CHAPTER 6: ENVIRONMENTAL MEASUREMENTS AND MONITORING PROGRAMS
TABLE OF CONTENTS

CHAPTER 6 TABLE OF CONTENTS (CONT.)

CHAPTER 6 LIST OF TABLES

CHAPTER 6 LIST OF FIGURES

6.0 ENVIRONMENTAL MEASUREMENTS AND MONITORING PROGRAMS

This chapter evaluates the environmental measurements and monitoring related to the construction and operation of Units 6 & 7. This section describes the monitoring programs that were initiated for Units 6 & 7 during the pre-Application phase and would be continued during construction, preconstruction, and operation phases.

This chapter is divided into the following sections:

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

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

6.1 THERMAL MONITORING

6.1.1 PRE-APPLICATION THERMAL MONITORING

The Units 6 & 7 pre-application thermal monitoring program was performed to establish background water temperatures for the Biscayne aquifer at the plant area prior to construction and operation of Units 6 & 7. As presented in Subsection 2.3.1, there are no freshwater streams, lakes, or impoundments on the Turkey Point plant property. In addition, no lakes or impoundments considered to be waters of the state or the U.S. would be used or affected by the construction or operation of Units 6 & 7. This phase of the monitoring is designed to establish background conditions and support the thermal descriptions that are presented in Section 2.3.

Temperatures at the Units 6 & 7 plant area were reported at twelve monitoring wells at the upper and lower screened intervals (Table 2.3-21) of the Biscayne aquifer and two surface water monitoring locations in the return canals of the industrial wastewater facility to establish baseline temperature conditions. Figure 2.3-25 shows the locations of the monitoring wells and surface water monitoring locations.

6.1.2 CONSTRUCTION AND PREOPERATIONAL THERMAL MONITORING

The construction and preoperational thermal monitoring program is designed to continue monitoring activities during the development stages (site preparation and construction) of Units 6 & 7 until they are operational. The monitoring activities are described in the following paragraphs.

6.1.2.1 Surface Water

Thermal monitoring at the existing units' release to the industrial wastewater facility will continue in accordance with the IWW Facility Permit (FL0001562).

As part of the planned uprates of Units 3 & 4, thermal monitoring of Biscayne Bay will be performed.

No construction or pre-operational thermal monitoring of Units 6 & 7 stormwater releases to the cooling canals of the industrial wastewater facility would be performed because the stormwater would not be thermally altered.

Specific monitoring would be developed as part of the National Pollutant Discharge Elimination System (NPDES) permit process for construction activities that would occur offsite (e.g. linear facilities such as transmission corridors). The need for modifications to the monitoring program would be regularly assessed and implemented as necessary over the duration of the construction and preoperational thermal monitoring program.

6.1.2.2 Groundwater

As part of construction activities, an exploratory deep injection well would be installed to investigate the geology and hydrogeology of the site for the feasibility of disposal of fluids via deep well injection. The deep injection well and a dual zone monitoring well would be installed on the eastern perimeter of the Units 6 & 7 plant area. If the deep injection well is used for the disposal of wastewater during construction, thermal monitoring at the dual zone monitoring well would be performed on a weekly, then monthly (after operational testing) sampling interval in accordance with the UIC permit requirement. Thermal monitoring of the waste stream would likely be performed monthly.

A total of six dual zone monitoring wells would be installed at the Units 6 & 7 plant area to monitor groundwater as part of the operation of the 12 deep injection wells. Preoperational groundwater monitoring using selected zone monitoring wells would begin prior to plant operation to establish a baseline for water temperatures in the aquifers that would be affected by deep well injection from Units 6 & 7.

6.1.3 OPERATIONAL THERMAL MONITORING

The operational thermal monitoring program is designed to monitor surface and groundwater thermal impacts due to the operation of Units 6 & 7. The monitoring activities are described in the following paragraphs.

6.1.3.1 Surface Water

Thermal monitoring at the existing units’ release to the industrial wastewater facility will continue in accordance with the IWW Facility Permit (FL0001562).

As part of the planned uprates of Units 3 & 4, thermal monitoring of Biscayne Bay will be performed.

No operational thermal monitoring of Units 6 & 7 stormwater releases to the industrial wastewater facility would be performed because the stormwater would not be thermally altered.

Since the radial collector wells would be a secondary cooling water source for Units 6 & 7, the monitoring frequency would be dependent upon operation. During operation, field measurements of temperature would be collected from the return canal of the industrial wastewater facility and Biscayne Bay in the area of the Turkey Point barge slip.

6.1.3.2 Groundwater

A total of six dual zone monitoring wells would be installed at the Units 6 & 7 plant area to monitor groundwater as part of the operation of the 12 deep injection wells. Thermal monitoring at the dual zone monitoring wells would be performed on a monthly sampling interval in accordance with the UIC permit requirement. Thermal monitoring of the waste stream in the deep injection wells would likely be performed monthly.

The water pumped from the radial collector wells would be monitored for temperature. Groundwater could also be monitored for temperature at monitoring wells located adjacent to the radial collector wells and along the shoreline.

6.2 RADIOLOGICAL MONITORING

The general features of the Turkey Point radiological monitoring program, currently in place for Units 3 & 4, would not change as a result of the operation of Units 6 & 7. Some additional measurement locations would be identified in support of Units 6 & 7 construction and operations. The current and planned radiological monitoring program is described in the following paragraphs.

6.2.1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM BASIS

The existing Radiological Environmental Monitoring Program (REMP) is described in the Turkey Point Offsite Dose Calculation Manual (ODCM) (FPL 2007) and is summarized in the following subsections.

6.2.2 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM CONTENTS

Preoperational data collected in the early 1970s provides a baseline for the existing units and Units 6 & 7. The measurement of radiation levels, concentrations (including surface area), and/or other quantities of radioactive material are used to evaluate potential exposures and doses to members of the public and the environment.

The following exposure pathways to radiation are monitored:

- Direct (dosimeters)
- Airborne (iodine and particulates)
- Waterborne (surface water, groundwater, and shoreline sediment)
- Aquatic (fish and crustacea tissue)
- Ingestion (fish and crustacea tissue)
- Vegetation (broadleaf vegetation)

The ODCM provides a detailed description of the monitoring program including number and location of sample collection points and measuring devices and the pathway sampled or measured, sample collection frequency and sampling duration, type and frequency of analysis, general types of sample collection and measuring equipment, and lower limit of detection for each analysis. Sampling media and sample size are defined in environmental monitoring and laboratory standard operating procedures.

Sampling results and locations are evaluated to determine effects from seasonal yields and variations. Figures 6.2-1 and 6.2-2 show the existing remote and local radiological sampling locations near the site, respectively. Table 6.2-1 provides details of the radiation exposure pathways monitored and the frequency of monitoring. Tables 6.2-2 and 6.2-3 provide remote and local sample descriptions and locations, respectively. Trending and comparison reviews provide information regarding changes in background levels and determine the adequacy of analytical techniques in light of program results and changes in technology, when compared to baseline measurements. Changes in program implementation (including sampling techniques, frequencies, and locations) may occur as a result of monitoring results.

FPL conducts a supplemental monitoring program in addition to the required program. The sample sites, frequency, and analyses have been agreed to with the Florida Department of Health. These samples are not required to be performed, but based on this agreement, are performed to provide a broader database for the REMP. Sample descriptions and locations are shown in Table 6.2-4.

FPL participates in a voluntary industry initiative on groundwater protection, developed by the Nuclear Energy Institute. Currently, nine wells are sampled quarterly. Samples are analyzed for tritium and principal gamma emitters. Sample results are included in the Annual Radiological Environmental Operating Report and the Annual Radiological Effluent Release Report. This groundwater sampling program is described in Appendix B of the REMP. Sample locations are shown in Table 6.2-5.

6.2.2.1 Preoperational and Operational Radiological Monitoring Programs

The existing Units 3 & 4 radiological monitoring program would serve as the preoperational radiological monitoring program. The existing REMP would be modified for Units 6 & 7 and would be based on *Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Pressurized Water Reactors*, 1991 (NUREG-1301) and the NRC's Branch Technical Position Paper, *An Acceptable Radiological Environmental Monitoring Program, Revision 1*, 1979.

The ODCM would be modified for Units 6 & 7 based on the Technical Specifications and would address the requirements of 10 CFR Part 50, Appendix I. One of the requirements is the publication of the Annual Radiological Environmental Operating Report. As noted in the DCD (WEC June 2011) Chapter 16 — Technical Specifications, Section 5.6, a single report can be prepared for a multiple-unit station. Therefore, the Turkey Point REMP would address the releases from the Turkey Point site as a whole. This modified REMP would retain compliance with the Units 3 & 4 Technical Specifications and ODCM.

Additional direct radiation monitoring thermoluminescent dosimeter (TLD) locations would be added at the exclusion area boundary around Units 6 & 7. For preconstruction and construction monitoring, TLDs would be placed at the Units 6 & 7 reactor locations to determine the external radiation exposure levels.

As described in Sections 3.4 and 3.5, small amounts of radioactivity, well below regulatory limits, would be discharged from Units 6 & 7 to the Lower Floridan aquifer (Boulder Zone) through the deep injection wells. The well casings would be installed to a depth of approximately 2900 feet below grade. Each deep injection well pair would be equipped with a dual zone monitoring well. The upper monitoring zone would extend from approximately 1400 to 1420 feet below grade, and the lower monitoring zone would extend from approximately 1850 to 1870 feet below grade. These monitoring wells would serve as sample points for groundwater monitoring. These new groundwater pathway sample locations are shown on Figure 3.1-3.

The existing REMP is conducted in accordance with RG 4.15, *Quality Assurance for Radiological Monitoring Programs (Normal Operations) — Effluent Streams and the Environment, Revision 1*, 1979. Quality assurance is provided in the existing NRC-approved REMP through quality training, program implementation by periodic tests, the Inter-laboratory Comparison Program, and administrative and technical procedures. The modified REMP would be conducted in accordance with RG 4.15, *Quality Assurance for Radiological Monitoring Programs (Normal Operations) — Effluent Streams and the Environment, Revision 2*, 2007.

6.2.3 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM REPORTING

An Annual Radiological Environmental Operating Report for Turkey Point is submitted in accordance with the existing units' ODCM. Results from REMP implementation and evaluation are compared to results from previous years for measurement trends, methodology consistency, and indications that the program is adequate and does not need revisions.

A land use census is conducted annually within a designated distance of the site, currently five miles, to determine sampling yields and locations, and to ascertain if changes to the REMP are warranted. Information collected includes locations of nearest residence, milk-producing animal, and garden with broadleaf vegetation in each of the 16 compass directions. The radius of this land use census would be expanded to include the area within six miles of the mid-point between Units 3 & 4 and Units 6 & 7.

Section 6.2 References

FPL 2007. *Offsite Dose Calculation Manual for Gaseous and Liquid Effluents from the Turkey Point Plant Units 3 and 4*, Revision 14, June 2007.

WEC June 2011. Westinghouse Electric Company, LLC, *AP1000 Design Control Document*, Revision 19, Pittsburgh, Pennsylvania, June 13, 2011.

Table 6.2-1
Pre-Application, Construction/Preoperational, and Operational Radiological Monitoring Program[(a)]

Exposure Pathway and/or Sample	Number of Representative Samples and Sample Locations[(b) (c)]	Sampling and Collection Frequency[(d)]	Type and Frequency of Analysis[(d)]
1. Direct Radiation[(e)]	21 Monitoring Locations	Continuous monitoring with sample collection quarterly[(f)]	Gamma exposure rate - quarterly
2. Airborne Radioiodine and Particulates	Five Locations	Continuous sampler operation with sample collection at least weekly or more frequently if required by dust loading	Radioiodine Filter- Analysis for I-131 weekly Particulate filter - Gross beta radioactivity analysis ≥24 hours following filter change[(g)]; Gamma isotopic analysis[(h)] of composite[('g)] (by location) quarterly
3. Waterborne[(i)]			
a. Surface[(h)]	Three Locations[(j)]	Monthly	Gamma isotopic[(h)] and tritium analysis monthly
b. Sediment from shoreline	Three Locations	Semiannually	Gamma isotopic analysis[(h)] semiannually
4. Groundwater	6 Locations (1 upper zone and one lower zone monitoring well for each injection pair site)	Monthly (Gamma isotopic and tritium) Monthly/Quarterly (Gross Alpha, Radium-226, Radium-228)	Gamma isotopic[(h)], Gross Alpha, Radium-226, Radium-228 and tritium analysis.
5. Ingestion			
a. Fish and Invertebrates			
1. Crustacea	Two Locations	Semiannually	Gamma isotopic analysis[(h)] semiannually
2. Fish	Two Locations	Semiannually	Gamma isotopic analysis[(h)] semiannually
b. Food Products			
1. Broadleaf Vegetation	Three Locations[(k)]	Monthly when available	Gamma isotopic analysis[(h)] and I-131 analysis monthly

Source: FPL 2007

(a) Deviations are permitted from the required sampling schedule if specimens are unobtainable due to circumstances such as hazardous conditions, seasonal unavailability, and malfunction of automatic sampling equipment or other legitimate reasons. If specimens are unobtainable as a result of sampling equipment malfunction, corrective action shall be taken before the end of the next sampling period. All deviations from the sampling schedule will be documented in the Annual Radiological Environmental Operating Report pursuant to Control 1.4.

(b) Specific parameters of distance and direction sector from the centerline of the plant vent stack and additional description where pertinent, will be provided for each and every sample location in tables and figure(s) in the ODCM.

(c) At times, it may not be possible or practicable to continue to obtain samples of the media of choice at the most desired location or time. In these instances, suitable alternative media and locations may be chosen for the particular pathway in question and appropriate substitutions made within 30 days in the Radiological Environmental Monitoring Program given in the ODCM.

(d) The following definition of frequencies shall apply to Table 6.2-1 only:
Weekly — Not less than once per calendar week. A maximum interval of 11 days is allowed between the collection of any two consecutive samples.
Semimonthly — Not less than 2 times per calendar month with an interval of not less than 7 days between sample collections. A maximum interval of 24 days is allowed between collection of any two consecutive samples.
Monthly — Not less than once per calendar month with an interval of not less than 10 days between collection of any two consecutive samples.
Quarterly — Not less than once per calendar quarter.
Semiannually — One sample each between calendar dates (January 1–June 30) and (July 1– December 31). An interval of not less than 30 days will be provided between sample collections.
The frequency of analyses is to be consistent with the sample collection frequency.
(e) One or more instruments, such as a pressurized ion chamber, for measuring and recording dose rate continuously may be used in place of, or in addition to, integrating dosimeters. For the purposes of this table, a TLD is considered to be one phosphor; two or more phosphors in a packet are considered as two or more dosimeters.
(f) Refers to normal collection frequency. Most frequent sample collection is permitted when conditions warrant it.
(g) Airborne particulate sample filters are analyzed for gross beta radioactivity 24 hours or more after sampling to allow for radon and thorium daughter decay. In addition to the requirement for a gamma isotopic on a composite sample, a gamma isotopic is also required for each sample having a gross beta radioactivity which is >1.0 pCi/m3 and which is also >10 times that of the most recent control sample.
(h) Gamma isotopic analysis means the identification and quantification of gamma-emitting radionuclides that may be attributable to the effluents from the facility.
(i) Discharges do not influence drinking water or groundwater pathways.
(j) Offshore grab samples.
(k) Samples of broadleaf vegetation grown nearest each of two different offsite locations of highest predicted annual average ground level D/Q, and one sample of similar Broadleaf vegetation at an available location 15–30 kilometers distant in the least prevalent wind direction based upon historical data in the ODCM.

Table 6.2-2 (Sheet 1 of 2)
Remote Radiological Monitoring Program Sample Description and Location

Pathway	Location	Description	Samples Collected	Sample Collection Frequency	Approx. Distance (miles)	Direction Sector
Direct Radiation	N-7	Black Point Marina parking lot on siren pole	TLD	Quarterly	7	N
Direct Radiation	N-10	Old Cutler Rd across from Perdue Med. Ctr. on siren pole	TLD	Quarterly	10	N
Direct Radiation	NNW-10	Bailes Rd. E. of US 1 on siren pole	TLD	Quarterly	10	NNW
Direct Radiation	NW-5	Intersection of Mowry Dr. & 117th Ave. on siren pole	TLD	Quarterly	5	NW
Direct Radiation	NW-10	On Newtown Rd. N. of Coconut Palm Drive on siren pole	TLD	Quarterly	10	NW
Direct Radiation	W-5	Palm Drive 0.3 mi. west of Tallahassee Rd	TLD	Quarterly	5	W
Direct Radiation	WNW-10	NW 2nd Ave. S. of Campbell Dr. at Hmstd. Middle School on siren pole	TLD	Quarterly	10	WNW
Direct Radiation	W-9	Card Sound Rd. 0.6 mi. SSE of US 1 on siren pole	TLD	Quarterly	9	W
Direct Radiation	WSW-8	Card Sound Rd. 3.4 mi. SSE of US 1 on siren pole	TLD	Quarterly	8	WSW
Direct Radiation	SW-8	Card Sound Rd. 5 mi. SSE of US 1 at entrance to Navy facility	TLD	Quarterly	8	SW
Direct Radiation	SSW-5	On site, southwest corner of cooling canals	TLD	Quarterly	5	SSW
Direct Radiation	SSW-10	At Card Sound Bridge on siren pole	TLD	Quarterly	10	SSW
Direct Radiation	S-5	On site, south east end of cooling canals	TLD	Quarterly	5	S
Direct Radiation	S-10	Card Sound Road at Steamboat Creek	TLD	Quarterly	10	S
Direct Radiation	SSE-10	Ocean Reef	TLD	Quarterly	10	SSE
Direct Radiation	NNE-22[a]	Natoma Substation	TLD	Quarterly	22	NNE
Airborne	T57	Siren pole 27, intersection of SW 112th Ave and SW 304th St.	Radioiodine and Particulate	Weekly	4	NW
Airborne (Alternate to T57)	T52	Florida City Substation	Radioiodine and Particulate	Weekly	7	W

Table 6.2-2 (Sheet 2 of 2)
Remote Radiological Monitoring Program Sample Description and Location

Pathway	Location	Description	Samples Collected	Sample Collection Frequency	Approx. Distance (miles)	Direction Sector
Airborne	T64[a]	Natoma Substation	Radioiodine and Particulate	Weekly	22	NNE
Waterborne	T67[a]	Biscayne Bay, vicinity of Cutler Plant north to Matheson Hammock Park	Surface Water Shoreline Sediment	Monthly Semiannually	13–18	N,NNE
Waterborne	T81	Card Sound, near mouth of old discharge canal	Surface Water Shoreline Sediment	Monthly Semiannually	6	S
Food Products	T67[a]	Biscayne Bay, vicinity of Cutler Plant north to Matheson Hammock Park	Crustacea Fish	Semiannually Semiannually	13-18	N,NNE
Food Products	T81	Card Sound near mouth of old Discharge Canal	Crustacea Fish	Semiannually Semiannually	6	S
Food Products	T40	South of Palm Dr. on SW 117th St extension	Broadleaf vegetation	Monthly	3	W/WNW
Food Products	T67[a]	Near Biscayne Bay, Vicinity of Cutler Plant North to Matheson Hammock Park	Broadleaf vegetation	Monthly	13–18	N, NNE

(a) Denotes control sample

Source: FPL 2007

Table 6.2-3
Local Radiological Monitoring Program Sample Description and Location

Pathway	Location	Description	Samples Collected	Sample Collection Frequency	Approx. Distance (miles)	Direction Sector
Direct Radiation	N-2	Convoy Point	TLD	Quarterly	2	N
Direct Radiation	NNW-2	East end of N. Canal Dr. on siren pole E. of 117th Ave.	TLD	Quarterly	2	NNW
Direct Radiation	NW-1	Turkey Point Entrance Rd	TLD	Quarterly	1	NW
Direct Radiation	W-1	On site north side of Discharge Canal.	TLD	Quarterly	1	W
Direct Radiation	SW-1	On site near land utilization offices	TLD	Quarterly	1	SW
Direct Radiation	SSE-1	On site South East side of cooling canals at "Turtle Point"	TLD	Quarterly	1	SSE
Airborne	T51	Entrance to Homestead Bayfront Park	Radioiodine and Particulate	Weekly	2	NNW
Airborne (Alternate to T51)	T71	Red Barn/Beach Area	Radioiodine and Particulate	Weekly	0.5	NNE
Airborne	T58	Turkey Point Entrance Rd	Radioiodine and Particulate	Weekly	1	NW
Airborne	T72	Turkey Point Land Utilization Entrance	Radioiodine and Particulate	Weekly	<1	WSW
Groundwater	6 total	Deep Injection Monitoring Wells	Groundwater	Monthly/Quarterly	<1	Multiple
Waterborne	T42	Biscayne Bay, at Turkey Point	Surface Water Shoreline Sediment	Monthly Semi-annually	<1	ENE
Food Products	T41	Palm Dr. west of FPL wellness center near the site boundary	Broadleaf vegetation	Monthly	2	WNW

Source: FPL 2007

Table 6.2-4 (Sheet 1 of 3)
Supplemental Radiological Monitoring Program Sample Description and Location

Pathway	Location	Description	Samples Collected	Sample Collection Frequency	Approx. Distance (miles)	Direction Sector
Direct Radiation	NNW-6	Siren S29 pole, NE corner Moody Dr. (SW 268 St) & Allapattah (SW 112 Av)	TLD	Quarterly	6	N
Direct Radiation	NW-7	Siren S28 pole, E side Pine Island Rd (SW 132 Av) & N of Waldin Dr (SW 280 St.)	TLD	Quarterly	7	N
Direct Radiation	NW-8	Siren S7 pole, SW 152 Av at E end of SW 248 St	TLD	Quarterly	8	NNW
Direct Radiation	WNW-2	FPL Satellite School, cement pole in school yard	TLD	Quarterly	2	NW
Direct Radiation	WNW-3	Siren S21 pole, NW corner Palm Dr and Allapattah Rd (SW 117 Av)	TLD	Quarterly	3	NW
Direct Radiation	W-8	Siren S25 pole, W side Tallahassee Rd (SW 137 Av), N of Moody Dr	TLD	Quarterly	8	W
Direct Radiation	ENE-1	E end of Turkey Point, past Ranger Station	TLD	Quarterly	1	WNW
Direct Radiation	T71	On Site "Red Barn" picnic area	TLD	Quarterly	0.5	NNE
Direct Radiation	T72	On Site, just outside LU entrance	TLD	Quarterly	<1	On Site
Airborne	T41	FPL Satellite School, cement pole in school yard	Radioiodine and Particulate	Weekly	2	WNW
Airborne	T52	Florida City Substation	Radioiodine and Particulate	Weekly	8	W
Airborne	T56	SW corner parking lot @ Black Point Marina	Radioiodine and Particulate	Weekly	7	NNW
Airborne	T71	On Site "Red Barn" picnic area	Radioiodine and Particulate	Weekly	0.5	NNE
Waterborne	T75	Florida City Canal (~ cross-street from satellite school)	Surface Water	Monthly	1.2	NW

Table 6.2-4 (Sheet 2 of 3)
Supplemental Radiological Monitoring Program Sample Description and Location

Pathway	Location	Description	Samples Collected	Sample Collection Frequency	Approx. Distance (miles)	Direction Sector
Waterborne	T84	Cooling canal, discharge, ~ by bridge to parking lot	Surface Water	Monthly	0.5	WSW
Waterborne	T97	Cooling Canal, intake, ~ Air Force school area	Surface Water	Monthly	0.2	E
Waterborne	T08	Southern shore of canal system, west of Grand Canal Bridge	Surface Water	Monthly	5.5	S
Waterborne	T84	‘Seaweed’ from any location in the cooling canal	Waterborne Seaweed	Quarterly	0.5	WSW
Waterborne	T01	Cooling Canals	Surface Water Shoreline Sediment	Annual	<1	WSW
Waterborne	T02	Cooling Canals	Surface Water Shoreline Sediment	Annual	<1	WSW
Waterborne	T03	Cooling Canals	Surface Water Shoreline Sediment	Annual	<1	WSW
Waterborne	T04	Cooling Canals	Surface Water Shoreline Sediment	Annual	<1	WSW
Waterborne	T05/T84	Cooling Canals	Surface Water Shoreline Sediment	Semiannual	<1	WSW
Waterborne	T06/T85	Cooling Canals	Surface Water Shoreline Sediment	Semiannual	<1	WSW
Waterborne	T07	Cooling Canals	Surface Water Shoreline Sediment	Annual	<1	WSW

Table 6.2-4 (Sheet 3 of 3)
Supplemental Radiological Monitoring Program Sample Description and Location

Pathway	Location	Description	Samples Collected	Sample Collection Frequency	Approx. Distance (miles)	Direction Sector
Waterborne	T08	Cooling Canals	Surface Water Shoreline Sediment	Annual	<1	WSW
Waterborne	T09	Cooling Canals	Surface Water Shoreline Sediment	Annual	<1	WSW
Waterborne	T10	Cooling Canals	Surface Water Shoreline Sediment	Annual	<1	WSW
Ingestion	T99	183rd block of SW 262nd St.	Milk	Semiannual	12	WNW
Ingestion (alt)	-	134th block of SW 224th St.	Milk	Semiannual	10	W
Ingestion	T84	Cooling canal, discharge, ~ by bridge to parking lot	Fish	Semiannual	0.5	WSW
Ingestion	T43	Various locations: “truck farm” point of sale growing fields, miscellaneous other sources locally grown food crops (e.g., corn, potato, sugarcane, greens, etc.		Annual	Various locations N through NW to W typically 2 to 10 miles from plant	
Ingestion	T44					
Ingestion	T45					

Source: FPL 2007

Table 6.2-5
Groundwater Sampling Program to Support the Industry Initiative on Groundwater Protection

Well	Location
G-21	Tallahassee Road extension, west of FPL property. Sample from top and bottom.
G-28	Tallahassee Road extension, west of FPL property. Sample from top and bottom.
L-3	West of Interceptor Canal, on Land-U property. Sample from top and bottom.
L-5	West of Interceptor Canal, on Land-U property. Sample from top and bottom.
STP-1	Northeast of Turkey Point Sewage Plant.
P-94-2	North of Solids Settling Basin, east of Turkey Point intake.
P-94-4	East of Dress-out Building, in the RCA.
PTPED-9	Northeast Corner of Neutralization Basin.
CD-1	Northeast Corner of Neutralization Basin.

Source: FPL 2007

Figure 6.2-1 Units 6 & 7 Remote REMP Sample Locations

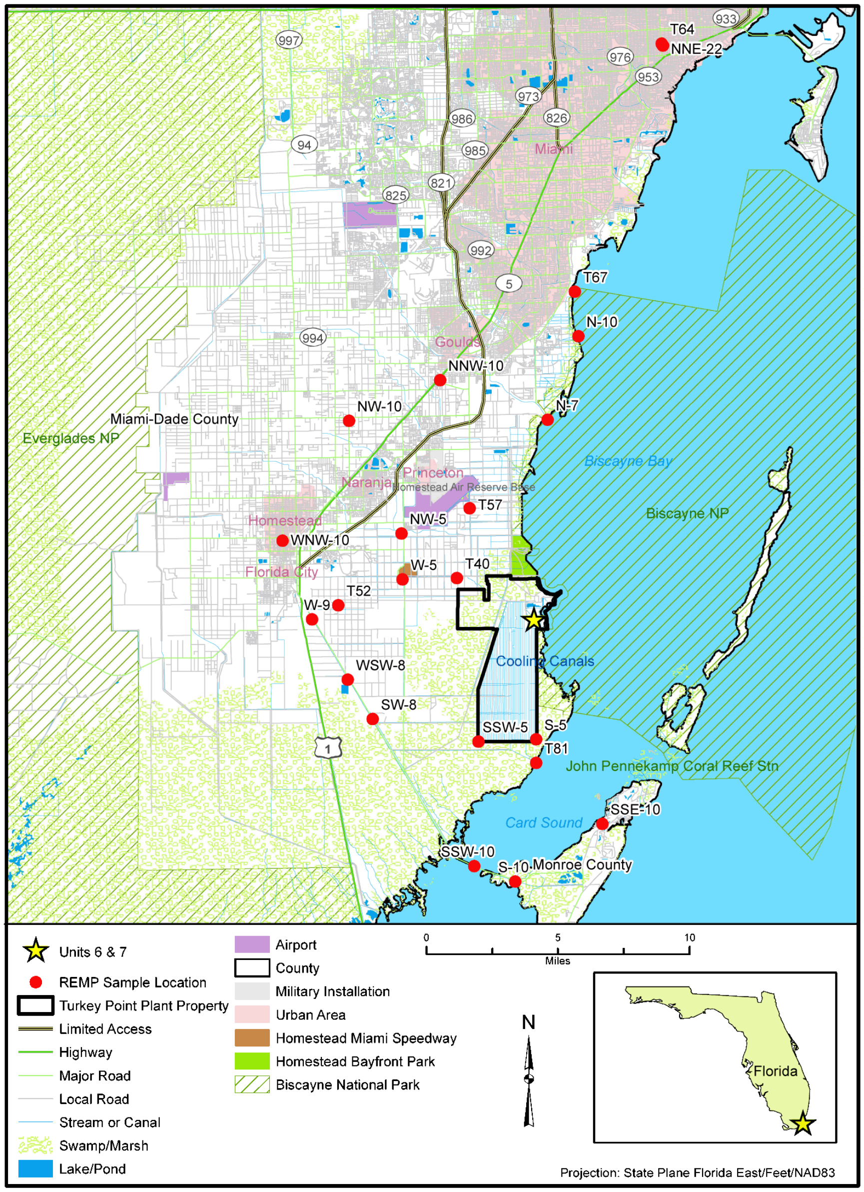
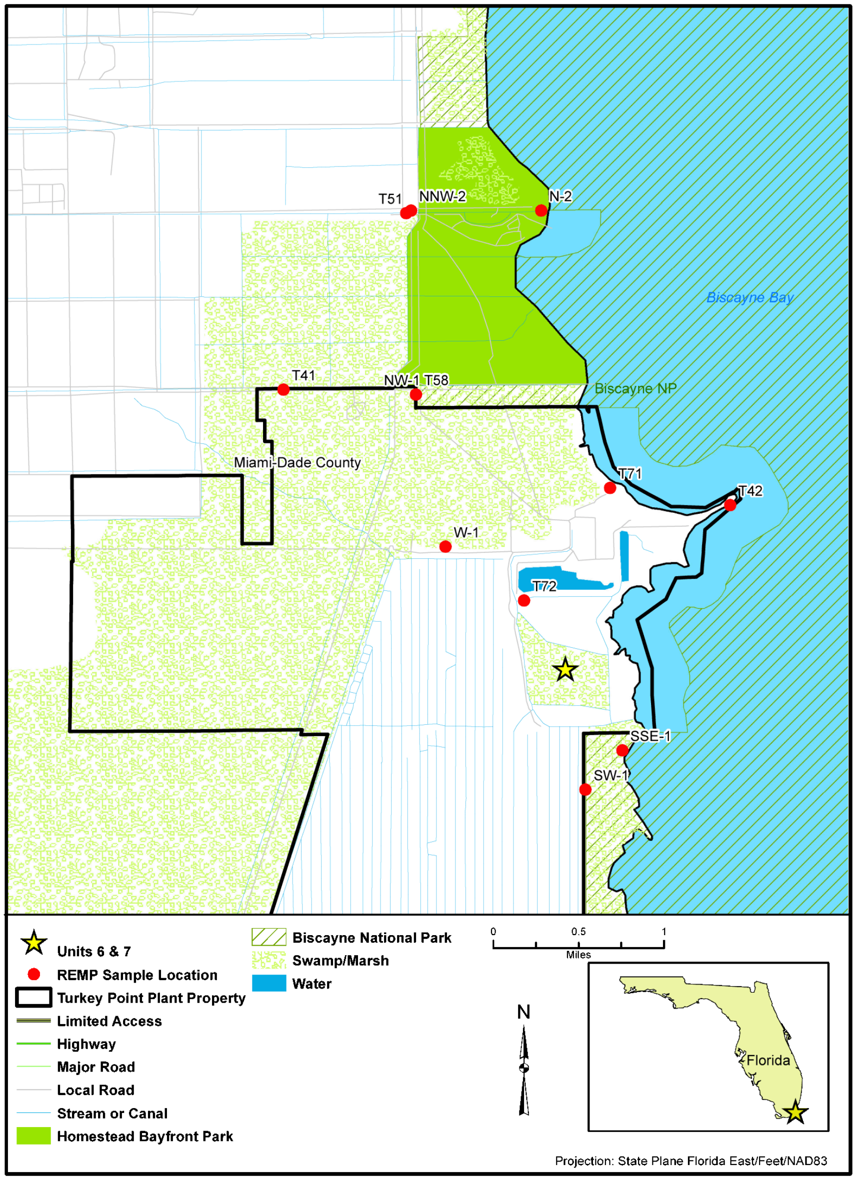


Figure 6.2-2 Units 6 & 7 Remote REMP Sample Locations



6.3 HYDROLOGICAL MONITORING

This section addresses the hydrologic monitoring program that would be implemented to monitor the effects of Units 6 & 7 on the local hydrology. The hydrological monitoring includes baseline (pre-application) groundwater monitoring, field studies for the radial collector wells and deep injection wells, monitoring of construction dewatering activities and surface water discharge, and operational monitoring of the deep injection wells and radial collector wells.

6.3.1 PRE-APPLICATION HYDROLOGICAL MONITORING

This phase of the monitoring supported the background hydrologic descriptions presented in Section 2.3. The objective of the pre-application hydrologic monitoring program is to document background conditions of local groundwater before the construction and operation of the Units 6 & 7. Additional monitoring was performed during pumping tests at the Units 6 & 7 plant area to provide design-level hydrogeologic data for construction dewatering. The pre-application monitoring is described in the following sections.

6.3.1.1 Groundwater Monitoring — Units 6 & 7 Plant Area

This data consisted of groundwater level measurements obtained from shallow and deep monitoring wells installed at the Units 6 & 7 plant area. The monitoring wells and water level measurements are summarized in Table 2.3-15. Figure 2.3-25 depicts the location of the monitoring wells. In addition, water levels were monitored at several monitoring wells using pressure transducers on an hourly (first month) and continuous 36-hour period per month (remainder of year).

6.3.1.2 Groundwater Monitoring — Pumping Tests

Groundwater pumping tests were performed at the Units 6 & 7 plant area to collect hydrogeologic information to determine the design level data for construction dewatering. Monitoring included baseline water levels to determine tidal influences before and during the pumping tests.

Monitoring of the pumping test included discharge rates at each pumping well and water level measurements at multiple, temporary monitoring wells screened at several levels from approximately 10 feet below grade to 110 feet below grade. Subsection 2.3.1.2.2.3 describes the results of these tests.

6.3.2 CONSTRUCTION HYDROLOGICAL MONITORING

The objective of the construction hydrologic monitoring program is to monitor and control potential effects caused by site preparation and construction. Controls and mitigation measures for anticipated construction effects are presented in Section 4.2.

6.3.2.1 Surface Water

As addressed in Section 4.2, the construction activities for Units 6 & 7 would be performed as required under the existing Florida Department of Environmental Protection (FDEP) National Pollutant Discharge Elimination System (NPDES) permit. FDEP adopted the *Generic Permit for Stormwater Discharge from Large and Small Construction Activities* under Rule 62-621.300(4) of the Florida Administrative Code (F.A.C.). Construction activities would be in accordance with any new permit requirements for Units 6 & 7, including any monitoring requirements. As required, a stormwater pollution prevention plan would be developed or the work would be performed under existing FPL permits/plans for construction activities that would require dewatering. The potential effects of groundwater drawdown on surface water features in the vicinity of the construction would be monitored.

Hydrologic monitoring of surface water during the construction of Units 6 & 7 would include monitoring of the cooling canals (e.g., water level, turbidity) to ensure no adverse impacts on the operations of Units 1 through 4.

In addition, hydrologic monitoring of surface water would be established at surface water monitoring points most likely to be potentially impacted by construction activities. These locations could include the barge turning basin and Biscayne Bay and would be monitored for applicable hydrologic parameters including turbidity to ensure no adverse impacts to surface water.

Specific monitoring would be developed as part of the NPDES permit process for construction activities that would occur offsite (e.g., roadway improvements, transmission substation expansion, and linear facilities such as transmission line rights-of-way, reclaimed water pipelines, and potable water pipelines). The need for modifications to the monitoring program would be regularly assessed and implemented as necessary over the duration of the construction hydrological monitoring program to ensure no adverse impacts.

6.3.2.2 Groundwater

As addressed in Section 4.2, the dewatering required for site preparation and the excavation of the Units 6 & 7 power block area could impact groundwater in the area. Several pre-application monitoring wells (Figure 2.3-25) are located within the construction area for Units 6 & 7, and therefore, would have to be abandoned in accordance with FDEP or South Florida Water Management Department regulatory guidelines before construction activities. Several replacement wells may require installation at appropriate locations to ensure adequate monitoring continues during construction. During dewatering activities associated with the construction of the power blocks, temporary monitoring wells may be installed near construction areas to monitor changes in the water table.

As presented in Section 4.2, construction-related wastewater may be discharged to a deep injection well. As previously described in Section 6.1, an exploratory deep injection well would be constructed, along with a dual zone monitoring well. Once permitted, the deep injection well and dual-zone monitoring well would be operated to monitor the injection process and ensure that no adverse effects occur to the overlying aquifer units. Table 6.3-1 summarizes the monitoring of this deep injection well. The data would be collected and submitted to FDEP in accordance with the underground injection control well permit.

Hydrologic alteration to groundwater from the improvement of existing site roads could occur. However, impacts resulting from the hydrologic alteration of groundwater flow, if it occurs, would be temporary and groundwater would return to pre-existing conditions. Therefore, no hydrologic monitoring of groundwater in these areas would be required during construction activities.

Impacts to groundwater flow from equipment barge unloading area modifications would be temporary and groundwater would return to pre-existing conditions. Therefore, no hydrologic monitoring of groundwater in these areas would be required during construction activities.

Any dewatering activities related to construction activities that would occur offsite (e.g., roadway improvements, transmission substation expansion, and linear facilities such as transmission line rights-of-way, reclaimed water pipelines, and potable water pipelines) would be localized and temporary, therefore, no hydrologic monitoring of groundwater in these areas would be required.

6.3.3 PREOPERATIONAL HYDROLOGICAL MONITORING

The preoperational hydrological monitoring program would be designed to provide the baseline for evaluating hydrologic changes arising from the operation of Units 6 & 7. The preoperational hydrological monitoring program would begin approximately 1 year before Unit 6 operation to establish a refined baseline. Additional monitoring wells may be installed following construction activities and before plant operation.

Surface water monitoring during the preoperational phase would be similar to the construction phase. The water level elevation of the existing cooling canals would continue to be monitored during this phase until groundwater levels in the vicinity of the power blocks return to normal. Once this occurs, surface water elevation data for the cooling canals in the vicinity of Units 6 & 7 would be collected to reestablish a baseline for the operations of the radial collector wells.

6.3.3.1 Surface Water

Surface water monitoring for the cooling canals of the industrial wastewater facility during the preoperational phase would be addressed using the existing surface water monitoring program and would suffice as the preoperational hydrologic baseline.

Pre-operational hydrological monitoring for the radial collector wells could include surface water stage within the return canal of the industrial wastewater facility and in Biscayne Bay in the area of the equipment barge unloading area.

During the preoperational phase, it could be necessary to perform routine maintenance on the offsite facilities (e.g., transmission lines, reclaimed and potable water pipelines, access roads). Any disturbances to surface water flow as a result of the activities would be temporary and would not require hydrologic monitoring.

6.3.3.2 Groundwater

Monitoring would be conducted to reestablish baseline conditions for groundwater levels and flow direction after construction is complete. Permanent monitoring wells at the Units 6 & 7 plant area would continue to be monitored to determine the effects of the construction activities on local groundwater.

Initial startup and monitoring plans would be developed and executed as necessary to demonstrate the operational effectiveness of the radial collector wells and the effects on the local groundwater flow regime and surface water bodies such as the industrial wastewater facility and Biscayne Bay.

As previously described in Section 5.2, the operation of the deep injection wells would consist of 12 deep injection wells and 6 dual zone monitoring wells to monitor the potential impact of the injection process on overlying aquifer units. It is anticipated that hydraulic monitoring would be similar to the construction monitoring summarized in Table 6.3-1. Groundwater monitoring data would be collected and submitted to the FDEP in accordance with the underground injection control well permit.

Preoperational testing of the deep injection wells would be performed to validate the initial construction and monitor the effects on local groundwater at the site. Preoperational startup testing and monitoring plans for the deep injection wells would be developed and implemented.

During the preoperational phase, it could be necessary to perform maintenance that would require excavation and dewatering at offsite facilities (e.g., transmission lines, reclaimed and potable water pipelines, access roads). The dewatering activity could create temporary drawdown of the water table. However, the water table and flow would return to normal once dewatering ceased. No hydrologic monitoring of these offsite facilities is required during preoperation.

6.3.4 OPERATIONAL HYDROLOGICAL MONITORING

This phase of the monitoring would document observable effects from Units 6 & 7 operation. The operational hydrologic monitoring program would be designed to document the effects of the operation of the units 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 Units 6 & 7 operation. Modifications to the monitoring program (for example, changes in monitoring stations or collection procedures) would be regularly assessed over the duration of the operational hydrological monitoring program.

6.3.4.1 Surface Water

As addressed in Section 5.2, the FDEP has delegated authority of the NPDES permitting program for the state of Florida. Florida adopted the federal storm water general permit for industrial activities as specified in Rule 62-621.300(5) (a), F.A.C., and operates the permit as the *State of Florida Multi-Sector Generic Permit for Stormwater Discharge Associated with Industrial Activity*. Stormwater from Units 6 & 7 would be released to the industrial wastewater facility under a requested modification of the site's non-discharge IWWF permit.

It is anticipated that surface water monitoring of the existing cooling canals would continue to be performed similar to the preoperational monitoring activities.

Since the radial collector wells would be a secondary cooling water source for Units 6 & 7, the monitoring frequency would be dependent upon their operation. Surface water stages would be measured within the return canal of the industrial wastewater facility and in Biscayne Bay in the area of the equipment barge unloading area.

6.3.4.2 Groundwater

Specifics related to the operational monitoring are anticipated to be similar to the specifics for the preoperational hydrological monitoring program. An operational plan for hydrologic monitoring may be implemented to identify changes in groundwater hydrology from the pumping of water from the radial collector wells. The groundwater level monitoring program would consist of extending preoperational monitoring for the duration of the Units 6 & 7 operation. The need for modifications to the monitoring program (for example, changes in monitoring stations or frequency of collection) would be regularly assessed over the duration of the operational hydrological monitoring program.

As presented in Section 5.2, wastewater and cooling tower blowdown would be discharged to the Boulder Zone of the Lower Floridan aquifer via deep injection wells. Twelve deep injection wells and six dual-zone monitoring wells would be operated. It is anticipated that the hydraulic monitoring program would be similar to the exploratory well monitoring program and is summarized in Table 6.3-1.

During operation, the volume of water pumped by the radial collector wells would be monitored. Groundwater could be also monitored at monitoring wells adjacent to the collector wells and along the shoreline to collect field measurements of water elevation.

During the operational phase, it could be necessary to perform routine maintenance on the offsite facilities (e.g., transmission lines, reclaimed and potable water pipelines, access roads). Any disturbances to surface water flow as a result of the activities would be temporary and would not require hydrologic monitoring.

Table 6.3-1
Hydrological Monitoring of the Deep Injection Wells

Monitoring Station	Parameter	Frequency
Deep Injection Wells	Flow Rate	Continuous
Dual Zone Monitoring Wells	Water Level	Continuous

6.4 METEOROLOGICAL MONITORING

The meteorological monitoring program is the same throughout the pre-application, preconstruction, construction, and operational phases. The monitoring program is a continuation of the ongoing meteorological monitoring program for Units 3 & 4.

The purpose of this section is to establish that the onsite meteorological measurements program used by Units 6 & 7 would be adequate to: (1) describe local and regional atmospheric transport and diffusion characteristics, (2) ensure environmental protection, and (3) provide an adequate meteorological database for evaluation of the effects of plant operation. This description includes an analysis of the meteorological monitoring system that provides an evaluation of:

- Tower location and instrument siting
- Meteorological parameters measured
- Meteorological sensors
- Data recording and transmission
- Instrument surveillance
- Data acquisition and reduction
- Data validation and screening
- Data display and archiving
- System accuracy
- Data recovery rate and annual and joint frequency distribution of data
- Need for additional data sources for airflow trajectories

This evaluation demonstrates that the meteorological monitoring program meets the requirements of 10 CFR Part 50, Appendix I and 10 CFR 51.45(c), 51.50, and 100.20(c)(2) and the guidance in Section C of RG 1.23, Revision 1, with the exception of humidity measurements; Section C.4 of RG 1.111, Revision 1; RG 1.21, Revision 1 and ANSI/ANS 3.11, Dec 2005.

6.4.1 GENERAL DESCRIPTION — ONSITE METEOROLOGICAL MEASUREMENTS PROGRAM

The location at which meteorological measurements would be necessary in order to characterize the dispersion conditions depends largely on the complexity of the terrain in the vicinity of the site. The following briefly describes the topographic features of the Turkey Point vicinity. This description, together with the description in Section 2.7 regarding the topographic features and the dispersion characteristics of the Turkey Point plant property, forms the basis for assessing the adequacy of the meteorological monitoring program for Units 6 & 7.

As a peninsula, Florida receives sea breezes from both the Gulf of Mexico and the Atlantic Ocean. The major local influence on onsite meteorology is the presence of the Atlantic Ocean. Units 6 & 7 would be located less than 0.4 miles west from the shore of Biscayne Bay. Figures 2.7-1 and 2.7-15 provide 50-mile and 5-mile radius maps, respectively. As shown in Figure 2.7-1, terrain within 50 miles is generally flat and rises gently from sea level at the shore to approximately 86 feet MSL northeast of the site and 8 to 10 miles west of the site. Additional images presenting terrain variations by downwind sector are shown in Figure 2.7-14.

6.4.2 PREOPERATION MONITORING PROGRAM

Unit 3 began operation in 1972 and Unit 4 in 1973. Renewed operating licenses for both units were issued by the NRC in 2002 (NUREG-1437). The onsite meteorological measurement program includes the South Dade 60-meter guyed meteorological tower that serves as the primary data collection system and the land utilization (LU) 10-meter tower with engineered guy wires that serves as a backup to the primary system. The 10-meter tower is used for emergency situations at Turkey Point. The South Dade tower was rebuilt in 1994. Meteorological data from the South Dade tower was used for pre-application analysis. The backup meteorological system is an independent system installed and maintained for the purpose of providing redundant site-specific meteorological information (10-meter wind speed, wind direction, and sigma theta), representative of the local environment.

The onsite meteorological measurement program for both the primary and backup towers was upgraded in 2007 to support the new Units 3 & 4 Distributed Control System (DCS) installation. Existing data loggers and radio communication equipment were replaced with improved instrumentation to enhance the maintainability and reliability of the system. The upgraded system included meteorological tower communication hardware and computer software.

The monitoring system is equipped with lightning protection and redundant power supplies.

For preparation of the COL Application, the adequacy and accuracy of the meteorological collection system were assessed based on the recommendations contained in NUREG-1555. The areas assessed include tower locations, siting of sensors, sensor performance specifications, methods and equipment for recording sensor output, data acquisition and reduction procedures, and the quality assurance program for sensors, recorders, and data reduction. The findings, as summarized in Tables 6.4-1 through 6.4-4 conclude that the instrument heights, location of the South Dade tower, relocation of the LU tower, system accuracies, methodologies for data acquisition and reduction, and procedures for instrumentation surveillance conform to RG 1.23 Revision 1 (except for humidity measurements as previously noted) and industry standard ANS/ANSI 3.11 (Dec 2005). Data collected by the South Dade tower for Units 3 & 4 provides a suitable data set for Units 6 & 7.

Because the South Dade tower and instrument siting conform to RG 1.23, Revision 1, data collected by the tower is representative of the overall site meteorology. Instrumentation surveillance and data validation in accordance with the applicable regulatory and industry guidance has routinely been performed to ensure data quality as well as to achieve the acceptable annualized data recovery rate of 90 percent.

Data collected from the South Dade tower has been used for Units 6 & 7 to:

- Describe local and regional atmospheric transport and diffusion characteristics
- Calculate the dispersion estimates for both postulated accidental and expected routine airborne releases of effluents
- Evaluate environmental risk from the radiological consequences of a spectrum of accidents
- Provide an adequate meteorological database for evaluation of the effects of construction and operation, including radiological and nonradiological impacts and real-time predictions of atmospheric effluent transport and diffusion.

6.4.2.1 Location, Elevation, and Exposure of Instruments

Factors that were considered in determining how well the measurement instrument locations would represent the conditions for Units 6 & 7 include the prevailing wind direction, topography, and location of man-made and vegetation obstructions.

Findings, as presented below, indicate that the data collected from the South Dade tower is suitable for use in characterizing atmospheric dispersion conditions for Units 6 & 7.

6.4.2.2 Tower Siting and Instrument Conformance

The geographic coordinates for the South Dade tower are: 25º 21' 05.74120" north latitude and 80º 22' 45.54962" west longitude. The geographical coordinates for the LU tower are: 25º 25' 35.072" north latitude and 80º 20' 15.536" west longitude.

As shown in Figure 2.7-15, the area within five miles of Units 6 & 7 is generally flat with terrain variation of approximately seven feet. The locations of the South Dade and LU meteorological towers with respect to the existing and new units are shown in Figure 6.4-1 and 6.4-2, respectively. The South Dade tower is approximately 5.8 miles southwest of Units 6 & 7, at elevation 0.8 feet MSL, while the LU tower is currently approximately 0.30 miles northwest of Units 6 & 7, at elevation 3 feet MSL. The finished grade at the Units 6 & 7 power blocks would be approximately 25.5 feet MSL.

Although the base of the South Dade tower is approximately 25 feet below the elevation of the finished plant grade of Units 6 & 7, there would be minimal terrain variations between the Units 6 & 7 plant area and the South Dade tower. The locations of the South Dade meteorological tower and Units 6 & 7 have similar meteorological exposures.

The base of the LU tower would be approximately 22 feet below the finished plant grade of Units 6 & 7. Based on the relatively close distance (0.30 miles) of the LU tower to Units 6 & 7, the LU tower would have different meteorological exposures than Units 6 & 7 and would require relocation.

6.4.2.3 Obstructions

The wind sensors should be located over level, open terrain at a distance of at least 10 times the height of any nearby natural and man-made obstructions (e.g., terrain, trees, and buildings), if the height of the obstruction exceeds one-half the height of the wind measurements (RG 1.23, Revision 1). Therefore, an assessment regarding whether the wind measurements made at locations and heights on the South Dade and LU towers would avoid airflow modifications by obstructions was made and the findings are described below.

Equipment shelters, housing the data acquisition system for tower measurements and a backup diesel generator, are located adjacent to both the South Dade and LU towers. The shelters are located on raised mounds to protect them from tidal surges and hurricanes.

The South Dade equipment shelter mound (the built up area on which the shelter rests) is approximately 21.5 feet north of the South Dade tower and the equipment shelter building is approximately 36.8 feet north of the tower. The roof height of the shelter (relative to 60-meter tower base elevation) was measured; the shelter mound at approximately 9.6 feet above ground level north of the tower and the shelter roof at approximately 10.8 feet above the base, for a total height of approximately 20.4 feet.

Possible obstruction interference on the South Dade meteorological measurement was evaluated. The azimuth angles of each side of the shelter were sighted and measured from the tower base. These form the basis of defining a sector of possible influence. This sector extends from approximately 353 degrees to 28 degrees in the 360-degree tower wind measurement field.

A frequency of occurrence analysis of wind direction for one year (January–December 2003) of wind data from the 10-meter level from the sector of possible influence occurred 6.8 percent of the time during 2003. It was concluded that the effects of the building mound/shelter at the 10-meter wind measurement were minimal.

There have been no changes to obstructions in relation to the South Dade tower. As previously stated, potential wake effects are not considered to have influenced wind measurements from the South Dade tower during the period of record used to support preparation of this COL Application.

The surrounding terrain, nearby trees, and plant structures (existing and planned) were also evaluated to determine whether they could affect the meteorological measurements. As shown in Figure 6.4-1, surrounding terrain of the South Dade tower, located in an open field, is generally flat with low profile plants. No terrain-induced airflow influence on the meteorological measurement would result. The tallest existing and planned buildings (both Units 3 & 4 and Units 6 & 7) would be approximately 5.8 miles northeast from the South Dade tower. No building-induced obstructions to airflow would result from Units 6 & 7.

Finally, wind sensors are mounted on a boom extending six feet outward on the upwind side of the tower to minimize tower structure influence.

The LU meteorological tower equipment shelter is currently located approximately 35 feet (10.7 meters) west of the 10-meter LU tower. With an obstruction height of approximately 20 feet, according to the 10 times the height of the obstruction convention, the tower should be 200 feet away. Since tower separation from the obstruction is approximately 35 feet, the site does not meet conventional specifications for the measurement of an obstruction. A utility pole is located northwest of the LU tower. It should be noted however, that similar to the South Dade tower, the obstructions are not in the path of prevailing east wind direction flow.

Due to increased traffic during Units 6 & 7 construction and the raised elevation of the finished plant grade (25.5 feet MSL) and associated structures, the LU tower would need to be relocated to an appropriate location on the plant property to ensure tower/instrument operation is in conformance with relevant regulations and guidance documents.

6.4.2.4 Heat and Moisture Sources

Based on the structure layout as shown in Figure 6.4-3, the ambient temperature measurements on the South Dade tower were assessed to determine whether they avoid air modification by any heat and moisture sources (e.g., ventilation sources, cooling towers, water bodies, large parking lots). A brief description is also included for the LU tower.

The South Dade tower is in a field with grassy surfaces. There are no large concrete or asphalt parking lots or temporary land disturbances such as plowed fields or storage areas nearby. The closest large concrete or asphalt parking lots and ventilation sources are at Units 3 & 4, which is approximately 6.5 miles from the South Dade tower.

The cooling system for Units 6 & 7 would include six mechanical draft cooling towers. As shown in Figure 6.4-1, the cooling canals of the industrial wastewater facility are approximately 4500 feet northeast of the South Dade tower at their closest point, while the Units 6 & 7 cooling towers would be located approximately 5.5 miles northeast of the South Dade tower. The location of the South Dade tower is not directly downwind of the cooling canals or the Units 6 & 7 cooling towers under the prevailing downwind wind direction (i.e., easterly). Therefore, there would be no influence on the South Dade heat sensors. In addition, the tower temperature sensors are mounted in fan-aspirated radiation shields, which are horizontal to minimize the impact of thermal radiation and precipitation. The monitoring functions on the South Dade tower would be maintained.

The LU tower is located immediately adjacent to the main return canal in the industrial wastewater facility (Figure 6.4-2). Although the proximity to the canals could impact temperature measurements, temperature is not measured at the LU tower. The LU tower is used for emergency situations only (short-term) and not for normal data collection/reporting. The LU tower is located near an asphalt road, however the road has very little traffic and again, temperature is not measured at the LU tower. The potential effects from temperature would not be a factor for tower relocation.

No parameters related to atmospheric moisture are currently measured on the Turkey Point plant property.

6.4.2.5 Wind Loss

Both precipitation gauges are equipped with funnel screens, but not equipped with wind shields to prevent wind-caused under-recording of precipitation. However, wind effects on precipitation catch losses are known to be much greater during snowfall than rainfall, and snowfall is not a factor at the Turkey Point plant property.

6.4.2.6 Meteorological Parameters Measured

Meteorological instrumentation includes two levels of measurements on the South Dade tower, and a single level on the LU tower. The meteorological data collected for NRC reporting take all of their data from the South Dade tower. The LU 10-meter data would be used as backup, if needed. The meteorological instrumentation on these towers is summarized in Table 6.4-3.

The actual height of the sensors for wind direction and speed at the 10-meter elevation of the South Dade tower (height from bottom of concrete pad base is 11.58 meters (38.0 feet). The Units 6 & 7 reactor buildings would have no stacks. Power block accident atmospheric release points for the AP1000 are at ground level, 25.5 feet above sea level, below the upper wind measurement height (i.e., 60 meters). Ground level releases include all release points or areas that are lower than two and one-half times the height of adjacent solid structures. Because the ground level release scenario provides a bounding case, and none of the release heights is higher than 2.5 times the height of the associated reactor containment shield building, elevated releases were not considered. Meteorological parameters measured for these releases are consistent with RG 1.23, Revision 1, Section 2.

Ambient temperature is monitored both at the 10- and the 60-meter levels. The actual height of temperature sensors A and B at the 10-meter elevation of the South Dade tower (height from bottom of concrete pad base is 10.36 meters (34 feet) above ground level. Vertical differential temperature (i.e., ΔT) is calculated as the difference between the temperatures measured at the 10-meter and 60-meter levels. Precipitation is measured using a tipping bucket precipitation gauge mounted at ground level but away from the tower shelter to prevent any interference in precipitation capture. The precipitation gauge is located 24.5 feet (7.5 meters) southeast from the base of the 60-meter tower. Solar radiation is measured approximately 23 feet (7 meters) southeast from the base of the 60-meter tower at 4 feet (1.2 meters) above ground, but the data collected was not used in preparing this COL Application.

On the LU tower, wind speed, wind direction, and wind direction standard deviation (i.e., sigma theta for atmospheric stability class determination), are obtained at the 10-meter level.

6.4.2.6.1 Meteorological Sensors

A description of the meteorological sensors including sensor type, manufacturer model, sensor specifications (including sensor starting threshold, range, and measurement resolution), and system accuracy for the Units 3 & 4 data collection system during the preoperational monitoring period for the current configuration are provided in Table 6.4-4.

As presented in Subsection 6.4.2, the existing meteorological data collection system was upgraded in 2007 to support the new DCS system installation, which included upgrading data logger and radio communication equipment in the control buildings for both the primary and backup towers to enhance maintainability and reliability of the system. Climatronics cup sets and bi-vane are used for wind measurements. Climatronics temperature sensors are used for ambient temperature and ΔT calculations. Campbell Scientific added bridge circuits to the thermistor to provide a voltage input directly to the data loggers. A Climatronics 8-inch rain gauge (tipping bucket) is located approximately 24.5 feet southeast from base of the South Dade tower.

Meteorological sensors used on both the primary and backup meteorological towers are designed to operate in the environmental conditions found at Turkey Point. Specifically, these instruments are capable of withstanding the following environmental conditions as provided in the specification of the upgraded meteorological monitoring system:

- Ambient temperature range of –40.0°F (–40°C) to +120.0°F (49°C).
- Wind load up to 100 mph (45 meters per second) (The wind sensors were damaged at 100 mph when tested by Hurricane Andrew).

The instruments on the towers, past and present, are off-the-shelf components that are used universally throughout the nuclear industry and other industries for meteorological measurement. Based on operating experience, the only adverse operational effects that have been noted were the susceptibility of the rotating cup and weather vane instruments to bearing wear and degradation as a result of the site environmental conditions that required the instruments to be replaced approximately every six months.

6.4.2.6.2 Instrumentation Surveillance

Calibration and maintenance of the onsite meteorological monitoring system is in accordance with RG 1.23, Revision 1, Section C.5, Regulatory Position, Instrument Maintenance and Servicing Schedules, and ANS/ANSI 3.11, Section 7, System Performance (ANS/ANSI Dec 2005).

The meteorological equipment is kept in proper operating condition by staff that are trained and qualified for the necessary tasks. The existing meteorological monitoring system is calibrated semiannually at both the primary and backup towers, and channel checks are performed daily in order to achieve maximum data recovery. System operability is also checked by using the system’s three radio frequencies, one which is exclusive to the land utilization building. Two other radio frequencies are exclusive to the Units 3 & 4 plant computers to remotely monitor the system status. More frequent calibrations and/or replacement intervals for individual components may be conducted, on the basis of the operational history of the component type.

Detailed instrument calibration procedures and acceptance criteria are followed during system calibration. Calibrations verify and, if necessary, reestablish accuracies of sensors, associated signal processing equipment, and displays. Routine calibrations include obtaining both as-found (before maintenance) and as-left (final configuration for operation) results. The end-to-end results are compared with expected values. Any observed anomalies that may affect equipment performance or reliability are reported for corrective action. If any acceptance criteria are not met during performance of calibration procedures, timely corrective measures (e.g., adjusting response to conform to desired results by qualified personnel on site or returning the sensor to vendor for calibration) are initiated.

Inspection, service, and maintenance, including preventive and/or corrective maintenance on system components for transmitting, manipulating, and/or processing meteorological data for computer display or storage, are performed according to the instrument manuals and plant surveillance program procedures to maintain at least 90 percent data recovery.

6.4.2.7 Meteorological Data Processing

The data processing procedure for Units 6 & 7 meteorological data involves three basic steps:

- Data acquisition
- Data processing
- Data analysis

6.4.2.7.1 Data Acquisition

Following an upgrade of the meteorological program in 2007 to accommodate the DCS installation, data has been collected and electronically transmitted to various plant computers for display. The LU computer is used for QC checks, but reports are done only from manual data collection from the towers directly. Archives of this data are held in hard copy in document control and digitally on the network drive.

The recorders were removed when the DCS system was installed. A modbus radio modem to a data logger transmits across fiber optic link to the plant computer.

Running 15-minute averages are performed at the towers and are transmitted to the plant. This is because of the risk of reconstruction error in the VHF radio modems; however, data from the meteorological tower is transmitted to a computer at the LU office, capable of reading the meteorological tower data real time. Refer to Figures 6.4-3 and 6.4-4 for the system block diagrams for the current configuration.

6.4.2.7.2 Data Processing

The processing equipment is housed in environmentally controlled (air conditioned) shelters. A direct readout capability from these microprocessors during routine system inspection is included.

The microprocessors sample the meteorological processor modules once per second for each parameter measured. Rainfall is monitored for pulse counts and calculated to a 15 minute total and hourly total. Water collected by the rain gauge is automatically drained and counted each time an internal bucket fills with 0.01 inch of rainfall.

The microprocessors provide current sampling values as well as the 15- and 60-minute averages. Sigma theta is computed for each wind direction channel in the microprocessor. These calculated averages are output to the data logger. Data can be stored to a diskette by plugging in a laptop and downloading it for subsequent system monitoring, data verification, and processing uses.

6.4.2.7.3 Data Analysis

Meteorological data is generally reviewed every workday to identify possible data problems and notify appropriate personnel. Meteorological data is validated before it is placed into permanent archival storage to verify that the amount of valid data in the master record meets regulatory requirements for minimum data collection.

Meteorological validations are performed to ensure accurate data transmission from the sensors and include checks such as minimum wind speed, minimum wind direction, wind speed, and wind direction comparisons between the 10- and 60-meter levels, temperature ranges, and hourly ΔT limits.

Computer software is used in the screening process to identify recurring types of data errors, including the following items:

- Missing data (out-of-range values) and unchanging data for the 10-meter wind speed, wind direction, and ΔT for the primary tower.
- The daily average difference between the primary and backup tower wind speeds and wind directions measured at 10 meters.
- Periods of daytime stable and nighttime unstable conditions.
- The parameter and the date(s) and time(s) requiring adjustment or correction are accurately identified. The reasons that the data is to be edited (missing or questionable) are indicated as well as the basis for the corrections or adjustments. Methods for data substitution include using the following:
    - — Alternate monitor (e.g., backup tower instrument or sigma theta to estimate atmospheric stability)
    - — Extrapolation for short durations if the observations before and after the missing/ questionable data is consistent (persistence)

— Seasonal average data

The quality of the adjusted data is reviewed, and suspected data is flagged. Any data adjustments or corrections are documented and archived. In addition, visual scanning of the 10-meter wind speed and direction data will be routinely performed for abnormal values or inconsistency.

Routine hourly average data would be downloaded and formatted monthly for review and editing. Acceptable data editing methods have been established and implemented. Typically, missing or invalid primary tower 10-meter wind speed, wind direction, and ΔT data are manually replaced with backup tower data. Upon completion of the validation and editing, the meteorological data constitute quality records.

6.4.2.7.4 Data Display and Archiving

In order to identify rapidly changing meteorological conditions for use in performing emergency response dose consequence assessments, 15-minute average values would be compiled for real-time display in the Units 6 & 7 control rooms, technical support center, and emergency operations facility. The meteorological channels required for input to the dose consequence assessment models are available and presented in a format compatible for input to these dose assessment models in RG 1.97.

An additional feature of the data acquisition system is the storage of the 15- and 60-minute averaged meteorological data. At a minimum, the latest 12 months of averaged data resides on the system hard-drive. The historical data can be retrieved, archived, displayed, or printed.

6.4.2.7.5 System Accuracy

Sources of error for time-averaging digital systems include sensors, cables, signal conditioners, temperature environments for signal conditioning and recording, equipment, recorders, processors, data displays, and data reduction process.

The system accuracies of the meteorological data collection system are compared to the regulatory requirements and the findings are summarized in Table 6.4-4. As shown in Table 6.4-4, the system accuracies meet the regulatory guidance in RG 1.23, Revision 1 and ANS/ANSI 3.11 (ANS/ANSI Dec 2005).

6.4.2.7.6 Meteorological Instrumentation

Currently, meteorological parameter data signals from the primary and backup towers are read directly by the dataloggers and transmit across serial links to the radio modems. The data logger converts, tracks, trends, and transmits the data via wireless antenna to the DCS, where the data is available to DCS workstations in Units 3 & 4 and emergency facilities. Each meteorological tower has its own dedicated communication link to the DCS of Units 3 & 4 and, therefore, the backup tower is the duplicate communication link for the primary tower.

The meteorological monitoring system block diagrams for Units 6 & 7 are provided in Figures 6.4-3 and 6.4-4 for the primary and backup towers, respectively.

6.4.2.8 Meteorological Data Used for Application

6.4.2.8.1 Data Recovery Rate and Annual Joint Frequency Distribution of Data

As described in RG 1.23, the minimum amount of onsite meteorological data to be provided at the time of application is a consecutive 24-month period of data that is defendable, representative, and complete, but not older than 10 years from the date of the application. However, 3 or more years of data are preferable and, if available, should be submitted with the application. Based on review of 10 years of data from Units 3 & 4, the 2005–2006 dataset was determined to be the best available (using validated data with the least data substitution), representative (tower and sensor siting in accordance with RG 1.23, Revision 1), and complete. However, as a result of data recovery issues at the 60-meter level, a third year of data was used (2002) to ensure a composite recover of at least 90 percent.

The annualized data recovery rates for 2002, 2005, and 2006 are presented in Table 6.4-5 for the individual parameters (i.e., wind speed, wind direction, ambient temperature, and temperature difference) and the composite parameters. As shown in the table, composite data recovery rates meet the RG 1.23, Revision 1 requirement of at least 90 percent.

The required joint frequency distributions are presented in Tables 2.7-10 and 2.7-11 in the format described in RG 1.23, Revision 1 for wind speed and wind direction by stability class and by all stability classes combined for the 10- and 60-meter level measurements. It should be noted that no calms were reported during the 2002, 2005, and 2006 annual periods. Wind speeds greater than 0.5 mph (starting threshold of sensor) are considered non-calm winds. Forty two hours of calm winds (less than 0.5 mph) were recorded. These hours, however, were not considered valid and not included in the dataset.

6.4.2.8.2 Need for Additional Data Sources for Airflow Trajectories

Because the Turkey Point area is generally flat with airflow dominated mostly by large-scale weather patterns as concluded in Section 2.7, data collected by the Units 3 & 4 collection system can be used for the description of atmospheric transport and diffusion characteristics within 50 miles of Units 6 & 7.

The modeling methodology used to calculate dispersion estimates out to 50 miles, XOQDOQ, does not use offsite data. The XOQDOQ model, an NRC-sponsored computational model based on RG 1.111, is a constant mean wind direction model using meteorological data from a single station. In the model, application of the terrain-induced airflow recirculation factor options are provided to account for the effects of airflow recirculation phenomenon occurring within the area of interest when the meteorological data from a single station is used to represent the entire modeling domain. However, application of the airflow recirculation factor for sites located within open terrain is not required. This methodology implies that the meteorological data from an onsite station is reasonably representative of the entire modeling domain and adjustment to the dispersion estimates calculated by the model out to 50 miles of a site located within open terrain is not required.

For coastal sites in open terrain such as Turkey Point, an airflow recirculation factor provided in the XOQDOQ model is used to account for potential airflow recirculation as a result of sea breeze and land breeze effects and during the infrequent stagnation conditions that could lead to more restrictive dispersion estimates. With application of the appropriate airflow recirculation factor, data collected from an onsite meteorological monitoring station for making dispersion estimates out to 50 miles is adequate. Therefore, no offsite data collection systems were used to determine the dispersion characteristics of the Turkey Point area.

6.4.2.8.3 Supplemental Data for Environmental Impact Evaluation

Supplemental data from the NWS, Miami International Airport, Florida, is suitable for making impact predictions resulting from operation of the Units 6 & 7 cooling towers, regarding visible plume, drift deposits, fogging, and icing. In particular, the AERMOD and CALPUFF models used for predicting cooling tower salt deposits and fogging impacts, respectively, require such data as twice daily mixing height, cloud ceiling, cloud cover, dry bulb, wet bulb, wind speed, and wind direction that are routinely measured at Miami but not at Turkey Point for all parameters. Furthermore, long-term meteorological data at Miami is available that allowed for the year-to-year variation in meteorological data to be factored into the cooling tower plume impact predictions. The 2001–2005 Miami meteorological data was used for this modeling.

6.4.3 OPERATIONAL MONITORING

The Units 3 & 4 meteorological monitoring program is conducted in accordance with the applicable regulatory guidance and the existing system would be used during Units 6 & 7 operation.

Although the current system, including both the tower and meteorological sensors, may be upgraded periodically or replaced before Units 6 & 7 operation, the functional requirements of the operational program for Units 6 & 7 are described based on the current system.

The LU tower would need to be relocated because of potential construction impacts. The relocated LU tower would be equipped with instrumentation that satisfies applicable regulations and regulatory guidance.

6.4.4 EMERGENCY PREPAREDNESS SUPPORT

The 10-meter wind speed/direction data from the LU 10-meter tower would be the primary data used in emergencies. The data from the South Dade tower would be used as backup during an actual plant emergency if required.

The Units 6 & 7 onsite data collection system would provide representative meteorological data for use in real-time atmospheric dispersion modeling for dose assessments during and following any accidental atmospheric radiological releases. The data would be also used to represent meteorological conditions within the 10-mile emergency planning zone radius (NUREG-0696, NUREG-0737, and NUREG-0654).

Similar to the Units 3 & 4 meteorological monitoring program, the microprocessors would sample the meteorological processor modules once per second for wind speed, wind direction, and ambient temperature for calculations of vertical temperature difference in order to provide near real-time meteorological data for use in atmospheric dispersion modeling. Dose assessment calculations would be performed using the most recent 15-minute average of data, in accordance with RG 1.97.

To identify rapidly changing meteorological conditions for use in performing emergency response, 15-minute average values would be compiled for real-time display in the Units 6 & 7 control rooms, technical support center, and emergency operations facility. The meteorological channels required for input to the dose assessment models would be available and presented in a format compatible for input to these dose assessment models, in accordance with the requirements in RG 1.97.

Provisions are currently in place to obtain representative regional meteorological data from the National Weather Service in Miami during an emergency if the existing meteorological system is unavailable. The current (or similar) emergency plan procedures and the monitoring system arrangement would be used for Units 6 & 7.

Section 6.4 References

ANS/ANSI 2005. *American National Standard for Determining Meteorological Information at Nuclear Facilities, ANS/ANSI 3.11-2005, December 2005.*

Table 6.4-1
Meteorological Tower Siting Conformance Status

RG 1.23, Revision 1 Criteria	Conformance Status	Remarks
Tower Siting		
The meteorological tower sites and the Units 6 & 7 location have similar meteorological exposure.	Yes	The Turkey Point plant property is generally flat land.
The base of the tower is at approximately the same elevation as the finished plant grade of Units 6 & 7.	No No	The South Dade tower is below the approximately 25.5 feet finished plant grade. However, due to the similarity of the landscape, there would be minimal effects. The finished plant grade of Units 6 & 7 and associated buildings would produce different meteorological exposures than at the current LU tower location. The LU tower would need to be relocated.
Location of the tower is not directly downwind of the plant cooling systems (i.e., cooling canals in the industrial wastewater facility and mechanical draft cooling towers) under the prevailing downwind wind direction.	Yes No	The South Dade tower is not located near preexisting or planned cooling systems. The LU tower is located near existing cooling canals on both the east and west sides; however, the majority of the cooling canals are located west of the LU tower, while the path of the prevailing downwind wind direction is from the east. The LU tower would need to be relocated because of construction impacts and operational concerns (i.e., height of the Units 6 & 7 finished plant grade and structures).
Tower is not located on or near permanent man-made surface.	Yes No	There are no large concrete or asphalt parking lot or temporary land disturbance, such as plowed fields or storage areas nearby the South Dade tower. The closest large concrete or asphalt parking lots are at Units 3 & 4, which is approximately 6.5 miles from the South Dade tower. The LU tower is located near an asphalt roadway and temperature is not measured. Temperature concerns would not be an issue in the siting of the LU tower at a new location.

Table 6.4-2
Meteorological Sensor Siting Conformance Status

RG 1.23, Revision 1 Criteria	Conformance Status	Remarks
Sensor Siting		
Wind sensors should be located away from nearby obstructions to airflow (e.g., plant buildings, other structures, trees, nearby terrain) by a distance of at least 10 times the height of any such obstruction that exceeds one-half the height of the wind measurement level to avoid any modifications to airflow (i.e., turbulent wake effects).	Yes No	The South Dade tower is located near a raised mound/equipment shelter. However, the effects were found to be minimal on the South Dade tower. The LU tower would need to be relocated because of construction impacts and operational concerns (i.e., height of the finished plant grade and buildings).
Wind sensors are located at heights that avoid airflow modifications by nearby obstructions with heights exceeding one-half of the wind measurement.	Yes	See remark above.
Wind sensors are located extended outward on a boom to reduce airflow modification and turbulence induced by the supporting structure itself. Wind sensors on the side of a tower should be mounted at a distance equal to at least twice the longest horizontal dimension of the tower (e.g., the side of a triangular tower).	Yes	Tower booms (6 feet long) are oriented into the prevailing winds to reduce tower effects on the measurements. The wind sensors are boom-mounted more than approximately 6.5 feet from the tower (more than twice the tower's width of 3 feet).
The sensors should be on the upwind side of the mounting object in areas with a dominant prevailing wind direction.	Yes	The wind speed/direction boom is pointed southeast into the dominant wind direction.
Air temperature and dew point sensors are located in such a way to avoid modification by the existing and proposed heat and moisture sources, such as ventilation systems, water bodies, or the influence of large parking lots or other paved surfaces.	Yes (see remark) No	The South Dade tower is not located near any heat or moisture sources. The LU tower is located near the cooling canals. Dew point is not measured at either the South Dade or LU towers.
Temperature sensors should be mounted in fan-aspirated radiation shields to minimize adverse influences of thermal radiation and precipitation. Aspirated temperature shields should either be pointed downward or laterally towards the north. The shield inlet should be at least 1.5 times the tower horizontal width away from the nearest point on the tower.	Yes	Temperature is measured only on the South Dade Tower. Temperature sensors are mounted in fan-aspirated radiation shields. Aspirated temperature shields are horizontal. The shield inlet is situated approximately 2.5 feet from the tower (slightly less than 1.5 times the tower's width of 3 feet).
Precipitation measured at ground level near the base of the tower. Precipitation gages should be equipped with wind shields to minimize wind-caused loss of precipitation and, where appropriate, equipped with heaters to melt frozen precipitation.	Yes (see remark)	Precipitation is measured at ground level near the base of each of the towers, but the gauge is located away from the tower shelter to prevent any interference in precipitation capture. Neither precipitation gauge is equipped with wind shields to minimize the wind-caused loss of precipitation, but each gauge has a funnel screen.

Table 6.4-3
Units 6 & 7 System Meteorological Instrumentation

Parameter	Primary Tower Level (meters)	Backup Tower Level (meters)
Wind Speed	10, 60	10
Wind Direction	10, 60	10
Temperature	10, 60	None
Vertical Temperature Difference	(10–60)	None
Sigma Theta	10, 60	10
Precipitation	1.37[a]	1.37
Solar Radiometer	1.2[b]	None
Barometric Pressure	[c]	None
Humidity	None	None

(a) Located approximately 7.5 meters (24.5 feet) southeast from base of 60-meter tower
(b) Located approximately 7 meters (23 feet) southeast from the base of the 60-meter tower
(c) Located outside the equipment shelter on the south wall

Table 6.4-4 (Sheet 1 of 3)
Units 6 & 7 Meteorological System — Preoperational/Operational Configuration

Sensed Parameter	Sensor Type	Range	System Accuracy	System[(a)] Accuracy NRC RG 1.23, Revision 1	System[(b)] Accuracy ANSI/ANS-3.11-2005	Starting Thresholds	Starting[(a)] Threshold NRC RG 1.23, Revision 1	Measure-ment Resolution	Measure-[(a)] ment Resolution NRC RG 1.23, Revision 1	Measure-[(b)] ment Resolution ANSI/ANS-3.11-2005	Elevation (Relative to Tower)
South Dade Tower Instruments											
Wind Speed	3 Cup Anemometer	0 to 100 mph (0 to 45 m/s)	0.5 mph (±0.22 m/s) or ±1.0% of true air speed (whichever is greater)	±0.45 mph (±0.2 m/s) or 5% of observed wind speed	±0.45 mph (0.2 m/s) or 5% of observed wind speed	0.5 mph (0.22 m/s)	1 mph (<0.45 m/s)	—	0.1 mph or 0.1 m/s	0.1 mph or 0.1 m/s	10 m, 60 m
Wind Direction	Wind Vane	0 to 360 degrees — mechanical	±5 degrees	±5°	5°azimuth	0.5 mph (0.22 m/s)	1 mph (<0.45 m/s)	<1 degree	1.0 degree	1.0 ° azimuth	10 m, 60 m
Ambient Temperature	Epoxy Coated Thermistor	–40.0° to +120.0°F (–40.0° to 49°C)	±0.27°F (±0.15°C)	±0.9°F (±0.5°C)	±0.9°F (0.5°C)	—	—	—	0.1°F or 0.1°C	0.1°F or 0.1°C	10 m
Differential Temperature[(a)]	N/A	—	—	±0.18°F (±0.1°C)	±0.18°F (±0.1°C)	—	—	—	0.01°F or 0.01°C	0.01°F or 0.01°C	60 m–10 m
Precipitation[(b)]	Tipping Bucket	—	+/-3% (Rates of 1 to 6 inches per hour)	±10% for a volume equivalent to 0.1 in (2.54 mm) of precipitation at a rate <2 in/h (<50 mm/h)	±10% for a volume equivalent to 0.1 in (2.54 mm) of precipitation at a rate <2 in/h (<50 mm/h)	—	—	—	0.01 in or 0.25 mm	0.01 in or 0.25 mm	Tower base

Table 6.4-4 (Sheet 2 of 3)
Units 6 & 7 Meteorological System — Preoperational/Operational Configuration

Sensed Parameter	Sensor Type	Range	System Accuracy	System[(a)] Accuracy NRC RG 1.23, Revision 1	System[(b)] Accuracy ANSI/ANS-3.11-2005	Starting Thresholds	Starting[(a)] Threshold NRC RG 1.23, Revision 1	Measure-ment Resolution	Measure-[(a)] ment Resolution NRC RG 1.23, Revision 1	Measure-[(b)] ment Resolution ANSI/ANS-3.11-2005	Elevation (Relative to Tower)
South Dade Tower Instruments (cont.)											
Solar Radiometer	Pyranometer	0.3-3um	±0.008 Langley/ min[(c)]	—	—	—	—	—	—	—	Tower base
Barometric Pressure	—	—	Consistent with current state-of-the-art	—	3 hPa	—	—	—	—	0.1 hPa	Instrument Building
Sigma-Theta[(d)]	N/A	N/A	N/A	—	—	N/A	—	1 degree	—	0.1 degrees azimuth	10 m, 60 m
Humidity	N/A	N/A	N/A	±4%	N/A	N/A	N/a	N/A	0.1%	N/A	N/A
LU Tower Instruments											
Wind Speed	Cup 3 Cup Anemometer	0 to 100 mph (0 to 45 m/s)	0.5 mph (±0.22 m/s) or ±1.0% of true air speed (whichever is greater)	±0.45 mph (±0.2 m/s) or 5% of observed wind speed	±0.45 mph (0.2 m/s) or 5% of observed wind speed	0.5 mph (0.22 m/s)	1 mph (<0.45 m/s)	—	0.1 mph or 0.1 m/s	0.1 mph or 0.1 m/s	10 m
Wind Direction	Wind Vane	0 to 360 degrees	±5°	±5°	5°azimuth	0.5 mph (0.22 m/s)	1 mph (<0.45 m/s)	<1 degree	1.0 degree	1.0 degree azimuth	10 m
Precipitation[(b)]	Tipping Bucket	—	+/-3% (Rates of 1 to 6 inches per hour)	±10% for a volume equivalent to 0.1 in (2.54 mm) of precipitation at a rate <2 in/h (<50 mm/h)	±10% for a volume equivalent to 0.1 in (2.54 mm) of precipitation at a rate <2 in/h (<50 mm/h)	—	—	—	0.01 in or 0.25 mm	0.01 in or 0.25 mm	Tower base

Table 6.4-4 (Sheet 3 of 3)
Units 6 & 7 Meteorological System — Preoperational/Operational Configuration

Sensed Parameter	Sensor Type	Range	System Accuracy	System[(a)] Accuracy NRC RG 1.23, Revision 1	System[(b)] Accuracy ANSI/ANS-3.11-2005	Starting Thresholds	Starting[(a)] Threshold NRC RG 1.23, Revision 1	Measure-ment Resolution	Measure-[(a)] ment Resolution NRC RG 1.23, Revision 1	Measure-[(b)] ment Resolution ANSI/ANS-3.11-2005	Elevation (Relative to Tower)
Sigma-Theta	N/A	N/A	N/A	—	—	N/A	—	1 degree	—	0.1 degrees azimuth	10 m

(a) The differential temperature value is a calculated value based on arithmetic differences in the ambient temperature measurements at 60-meter and 10-meter locations.
(b) Water is collected and drained each time an internal bucket fills with 0.01 inches of water.
(c) As measured at the output of primary equipment rack.
(d) The sigma theta value is a calculated value based on the wind direction variation measurements, and, therefore, has the same resolution as the wind direction measurements.

Table 6.4-5
Annual Data Recovery Rate (in percent) for Units 3 & 4 Meteorological Monitoring System (2002, 2005, and 2006)

Parameter	2002	2005	2006	3-Year Composite
Wind Speed (10 m)	100.0	98.9	99.6	99.5
Wind Speed (60 m)	99.9	90.8	100.0	96.9
Wind Direction (10 m)	99.6	98.6	99.6	99.2
Wind Direction (60 m)	99.9	89.6	100.0	96.5
∆T (60 m–10 m)[(a)]	94.0	98.9	99.6	97.5
Ambient Temperature (10 m)	95.0	99.7	99.9	98.2
Ambient Temperature (60 m)	95.9	99.8	99.8	98.5
Composite Parameters				
WS/WD (10m), ∆T (60m–10m)[(a)] (10–60)	93.6	97.2	99.2	96.7
WS/WD (60m), ∆T (60m–10m)[(a)] (10–60)	94.0	79.7	99.6	91.1
WS/WD (10m)	99.6	98.2	99.6	99.1
WS/WD (60m)	99.9	80.6	100.0	93.5

(a) ∆T between 60-meter and 10-meter levels.

Figure 6.4-1 Location of the South Dade Meteorological Tower

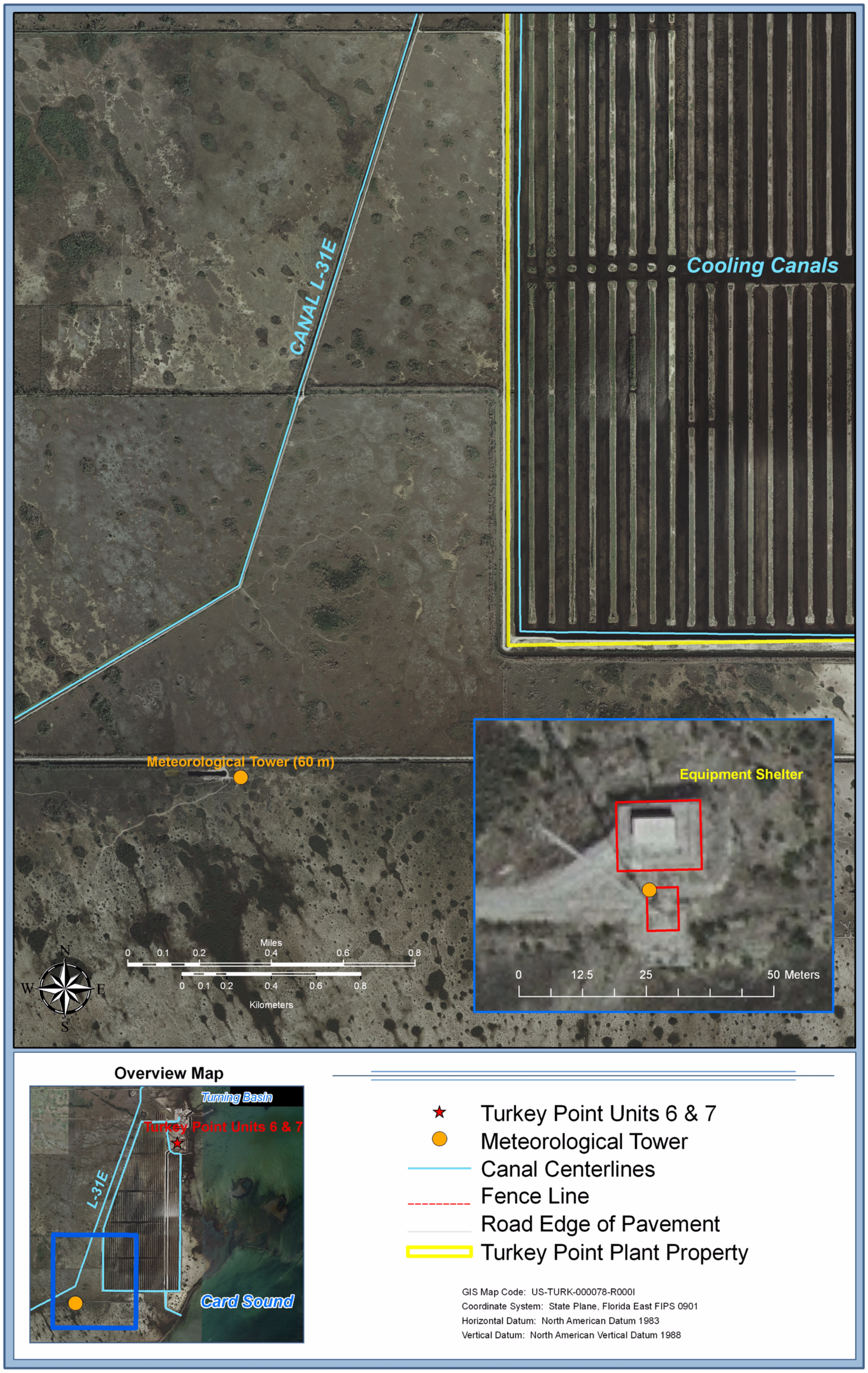


Figure 6.4-2 Location of the Land Utilization Meteorological Tower

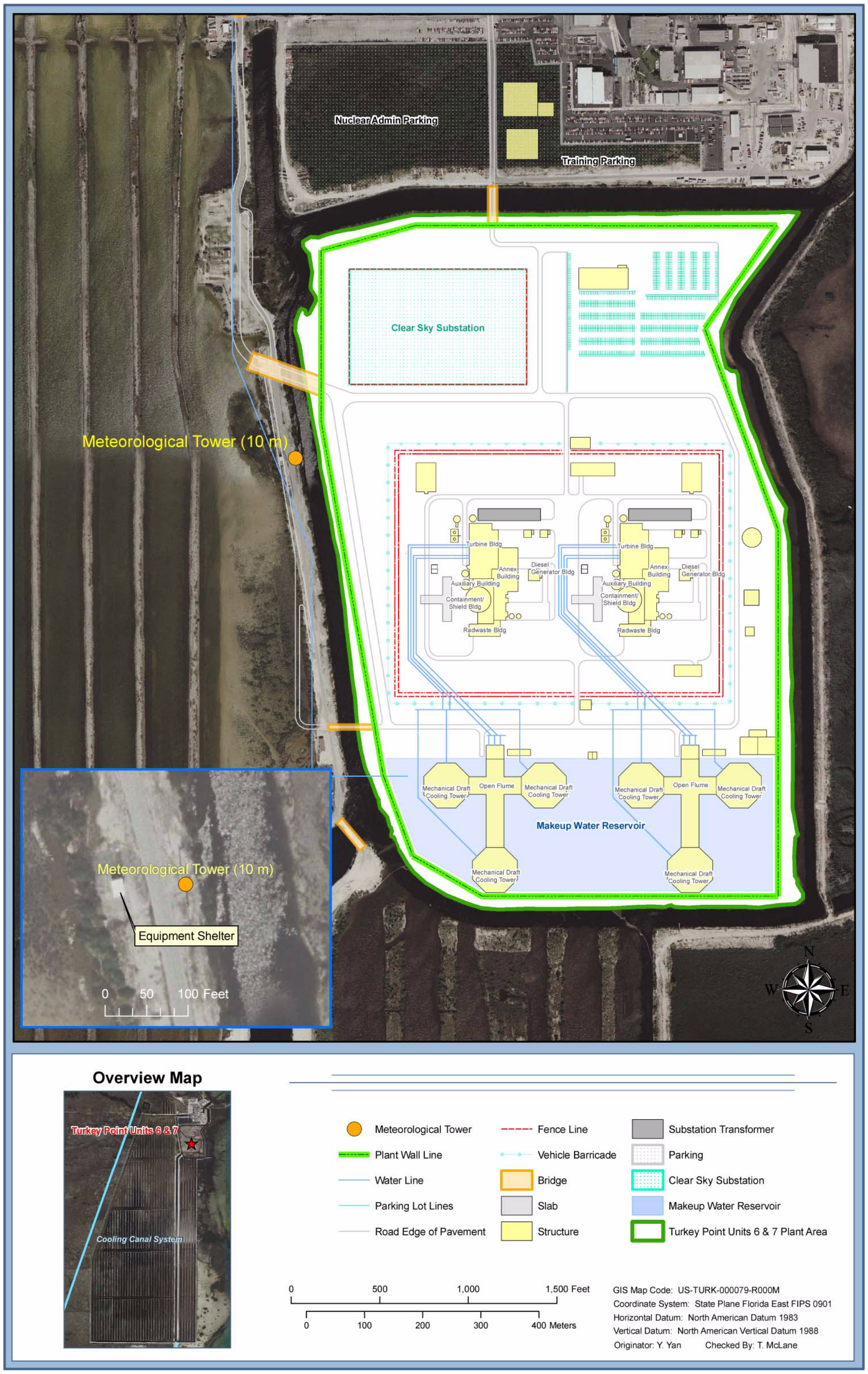


Figure 6.4-3 Meteorological System Block Diagram (South Dade Tower)

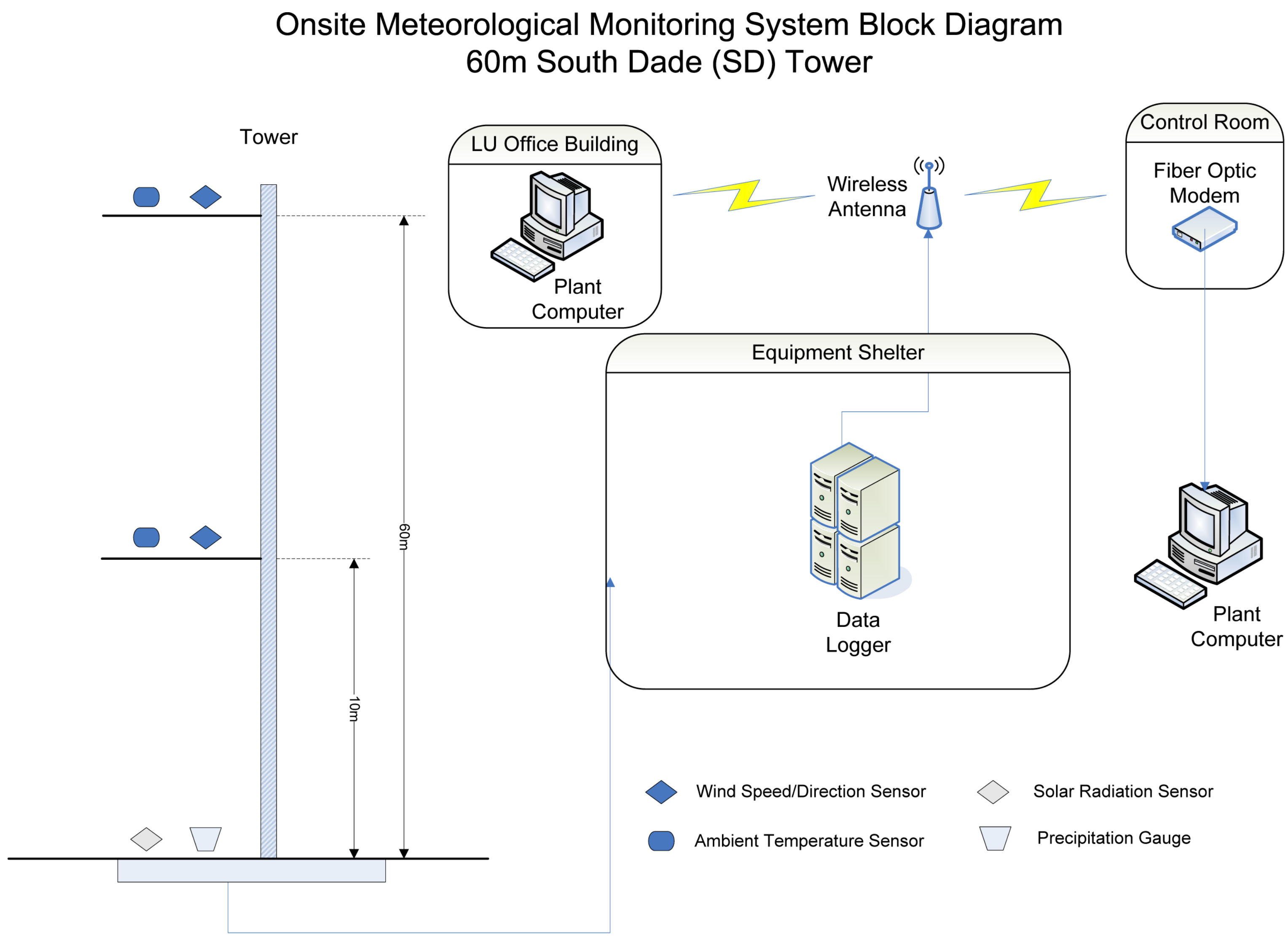
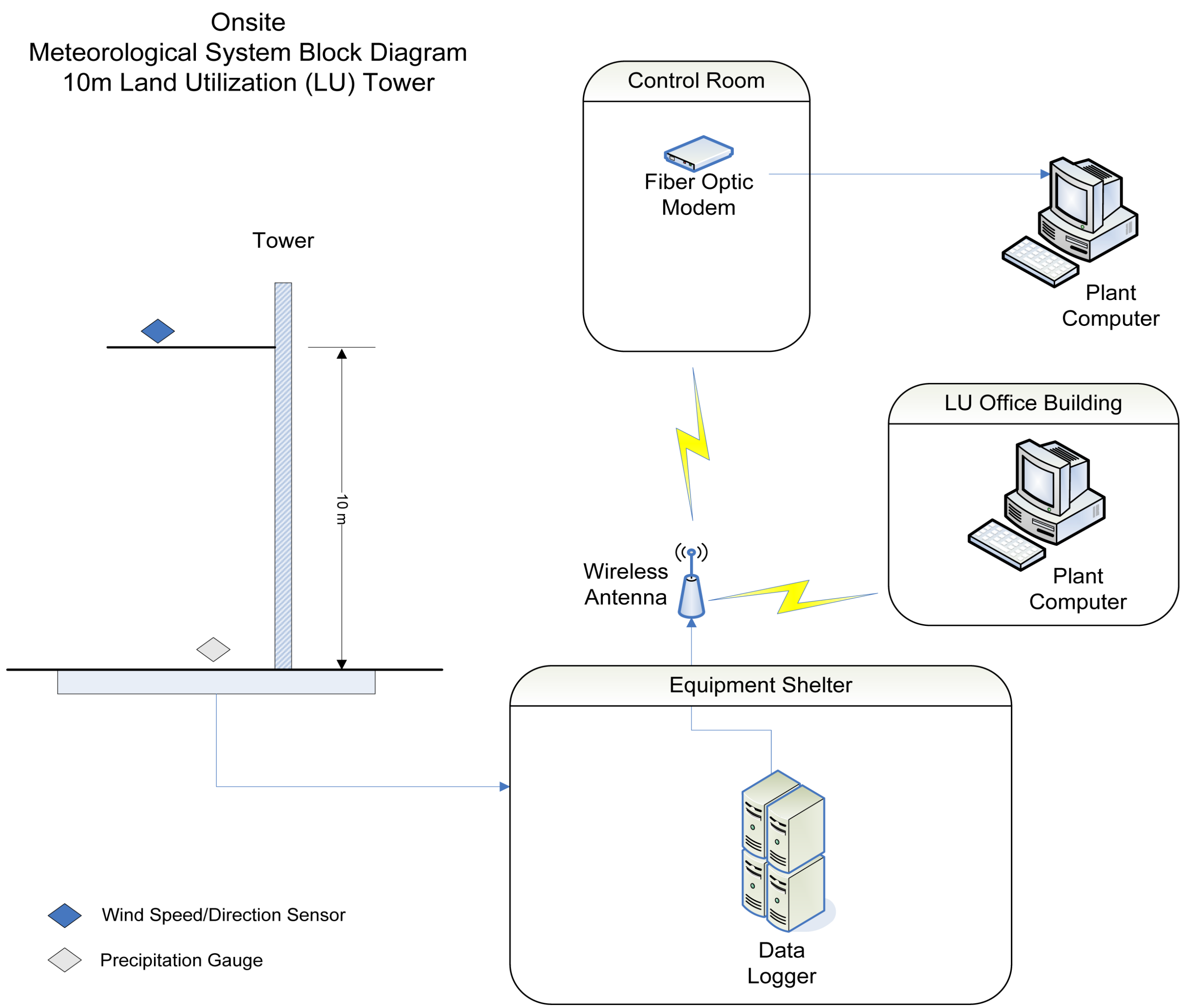


Figure 6.4-4 Meteorologic System Block Diagram (Land Utilization Tower)



6.5 ECOLOGICAL MONITORING

Ecological monitoring programs are typically implemented to address the elements of the ecosystem for which a causal relationship between new unit construction and/or operational activities and adverse change is established or strongly suspected. The following is a description of ecological monitoring for terrestrial resources (Subsection 6.5.1) and aquatic resources (Subsection 6.5.2) associated with Units 6 & 7. The results of the monitoring are described in Section 2.4.

6.5.1 TERRESTRIAL ECOLOGY AND LAND USE

6.5.1.1 Pre-Application Terrestrial Ecological Monitoring

Ecological monitoring includes the determination of the occurrence and relative abundance of terrestrial fauna, including “important” (NUREG-1555) species.

Wildlife presence and habitat occurrence were determined during a series of pre-application surveys documenting the amphibians, birds, mammals, and reptiles on site. Seasonal surveys for birds on the Turkey Point plant property were conducted in March 2009 and June 2009. The avian monitoring consisted of timed, pedestrian surveys of the various habitats within the Turkey Point plant property (Figure 2.4-3a) to determine their seasonal species composition and relative abundance. Approximately 90 species of birds have been documented during these and earlier surveys.

Surveys for small mammals, reptiles, and amphibians on the Units 6 & 7 plant area and other project construction areas, were conducted in April 2009. These one-time surveys were conducted during the peak period of activity of these species to document presence and relative abundance. Three, nine, and six species of amphibians, reptiles and mammals were documented during these surveys, respectively (see Table 2.4-2).

As reported in Subsection 2.4.1, several important species (as defined in NUREG-1555) exist or have been observed within the Turkey Point plant property including the American crocodile, American alligator, wood stork, Florida manatee, eastern indigo snake, little blue heron, snowy egret, reddish egret, tricolored heron, white ibis, white-crowned pigeon, roseate spoonbill, least tern, Florida burrowing owl, and game species such as deer, rabbits, waterfowl, and dove. Many other species are also listed as occurring in Miami-Dade County by federal and/or state agencies, but their habitats typically do not occur within the Turkey Point plant property and thus they have not been observed onsite. The monitoring programs were proposed for the crocodile, stork, and manatee because (1) they are federally listed, (2) construction activities could result in loss of critical habitat (crocodile), disturbance near breeding colonies (stork), or possible endangerment of individuals due to increases in vehicle/boat traffic (crocodile/manatee). Other important species generally do not require monitoring programs due to a less-threatened status (e.g., species of special concern rather than endangered), abundance of nearby habitats for them to utilize, or generally low numbers on plant property (e.g. upland game species).

Construction-related areas associated with Units 6 & 7 within the Turkey Point plant property have been surveyed for threatened and endangered species. Portions of the transmission, reclaimed and potable water pipeline corridors, and improved access roads, were surveyed for terrestrial threatened and endangered species during the pre-application phase.

The construction period will generally be the most sensitive period for all important species due to increased disturbance (e.g., noise, vibrations, traffic, human presence) and thus is the period in need of most monitoring. Given that crocodiles breed in the industrial wastewater facility adjacent to construction areas and the importance of this population to overall population recovery, regulatory agencies will likely suggest continuation of existing FPL crocodile monitoring and may require additional monitoring in support of the proposed action. Much of the Turkey Point plant property has been designated as critical habitat for the American crocodile (Figure 2.4-4). FPL has maintained a program to manage crocodile habitat since 1978 in response to the colonization of the industrial wastewater facility by this species in the late 1970s. A monitoring component was added to the program in subsequent years. The program activities are addressed in detail in Subsection 2.4.1.2, and include creation and enhancement of nesting habitat, nest monitoring, relocation of hatchlings to freshwater sanctuaries, managing vegetation in the nesting areas (cooling canals), and the education of site personnel and onsite workers on the occurrence of the species on site and their protection and conservation. Given that crocodiles are still federally listed (threatened), the Turkey Point crocodile population has grown over the last three decades and the industrial wastewater facility is classified as critical habitat for the crocodiles. The existing FPL crocodile monitoring program will be continued within the Turkey Point plant property through the pre-application period. Protected avian species, primarily wading birds, have been documented foraging and roosting within the Turkey Point plant property (Subsection 2.4.1). However, no nests for these species have been observed within the plant boundary. If these species are impacted during construction, their foraging and/or roosting activities would likely shift to other areas within the plant property or other nearby shallow water sites. Therefore, monitoring beyond the aforementioned seasonal avian surveys would not be necessary. Similarly, a few rare waterbirds have been observed along the proposed transmission and reclaimed and potable water pipeline corridors during recent reconnaissance, as described in Subsection 2.4.1. Additional pre-application surveys would not be necessary.

No rare plants have been observed during most surveys of construction-related areas within the Turkey Point plant property. However, recent surveys (2008-2009) of transmission corridors associated with Units 6 & 7 documented approximately 30 existing or proposed state and federally listed plant species, including three species within the segment of Clear Sky-to-Levee corridor within the plant property boundary. These three species are typically found on or near disturbed soils, such as spoil piles (see Subsection 2.4.1.2).

FPL has initiated discussions with the appropriate federal and state agencies regarding endangered and threatened species. Jurisdictional and non-jurisdictional wetland habitats would be impacted by construction activities, although the extent of this impact within the transmission and the reclaimed water pipeline corridors is pending finalization of those routes and wetland delineation projects within those corridors.

White-tailed deer, rabbits, waterfowl, and doves are game species that exist on the Turkey Point plant property and are classified as important species. There are no site-specific management activities for these species and they are not hunted on site. The construction and operation of Units 6 & 7 would not alter the conditions for these game species on the Turkey Point plant property. No hunting or management would occur, and no monitoring of these species is warranted.

Although specific monitoring of other important species is not performed, site personnel and onsite workers are trained on the protection and conservation of wildlife species.

6.5.1.2 Construction, Preoperational, and Operational Monitoring

Given the harsh environment (e.g., hypersaline mudflats) being altered and the limited flora and fauna inhabiting the Turkey Point plant property, general terrestrial ecology surveys (amphibians, birds, mammals, reptiles) are not planned for the Units 6 & 7 plant area and other impacted construction areas during the construction, preoperational, and operational stages. Possible exceptions include monitoring pertaining to American crocodiles and manatees. FPL's ongoing crocodile monitoring and management will continue, but may need to be expanded to examine for potential construction-related impacts to crocodiles nesting in the northern portion of the return canals and potential construction traffic-related impacts on crossing crocodiles throughout the industrial wastewater facility. The presence of manatees would be monitored during barge turning basin and equipment barge unloading area modifications and barge deliveries of components and equipment.

Important species other than the crocodile and manatee will likely shift to other areas when disturbed and thus would not require monitoring during the construction, preoperational, and operational stages.

Offsite areas include the reclaimed and potable water pipelines and transmission corridors to the Davis, Levee, Miami, and Pennsuco substations (Figure 2.2-5). As presented in Subsection 2.4.1, construction of the new corridors and potential modifications (expansion, new towers, etc.) to existing transmission corridors would not impact most protected wildlife species or critical habitats. However, wood storks nest near a segment of the Clear Sky-to-Levee transmission corridor; construction of these lines could potentially disturb these birds and affect their nesting. Similarly, this same segment of the corridor contains habitats used by both Florida panthers and

Everglade snail kites. Habitat impacts would be avoided to the extent practicable and potential impacts of the new lines on wood storks, Florida panthers, and/or Everglade snail kites would be monitored. Rare plants within the transmission corridors would be avoided to the extent practicable during construction and should not require additional monitoring.

6.5.2 AQUATIC ECOLOGICAL MONITORING

The aquatic communities within and adjacent to the areas proposed for development, as well as important offsite aquatic resources, are described in Subsection 2.4.2. Existing and proposed monitoring of aquatic resources are described in this section.

6.5.2.1 Pre-Application Aquatic Ecological Monitoring

Surveys of the Units 6 & 7 plant area were conducted in August and November 2007. The onsite surface water habitats that may be affected by construction and operation of Units 6 & 7 include hypersaline mudflats, remnant canals, channels, dwarf mangrove wetlands, and open water. All of these habitats support only a limited number of aquatic species because of the harsh conditions of water level fluctuations, high water temperatures, and high salinities. Other than the American crocodile, described in Subsection 6.5.1, no listed aquatic or semi-aquatic species exist within the Units 6 & 7 plant area.

Fish were surveyed during summer 2009 in seven areas that would be potentially impacted by construction of Units 6 & 7. These sample areas included the two remnant canals on the plant area, the dead-end canal (laydown area), pools within the mangrove areas (nuclear administration building, training building, and parking area), an area adjacent to SW 344th Street/ Palm Drive (in the area of the FPL reclaimed water treatment facility), a portion of the return canal, shallow flats in the east-central part of the nuclear island, and two locations along the cooling canals of the industrial wastewater facility.

Fish were collected using (8-foot diameter) cast nets, a 20-foot-long minnow seine, and standard "Gee" type minnow traps. All fish collected were hardy species common in estuarine habitats in south Florida. No rare, unusual, sensitive, or protected species were collected. One additional species, the Atlantic needlefish (*Strongylura marina*), was observed in the return canal but not captured. The Atlantic needlefish is a common inhabitant of coastal waters from New England to the Florida Keys and west to Mexico.

The primary open water habitat found on the Turkey Point plant property is the industrial wastewater facility, which supports a variety of aquatic species typical of a shallow, subtropical, hypersaline environment, including phytoplankton, zooplankton, marine algae, rooted plants, crabs, and estuarine fish. Historically, the most abundant fish in the industrial wastewater facility have been killifish (Family Cyprinodontidae) and live-bearers. Some game species, such as the common snook *(Centropomus undecimalis)* and tarpon *(Megalops atlanticus),* have been observed in the cooling canals, but the presence of self-sustaining populations has not been documented.

In summer 2008, a survey for the presence of seagrasses in the barge turning basin was performed in anticipation of the need to modify the equipment barge unloading area to accommodate delivery of modules and components for Units 6 & 7. Sparse patches of seagrass occur along the northern shore of the turning basin, in the vicinity of the existing boat slip and equipment barge unloading area. Several small areas with 5 percent to 20 percent coverage of turtlegrass (*Thalassia testudinum*) and shoal grass (*Halodule wrightii*) were observed, comprising a total of approximately 170 ft^2 (0.004 acres).

A one-year baseline aquatic biological characterization study was completed in March 2009. Five sampling stations were selected to characterize aquatic biota in Card Sound Canal and Card Sound. Sampling was conducted every other week for a total of 26 sampling events. Each sampling event consisted of three components: trawling for juvenile and adult fish and shellfish, towing nets for ichthyoplankton and meroplankton, and monitoring for water quality. Each station was sampled for each component once during the daytime and once at night for a total of 10 collections per sampling event (two sampling events per 24 hours at each of five stations). Sampling both daytime and nighttime photoperiods provided information on potential diel movements and changes in species composition and aggregations within the sampling area.

A baseline aquatic biological characterization of Card Sound was completed in March 2009. Plankton samples collected in Card Sound during the study may reasonably be assumed to represent plankton present in nearshore habitats of Biscayne Bay in the general area of the radial collector wells. Plankton were sorted and specimens assigned to one of four categories: fish eggs, fish larvae (ichthyoplankton), commercially important meroplankton, and non-commercially important meroplankton). The commercially important meroplankton are represented primarily by decapod crustaceans with commercial value, such as edible shrimps (penaeid species), lobster, blue crabs, and stone crabs, but also include some mollusks (e.g., clams, oysters, squid) and several other organisms used as bait or in medical research (e.g., mole crabs, horseshoe crabs, and mantis shrimps). The non-commercially important taxa represent a variety of other decapod crustaceans, such as grass shrimp, hermit crabs, and mud crabs (Xanthidae).

Benthic macroinvertebrates were sampled and seagrasses were surveyed from Biscayne Bay near the Turkey Point peninsula in March 2009. Sediment samples collected from 250 to 750 feet offshore in 3 feet of water were passed through a 0.5 mm sieve to collect macroinvertebrates. The majority of the 123 taxa identified from the Biscayne Bay samples were polychaetes and crustaceans. Abundance, species richness, and diversity were greatest at the station nearest to the shore.

Seagrasses were surveyed in approximately 49-hectares around the Turkey Point peninsula. Essentially the entire survey area was found to contain turtle grass or shoal grass. Turtle grass coverage was densest immediately surrounding the peninsula, but densities were variable. Shoal grass was less widespread, occurring most often in shallow waters along or near the peninsula shoreline. The two species often co-occurred, but shoal grass was absent at many sampling locations.

6.5.2.2 Construction, Preoperational and Operational Monitoring

Important aquatic habitats include Lower Biscayne Bay, Card Sound, Biscayne National Park, Biscayne Bay Park Aquatic Preserve, and Everglades National Park. A number of federally-listed and state-listed plants and animals are associated or potentially associated with these areas including two fish: the mangrove rivulus and the smalltooth sawfish (Subsection 2.4.2). Radial collector wells would be constructed as a source of makeup water to the circulating water system cooling towers. Because the radial collector well laterals would be advanced a lateral distance of up to 900 feet and installed at a depth of approximately 25 to 40 feet below the bottom of Biscayne Bay, construction and operation of the radial collector wells would not adversely impact these important aquatic habitats. Therefore, no preoperational or operational monitoring of fish or other aquatic species is warranted.

Aquatic species in the regional canals along the roads and transmission and reclaimed and potable water pipeline corridors include common freshwater forage fishes native to south Florida, such as mosquitofish (*Gambusia holbrooki*), sailfin molly (*Poecilia latipinna*), least killifish (*Heterandria formosa*), sunfish (*Lepomis* spp.), and gar (*Lepisosteus* spp.). Nonindigenous fish commonly inhabiting canals of Miami-Dade County include peacock bass (*Cichla ocellaris*), spotted tilapia (*Tilapia mariae*), blue tilapia (*Oreochromis aureus*), Mayan cichlid (*Cichlasoma urophthalmus*), jaguar guapote (*Cichlasoma managuense*), and oscar (*Astronotus ocellatus*).

Cooling water would be discharged via deep injection wells to the Boulder Zone of the Lower Floridan aquifer. No aquatic species would be exposed to the discharged water; therefore no pre-operational or operational monitoring is warranted.

Because no rare or sensitive aquatic species are expected to occur in the construction areas, and because construction activities would be conducted under stormwater permits that require the use of environmental best management practices, additional monitoring is not warranted.

6.6 CHEMICAL MONITORING

6.6.1 PRE-APPLICATION CHEMICAL MONITORING

The objective of the pre-application chemical monitoring program is to establish existing (baseline) water chemistry conditions to further support descriptions presented primarily in Subsection 2.3.1 and to assist in the determination of potential impacts during construction and operation in Chapters 4 and 5, respectively. Data was obtained for surface water and groundwater as explained below.

6.6.1.1 Surface Water

Water quality monitoring was performed at five locations in conjunction with the ecological characterization effort on a bi-weekly basis for one year. The sampling stations are located at the Card Sound Canal and Card Sound. Table 6.6-1 summarizes the analytical parameters included in the surface water quality monitoring. Figure 2.4-3a depicts the sampling locations.

6.6.1.2 Groundwater

Table 6.6-1 summarizes the analytical parameters included in the groundwater chemical monitoring program. The wells monitored and analytical/field results are summarized in Tables 2.3-22 and 2.3-23. Remote monitoring was also conducted at several monitoring wells for conductivity using transducers.

6.6.2 CONSTRUCTION AND PREOPERATIONAL MONITORING

The chemical monitoring of surface water and groundwater would be conducted to provide data necessary to evaluate changes in water quality that might result from construction of Units 6 & 7 up to initial operations. This evaluation would be completed using the pre-application baseline dataset and the results documented for periodic evaluation of operations impacts.

6.6.2.1 Surface Water

Surface water monitoring would be established at surface water monitoring points most likely to be potentially impacted by construction activities.

Table 6.6-2 summarizes the current surface water quality monitoring required by the IWWF permit before release into the cooling canals of the industrial wastewater facility. No changes to this monitoring are planned.

In addition, chemical monitoring of surface water would be established at other surface water monitoring points most likely to be potentially impacted by construction activities. These locations could include the barge turning basin and Biscayne Bay and would be monitored for applicable chemical parameters to ensure no adverse impacts to surface water.

Specific monitoring would be developed as part of the NPDES permit process for construction activities that would occur offsite (e.g., roadway improvements, transmission substation expansion, and linear facilities such as transmission line rights-of-way, reclaimed water pipelines, and potable water pipelines). The need for modifications to the monitoring program would be regularly assessed and implemented as necessary over the duration of the construction chemical monitoring program to ensure no adverse impacts.

6.6.2.2 Groundwater

The deep injection well and its associated dual zone monitoring well would be sampled and analyzed for the parameters and frequencies summarized in Table 6.6-3.

Pre-application monitoring wells located within the Units 6 & 7 plant area would be abandoned in accordance with applicable regulatory requirements during construction. Chemical measurements would be collected from newly installed monitoring wells to monitor the effects of construction, particularly dewatering, on groundwater. These newly installed wells may be temporary and would be later abandoned.

Initial startup and monitoring plans would be developed and executed as necessary to demonstrate the operational effectiveness of the radial collector wells and the effects on the local groundwater flow regime and surface water bodies such as the industrial wastewater facility and Biscayne Bay.

Any dewatering activities related to construction activities that would occur offsite (e.g., roadway improvements, transmission substation expansion, and linear facilities such as transmission line rights-of-way, reclaimed water pipelines, and potable water pipelines) would be localized and temporary, therefore, no chemical monitoring of groundwater in these areas would be required.

6.6.3 OPERATIONAL MONITORING

The operational chemical monitoring program would be designed to document effects from the operation of the Units 6 & 7 and detect any unexpected effects that arise from facility operation. The operational chemical monitoring program is anticipated to be an extension of the preoperational monitoring program. Modifications to the monitoring program (for example, changes in monitoring stations or collection procedures) would be assessed regularly over the duration of the operational hydrological monitoring program. Adjustments to the program would be made in consultation with FDEP.

6.6.3.1 Surface Water

The specific procedures of the operational monitoring requirements for the industrial wastewater facility are anticipated to be similar to the existing chemical monitoring program. The program may be modified in response to data collected and consultations with the FDEP. The current sampling requirements and frequencies for the IWWF permit are summarized in Table 6.6-2.

In addition, chemical monitoring of surface water could be established at other surface water monitoring points most likely to be potentially impacted by maintenance activities during operation. These locations could include the barge turning basin and Biscayne Bay and would be monitored for applicable chemical parameters to ensure no adverse impacts to surface water.

Since the radial collector wells would be a secondary cooling water source for Units 6 & 7, the monitoring frequency would be dependent upon operation. During operation, the radial collector well water would be monitored for conductivity, salinity, and total dissolved solids (TDS). Surface water locations located at the return canal of the industrial wastewater facility and in Biscayne Bay in the area of the equipment barge unloading area would be measured for conductivity and salinity.

During the operational phase, it could be necessary to perform routine maintenance on the offsite facilities (e.g., transmission lines, reclaimed and potable water pipelines, access roads). Any disturbances to surface water flow as a result of the activities would be temporary and would not require chemical monitoring.

6.6.3.2 Groundwater

The operational monitoring program for the deep injection wells, both at the injectate discharge and six dual-zone monitoring wells, would be similar to that described in Table 6.6-3.

Groundwater could be monitored at monitoring wells adjacent to the radial collector wells and along the shoreline for field measurements of conductivity and salinity.

During the operational phase, it could be necessary to perform maintenance that would require excavation and dewatering at offsite facilities (e.g., transmission lines, reclaimed and potable water pipelines, access roads). The dewatering activity could create temporary drawdown of the water table. However, the water table and flow would return to normal once dewatering ceased. No chemical monitoring of these offsite facilities is required during operation.

Table 6.6-1
Pre-Application Chemical Monitoring of Surface Water and Groundwater at the Units 6 & 7 Plant Area

Parameter	Units
Surface Water	
Dissolved Oxygen	mg/L
Specific Conductance	milliSiemens per centimeter
Salinity	ppt
pH	Standard Units
Groundwater	
pH	Standard Units (SU)
Dissolved Oxygen	mg/L
Specific Conductance	milliSiemens per centimeter
Turbidity	Nephelometric Turbidity Units
Oxidation- Reduction Potential	millivolts
Iron, Total Recoverable	mg/L
Total Dissolved Solids	mg/L
Calcium	mg/L
Iron	mg/L
Magnesium	mg/L
Manganese	mg/L
Potassium	mg/L
Silica	mg/L
Silicon	mg/L
Sodium	mg/L

mg/L – milligrams per liter
ppt – parts per thousand

Table 6.6-2
Current Chemical Monitoring in the Industrial Wastewater Facility[(a)]

Parameters (units)	Daily Maximum	Daily Minimum	Monitoring Frequency	Sample Type
Solids, Total Suspended (mg/L)	Report	—	Monthly	Grab
pH (SU)	Report	Report	Quarterly	Grab
Salinity (ppt)	Report	—	Quarterly	Grab
Specific Conductance (µmho/cm)	Report	—	Quarterly	Grab
Copper, Total Recoverable (µg/L)	Report	—	Semiannually	Grab
Iron, Total Recoverable (mg/L)	Report	—	Semiannually	Grab
Zinc, Total Recoverable (µg/L)	Report	—	Semiannually	Grab

(a) Industrial Wastewater Treatment Facility Permit No. FL0001562.

Table 6.6-3
Deep Injection Well Construction and Preoperational Chemical Monitoring

Parameters (units)	Monitoring Frequency
Dual Zone Monitoring Well	
Specific Conductance (μmho/cm)	Weekly[(a)]
pH (SU)	Weekly[(a)]
Chloride (mg/L)	Weekly[(a)]
Solids, Total Dissolved (mg/L)	Weekly[(a)]
Total Phosphorous (mg/L)	Weekly[(a)]
Sulfate (mg/L)	Weekly[(a)]
Sodium (mg/L)	Weekly[(a)]
Calcium (mg/L)	Weekly[(a)]
Magnesium (mg/L)	Weekly[(a)]
Potassium (mg/L)	Weekly[(a)]
Carbonate (mg/L)	Weekly[(a)]
Bicarbonate (mg/L	Weekly[(a)]
Waste stream	
Solids, Total Dissolved (mg/L)	Weekly[(a)]
Chloride (mg/L)	Weekly[(a)]
Specific Conductance (μmho/cm)	Weekly[(a)]
pH (SU)	Weekly[(a)]

(a) Frequency decreased to monthly following operational testing and FDEP approval.

6.7 SUMMARY OF MONITORING PROGRAMS

The Units 6 & 7 monitoring programs are described in detail in Sections 6.1 through 6.6 and are summarized in the following subsections. Table 6.7-1 identifies key elements of the monitoring programs to be implemented during the pre-application, construction, preoperational, and operational phases.

6.7.1 PRE-APPLICATION MONITORING

The current Units 3 & 4 ecological, radiological, chemical, hydrological, and meteorological monitoring programs have been used as a baseline to characterize the conditions for new Units 6 & 7. No additional pre-application radiological monitoring was performed.

Thermal monitoring was performed in the upper portion of the Upper Floridan and the Biscayne aquifers in the Units 6 & 7 plant area, as described in Sections 2.3 and 6.1.

Ecological surveys were performed during the pre-application phase at the Units 6 & 7 plant area, other impacted areas on the Turkey Point plant property, along the transmission corridors, along the route for the reclaimed and potable water pipelines, including both terrestrial and aquatic surveys, Card Sound, Biscayne Bay and Card Sound Canal. The results of these surveys were used to characterize environmental conditions. These surveys were described in Section 2.4 and 6.5.

Hydrological studies included the initiation of a groundwater investigation program described in Subsection 2.3.1, Section 6.3, and Section 6.6 at the Units 6 & 7 plant area. Monitoring also occurred during pumping tests at the Units 6 & 7 plant area.

Pre-application meteorological monitoring consisted of the continuation of the existing Units 3 & 4 program. Data from this program and a description of its use are provided in Sections 2.7 and 6.4.

Baseline water quality studies for chemical monitoring were conducted in the Biscayne aquifer and Card Sound. The results and monitoring are described in Subsections 2.3.2, 2.3.3 and Section 6.6.

6.7.2 PRECONSTRUCTION/CONSTRUCTION MONITORING

Historical information and current data formed the basis from which to assess the impacts of Units 6 & 7 preconstruction and construction activities.

The radiological monitoring currently being performed for Units 3 & 4 would be continued and enhanced to include Units 6 & 7 during construction and would overlap with the more comprehensive preoperational and operational monitoring programs (see Section 6.2). Additional thermoluminescent dosimeters would be installed for Units 6 & 7 before construction and the existing radiological monitoring program expanded to include these dosimeters.

Hydrological surface water monitoring would be performed as required by the NPDES permit. Groundwater elevation monitoring would be performed to measure the effects of dewatering during construction of the power blocks. Hydrologic and chemical monitoring would be performed in the dual zone monitoring wells designed to monitor potential impacts from operation of the deep injection wells. Planned environmental hydrological monitoring is described in Section 6.3. Chemical monitoring is outlined in Section 6.6.

Meteorological monitoring during plant construction is not planned because no significant air quality and meteorological-related construction impacts have been identified that would warrant site-specific onsite monitoring. However, the existing meteorological monitoring program would continue through this phase.

Ecological monitoring would be performed during the modification of the barge turning basin and equipment barge unloading area. Monitoring would also be conducted during barge deliveries.

Crocodile monitoring would continue to be performed during this phase of the project and may be increased due to the increased construction vehicular traffic in the Units 6 & 7 plant area.

Although sampling frequency would be dictated by site conditions, it is expected that surface water and groundwater would be monitored during portions of the construction phase to provide data for assessing potential changes in surface water or groundwater quality. This potential monitoring is described in Section 6.6.

6.7.3 PREOPERATIONAL MONITORING

Thermal monitoring of water would continue as outlined in Table 6.7-1. Areas to be monitored would include the Units 6 & 7 plant area, the radial collector well area, dual zone monitoring wells in the Upper Floridan aquifer, and potential areas of stormwater releases.

Radiological monitoring that would be expanded over the preconstruction/construction monitoring to include the features listed in Table 6.2-2 would continue. The preoperational radiological monitoring program would begin up to 2 years before operation of Unit 6, as identified in Table 6.2-1.

Hydrological preoperational monitoring would be a continuation of construction-phase monitoring.

Preoperational meteorological monitoring would be a continuation of the preexisting monitoring program.

Preoperational ecological monitoring would be a continuation of the preexisting ecological monitoring at Turkey Point.

Chemical monitoring would be a continuation of preconstruction/construction groundwater and surface water monitoring, as applicable. These activities would include characterization monitoring of the wells in the Upper Floridan aquifer to monitor the potential hydrologic, thermal, and chemical impacts from the deep injection wells. Preliminary frequency and chemical criteria are outlined Section 6.3 and 6.6.

6.7.4 OPERATIONAL MONITORING

Thermal, chemical, and hydrologic monitoring would be required for the dual zone monitoring wells associated with the deep injection wells. Thermal monitoring would continue to be performed on wells in the vicinity of the power blocks and would also be performed on wells associated with monitoring the potential impact of the radial collector wells on the industrial wastewater facility. The existing Units 3 & 4 radiological monitoring program would be expanded to include Units 6 & 7. Monitoring during this phase would be the same as for preoperational monitoring in accordance with the revised radiological monitoring program. Hydrological monitoring would include continued collection of groundwater elevation measurements during the course of implementing the radiological monitoring program. Monitoring would potentially include that of the deep injection dual zone monitoring wells in the Upper Floridan aquifer and wells associated with the radial collector wells, as well as those in the vicinity of the power blocks.

Meteorological monitoring would be a continuation of the preoperational monitoring program described in Section 6.4. No new specific ecological monitoring associated with operation of the new units is proposed. The existing crocodile monitoring program would continue. The chemical monitoring program would be that specified in the underground injection control permit and any permit requirements associated with operational permits issued by FDEP, including storm water permits and National Pollutant Discharge Elimination System (NPDES) permits, as well as any sampling required to monitor the operation of the radial collector wells. Currently, FPL does not release water under stormwater or NPDES permits. All current site water releases are to the industrial wastewater facility.

Table 6.7-1 (Sheet 1 of 4)
Summary of Monitoring Programs

Resource	Program	Scope/Content	Status
PRE-APPLICATION			
Ecology	Ecological Monitoring	Bird surveys	Complete
		One-time surveys for small mammals, reptiles, and amphibians	Complete
		Use of existing crocodile monitoring program through pre-application	Existing
		Performance of a seagrass survey in the equipment barge unloading area. Visual survey of dead-end canal northeast of Units 6 & 7 plant area.	Complete
		Performance of a 1-year baseline aquatic biological characterization	Complete
		Performance of a benthic invertebrate survey and seagrass survey in the area of the radial collector wells	Complete
Human Health	Radiological Monitoring	No additional radiological monitoring was performed	N/A
Water	Hydrological Monitoring	Monitoring was conducted during groundwater pumping tests in the Units 6 & 7 plant area to establish design level criteria.	Complete
		Groundwater monitoring was conducted to provide groundwater level data for baseline analyses	Ongoing[1]
	Thermal Monitoring	Thermal monitoring was performed as part of baseline groundwater and surface water monitoring	Complete
	Chemical Monitoring	Chemical monitoring was performed as part of baseline groundwater and surface water monitoring	Complete
Air Quality and Meteorology	Meteorological Monitoring	The existing meteorological monitoring program for Units 3 & 4 was used for pre-application analyses	Existing
PRECONSTRUCTION/CONSTRUCTION			
Ecology	Ecological Monitoring	Expansion of crocodile monitoring through this phase due to increased traffic	Existing
		Monitoring of manatees during construction activities in the barge turning basin, equipment unloading area modifications, and during barge deliveries	Complete
Human Health	Radiological Monitoring	Radiological monitoring program for Units 6 & 7 is planned to monitor for construction worker dose	To be developed
Water	Hydrological Monitoring	Surface water monitoring at the barge turning basin and Biscayne Bay for applicable hydrologic parameters including turbidity, as required	To be developed
		Groundwater flow/level monitoring during deep injection well pilot testing and use for construction discharges and full well installation	To be developed

Table 6.7-1 (Sheet 2 of 4)
Summary of Monitoring Programs

Resource	Program	Scope/Content	Status
Water (cont.)	Hydrological Monitoring (cont.)	Specific monitoring as part of the NPDES permit process for construction activities that would occur offsite (e.g., roadway improvements, transmission substation expansion, and linear facilities such as transmission line rights-of-way, reclaimed water pipelines, and potable water pipelines).	To be developed
		Groundwater and surface water level monitoring during dewatering activities at the power block	To be developed
		Surface water level monitoring during radial collector well installation	To be developed
	Thermal Monitoring	Stormwater discharges would continue to be monitored in accordance with an FDEP permit, as required	To be updated
		Groundwater thermal monitoring during deep injection well pilot testing and use for construction discharges and full well installation	To be developed
PRECONSTRUCTION/CONSTRUCTION			
Water	Chemical Monitoring	Monitoring at stormwater outfall and/or release points would be performed in accordance with permit requirements, as applicable	To be updated
		Groundwater monitoring would continue during portions of construction and preoperation to ascertain the chemical effects of construction and/or dewatering on local groundwater	To be developed
		Chemical monitoring would be performed for the deep injection well as part of the deep injection well permit requirements	To be developed
Air Quality and Meteorology	Meteorological Monitoring	The existing meteorological monitoring program for Units 3 & 4 would be used to monitor during these project phases	Existing
PREOPERATIONAL			
Ecology	Ecological Monitoring	Expand crocodile monitoring through this phase due to increased traffic	Existing
		Monitor for manatees during construction activities in turning basin, equipment unloading area modifications, and during barge deliveries	To be developed
Human Health	Radiological Monitoring	Radiological monitoring program for Units 6 & 7 would be incorporated into existing program	Update to existing
Water	Hydrological Monitoring	Existing surface water monitoring for the cooling canals of the industrial wastewater facility during the preoperational phase will suffice as the preoperational hydrologic baseline	To be developed
		Monitor groundwater in the vicinity of the deep injection wells	To be developed

Table 6.7-1 (Sheet 3 of 4)
Summary of Monitoring Programs

Resource	Program	Scope/Content	Status
Water (cont.)	Thermal Monitoring	Monitoring of groundwater in the Upper Floridan aquifer in the vicinity of the deep injection wells	To be developed
	Chemical Monitoring	Ongoing surface water monitoring could continue to identify potential impacts of site construction, if warranted by site conditions	Ongoing
		Monitoring at stormwater outfall and/or discharge points would be performed in accordance with permit requirements, as applicable	To be developed
		Groundwater monitoring would continue during portions of preoperation to ascertain the chemical effects on local groundwater during this period	Ongoing
		Chemical monitoring would be performed if required by FDEP wastewater deep injection well permit to discharge cooling water to the Boulder Zone of the Lower Floridan aquifer	To be developed
		Surface water monitoring at the barge turning basin and Biscayne Bay for applicable chemical parameters, as required	To be developed
Air Quality and Meteorology	Meteorological Monitoring	The existing meteorological monitoring program for Units 3&4 would be used to monitor during those project phases.	Existing/modified
OPERATIONAL			
Ecology	Ecological Monitoring	Expanding current monitoring through this phase due to increased traffic	Existing
		Monitoring manatees during maintenance activities in barge turning basin, equipment unloading area modifications, and during barge deliveries	To be developed
Human Health	Radiological Monitoring	The monitoring program specified in Section 6.2 would be conducted	Existing/modified
Water	Hydrological Monitoring	Existing surface water monitoring for the cooling canals of the industrial wastewater facility during the preoperational phase will suffice as the preoperational hydrologic baseline	To be developed
		Potential monitoring of groundwater in radial collector wells	To be developed
		Monitoring groundwater in vicinity of FDEP deep injection wells	To be developed

Table 6.7-1 (Sheet 4 of 4)
Summary of Monitoring Programs

Resource	Program	Scope/Content	Status
Water (cont.)	Chemical Monitoring	Monitoring at stormwater outfall and/or discharge points would be performed in accordance with permit requirements, as applicable	
		Groundwater monitoring would continue during portions of operations to ascertain the chemical effects during this period on local groundwater	To be developed
		Chemical monitoring would be performed to monitor the Upper Floridan aquifer as part of the deep injection well permit requirements	To be developed
		Specific monitoring as part of the NPDES permit process for operational activities that would occur offsite (e.g., roadway improvements, transmission substation expansion, and linear facilities such as transmission line rights-of-way, reclaimed water pipelines, and potable water pipelines)	To be developed
Air Quality and Meteorology	Meteorological Monitoring	The existing meteorological monitoring program for Units 3 & 4 would be used to monitor during these project phases	Existing

[1] Groundwater levels will be monitored for one year
N/A – Not applicable
FWC – Florida Fish and Wildlife Commission
MDC – Miami-Dade County
NMF – National Marine Fisheries
NOAA – National Oceanic & Atmospheric Administration
SFWMD – South Florida Water Management District
USFWS – U.S. Fish and Wildlife Service