirements. If water quality trends for specific parameters demonstrate no significant changes throughout the monitoring project, analysis of those parameters will be reduced or deleted from the monitoring program, as necessary.

6.7.6.3.1 Surface Water

The specific procedures of the operational monitoring requirements for the CFBC are anticipated to be similar to the preoperational chemical monitoring program. The program may be modified in response to data collected and consultations with the FDEP. The data will be evaluated to monitor for changes resulting from the withdrawal of makeup water from the CFBC. The frequency of chemical monitoring will be monthly for 2 years, bimonthly for the next 3 years, and quarterly thereafter.

The specific procedures of the operational monitoring requirements for the CREC are anticipated to be similar to the preoperational chemical monitoring program.

The program may be modified in response to data collected and consultations with the FDEP. The data will be evaluated to monitor for changes resulting from the discharge of blowdown to the CREC discharge canal. The frequency of chemical monitoring will be monthly for 2 years, bimonthly for the next 3 years, and quarterly thereafter.

6.7.6.3.2 Groundwater

The objective of the groundwater operational chemical monitoring program is to identify any changes in water quality that could result from the operation of the LNP. The operational chemical monitoring program is anticipated to be an extension of the construction and preoperational chemical monitoring program. Thus, chemical changes that result from facility operations can be evaluated. The frequency of groundwater chemical monitoring will be monthly for 1 year after plant operation begins and quarterly thereafter. The need for changes to the monitoring program (for example, changes in monitoring stations, parameters, collection, or analytical procedures) will be assessed regularly over the duration of the construction and preoperational chemical monitoring program.