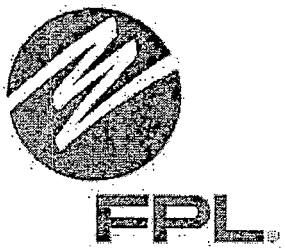
PLAN OF STUDY
316(b) IMPLEMENTATION

ST. LUCIE POWER PLANT

Prepared for:



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DOCUMENT REVIEW

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This document has been authored and reviewed by the following employees:

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April 26, 2017	April 26, 2017
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LIST OF ACRONYMS AND ABBREVIATIONS

AIF	Actual intake flow
BTA	best technology available
CFR	Code of Federal Regulations
CWIS	cooling water intake structure
FDEP	Florida Department of Environmental Protection
FPL	Florida Power & Light Company
IM	Impingement mortality
IWWF	industrial wastewater facility
MGD	Million gallons per day
POS	plan of study

1.0 INTRODUCTION

Florida Power & Light Company's (FPL's) St. Lucie power plant holds industrial wastewater facility (IWWF) permit No. FL0002208, issued on November 4, 2016. The permit includes a requirement to meet with Florida Department of Environmental Protection (FDEP) within three months of the effective date of the permit to discuss FPL's plan for compliance with the 316(b) rule. The meeting, conducted by teleconference on January 19, 2017, addressed applicable requirements under Title 40, Part 122.21(r), Code of Federal Regulations (CFR); previous data or studies to be used as part of the 40 CFR 122.21(r) compliance effort; and proposal for a peer review group.

This meeting is to be followed by submittal of a plan of study (POS) within six months of the permit's effective date (i.e., by May 4, 2017) "to address the timely implementation of the 316(b)...regulations" to include a schedule for the submittal "of all applicable 122.21(r) forms, any associated reports, and peer review documentation." The materials are to be submitted as soon as practicable but no later than 180 days prior to the expiration date of the permit.

This document provides the POS called for by the IWWF requirement. Note this document includes, as Appendix A, the proposed entrainment characterization study plan. The study plan includes summary information on the St. Lucie plant's cooling water intake structure (CWIS) configuration, previous impingement and entrainment study results, and proposed sampling and analysis methodologies.

2.0 PROJECT MILESTONES

The IWWF permit includes milestones for implementation of 316(b) rule compliance-related activities at the St. Lucie plant (Table 1). The following sections define activities FPL believes represent critical path items and presents a schedule for implementation of these items consistent with milestones defined in the IWWF permit.

Table 1. IWWF Permit Milestones for 316(b) Rule Compliance

Milestone	Notes	Date
IWWF permit is effective	—	11/04/16
Meeting with FDEP	Within three months of permit effective date	02/04/17
Submit 316(b) POS	Within six months of the permit effective date	05/04/17
Submit 316(b) reports	Not later than 180 days before expiration of IWWF permit, with the permit renewal application	05/07/21

Source: ECT, 2017.

3.0 PROCESS OVERVIEW

This section reviews the anticipated implementation process for the final rule that is consistent with the schedule constraints to be defined in the IWWF permit, as well as site-specific issues such as data availability.

3.1 DEFINITION OF CRITICAL PATH ITEMS

Critical path items are those items that must be completed in a timely manner to provide information needed for the assessments to be included in the renewal application to be submitted in May 2021. The following is a brief discussion of the project elements that represent the critical path, organized by the year in which they are expected to occur. These elements are represented on the project schedule as presented in the following subsections.

3.1.1 2017 TO 2018

Characterization of the rates of entrainment for the site-specific entrainment best technology available (BTA) assessment, including the nature of the entrained fish and shellfish, is a key project element and, under the rule, must include two years' worth of data entrainment data. To a great extent, analyses of costs and benefits for the BTA assessment depend on the nature of entrainment and completion (with documentation) of this effort. For this reason, important and complex elements of the project cannot be completed until the full set of entrainment data is available. A second year of entrainment data collection is scheduled to begin in November 2017 to supplement the 20 months of data collected the Phase II rule, and the field element of the program is expected to be completed in October 2018. Laboratory analysis and preparation of reports will take several months after the field work is completed. Therefore, the program elements that depend on entrainment data cannot begin in earnest until mid-2019.

3.1.2 2017

The 2017 time frame includes identification and FDEP approval of peer reviewers. The final rule's requirement for peer review of the entrainment BTA assessment constitutes an important critical path item, in that peer reviewers must be identified by the permittee and

approved by FDEP. Once this selection process has been completed, the entrainment assessments must be mapped out, coordinated, and completed under a defined schedule, and peer reviewers must commit to providing a timely review. FPL must then develop the report required under 40 CFR 122.21(r)(13) that responds to the peer reviewers' comments and provides justification for any comments not addressed. The impingement BTA approach must then be reconciled with the findings of the entrainment BTA and the 40 CFR 122.21(r)(6) report finalized. These steps must be completed sufficiently in advance of the application date for FPL to review and incorporate the findings into its renewal application.

FDEP approved FPL's proposed peer reviewer for biology (Dr. Steven Layman) in early June 2016. FPL proposed peer reviewers to FDEP for engineering and economics in a letter sent March 1, 2017, so they can be engaged in the planning of the entrainment BTA process to avoid adverse comments late in the process. FPL notes the rule does not require peer review of the entrainment work plan or entrainment characterization report under 40 CFR 122.21(r)(9). Despite this, Dr. Layman has reviewed and commented on the FDEP-approved entrainment characterization study plans developed for Fort Myers and other FPL once-through plants upon which this plan is modeled.

2018 AND 2019

Preliminary planning of the entrainment BTA process should begin in 2018 and continue into early 2019. The complex nature of the analyses to support assessment of entrainment BTA (discussed further in the next subsection) also represents a critical path item. The rule is expansive in including a number of factors that "must" or "may" be considered by FDEP when evaluating entrainment BTA. These factors include environmental, economic, biological, and engineering disciplines. These may also include factors well beyond the boundaries of the plant. Mapping out the assessment process should be undertaken to ensure it is complete as the entrainment data become available in mid-2019.

3.1.3 2019 AND 2020

3.1.3.1 Impingement BTA and Completion of 316(b) Reports

Assessment of impingement BTA at St. Lucie is facilitated by its use of offshore velocity caps, a preapproved technology for impingement mortality (IM) BTA under the rule. However; completion of the 316(b) reports will still be relatively involved and are planned to be initiated by the fourth quarter of 2019.

3.1.3.2 Execution of Entrainment BTA Analyses Including Peer Review

Execution of entrainment BTA analyses will be undertaken once the entrainment characterization study has been completed and should be completed by mid-2020 to allow for review by FPL as well as the peer reviewers. As noted previously herein, this work would begin only after a careful planning process, including approval by FPL's peer reviewers. Even with careful planning, this effort will be substantial, as it is highly integrated, multidisciplinary, and demands complex data and policy input from FPL.

3.1.4 POSTSUBMITTAL

FPL anticipates discussions with FDEP, and potentially other agencies, will occur following submittal of the documents by April 1, 2021. It is also anticipated FDEP will include a condition and schedule in the next permit (i.e., 2021 reissuance) for implementing any changes required by the site-specific entrainment BTA determination.

3.1.5 TIMING OF IMPINGEMENT BTA ASSESSMENT

The reports required under the final rule at 40 CFR 122.21(r), which encompass compliance with both impingement and entrainment standards, are normally due with the application for renewal of the discharge permit. While the rule clearly anticipates FDEP's decision regarding entrainment BTA should precede the determination of BTA for impingement, the existing offshore velocity caps are compliant with IM BTA requirements. Therefore, FPL does not anticipate additional IM requirements and will submit the required documentation under 40 CFR 122.21(r)(6) with submission of the permit renewal application in 2021.

3.2 ENTRAINMENT CHARACTERIZATION

Appendix A to this plan of study includes the entrainment characterization study plan that will be executed at the St. Lucie plant to address requirements of the rule. This effort consists of sampling every other week for one year and will be patterned after the Phase II efforts at St. Lucie as well as programs being executed at other FPL plants in Florida. The overall approach (collection gear, sampling frequency, and methods of laboratory assessment) was approved by FDEP for work previously executed at St. Lucie under the Phase II rule and, therefore, provides continuity with the prior efforts.

3.3 ENTRAINMENT BTA ASSESSMENT

This subsection summarizes the process FPL will pursue to address the requirements of 40 CFR 122.21(r)(9) through (13). These reports are all intended to provide information to FDEP so the agency can reach a site-specific decision regarding BTA for entrainment. While the rule calls for five separate reports that address different factors relevant to entrainment BTA, FPL believes the effort should integrate the relevant disciplines and analyses (see Section 3.4.2).

3.3.1 MEASURES TO BE CONSIDERED

The final rule requires facilities with actual intake flow (AIF) greater than 125 million gallons per day (MGD) consider the technical feasibility, costs, effectiveness, and benefits of the following alternative measures to reduce entrainment:

- Retrofitting to a closed-cycle recirculating cooling system.
- Use of fine mesh screens with a mesh size of 2 millimeters or smaller. (The rule does not state whether both fine mesh panels on traveling screen systems and wedgewire screens should be considered. FPL intends to consider them both but notes constraints present in the source water are likely to make wedgewire screens far less favorable than changes to the existing traveling water screens.)
- Water reuse or alternative sources of cooling water.

3.3.2 ENTRAINMENT ASSESSMENT PROCESS OVERVIEW

Under the rule, FDEP has the authority to determine what technologies and measures, including the status quo, represent BTA for entrainment. While the rule outlines the factors that FDEP must, per 40 CFR 125.98(f)(2), and may, per 40 CFR 125.98(f)(3), consider, the rule is clear that relative weighting of each factor is up to the discretion of FDEP. The goal of the reports prepared by FPL under 40 CFR 122.21(r)(9) through (13) is to provide FDEP with the site-specific data and analyses so the agency can reach an informed decision regarding entrainment BTA at the site.

While the rule segregates the entrainment BTA assessment into four separate reports, as shown in Figure 1, a successful process will integrate the analysis of the candidate options to ensure the feasibility, costs, effectiveness, and impacts are consistently defined and clearly presented. FPL also intends to summarize the resulting findings within the context of the factors defined by 40 CFR 125.98(f).

FPL also notes the rule provides little in the way of concrete guidance regarding the nature of the engineering and economic analyses to be pursued. The rule does call for consideration of specific factors but leaves the specifics to the applicant. Importantly, the final rule indicates a narrative discussion is required but indicates quantification of factors as well as their potential monetization is optional.

FPL believes these two aspects of the rule's requirements (e.g., a relatively complex, integrated, multidisciplinary analysis as well as the discretion left to the applicant) require the entrainment analyses be carefully planned and managed. Therefore, while the goals and overall approach to the entrainment BTA assessment are clear, FPL will refine the process over the 316(b) implementation process beginning in 2018 and continuing into 2019 as the entrainment characterization effort proceeds.

3.3.3 PEER REVIEW PROCESS

Under the final rule, three of the reports intended to support FDEP's consideration of entrainment BTA, those defined under 40 CFR 122.21(r)(10), (11), and (12), must be subject

to peer review. The results of the peer review, including a summary of the reviewers' credentials and FPL's response to the comments, are to be summarized as described at 40 CFR 122.21(r)(13).

The final rule provides little detail regarding the timing and nature of the peer review process. FPL perceives delaying peer review until the draft final documents are available would be a poor strategy, in that substantial comments could be received at a time when there is little time remaining to address the comments while meeting the regulatory deadlines. Such a strategy would also raise the potential for costly rework of analyses.

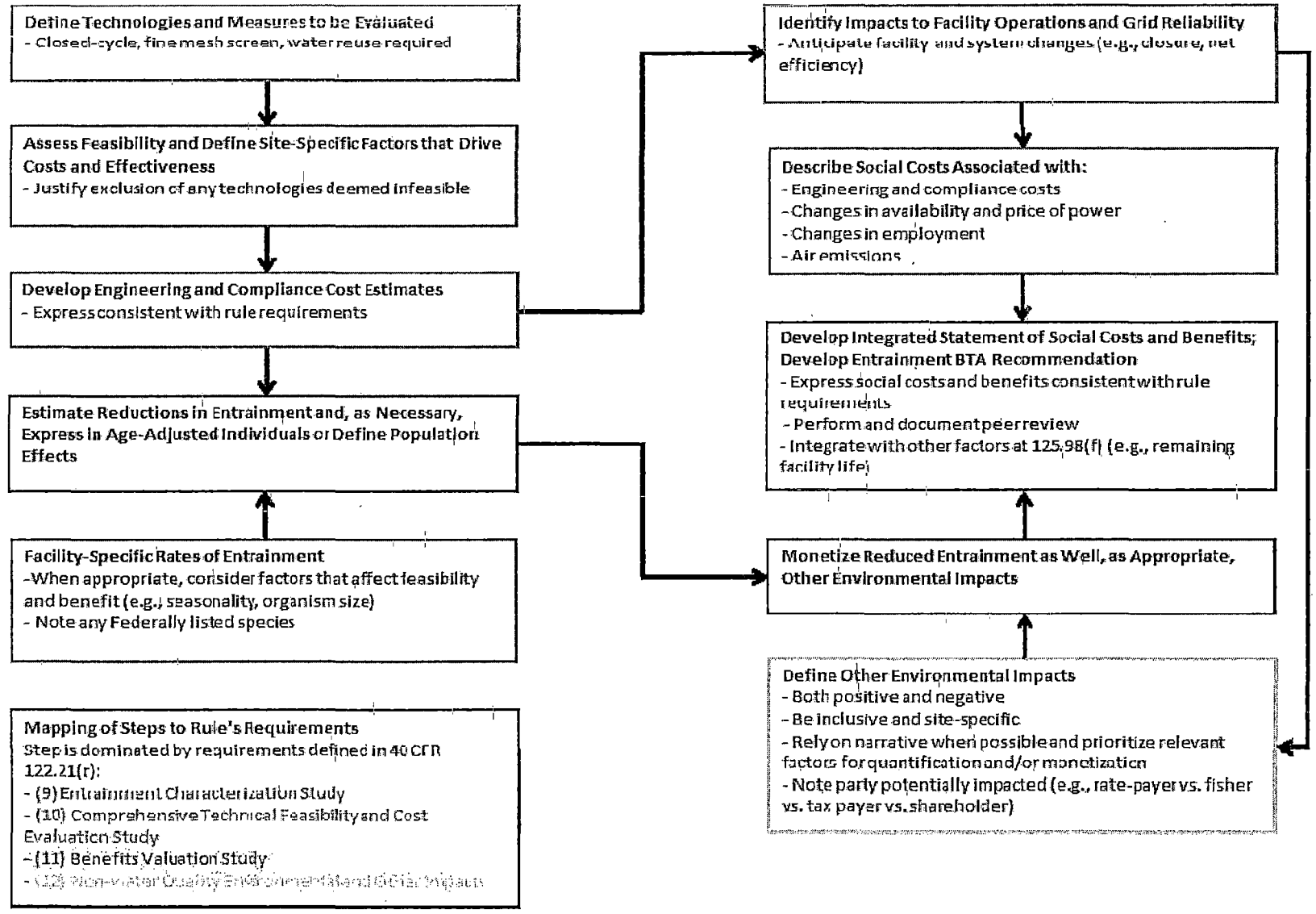

FIGURE 1.

ENTRAINMENT BTA ASSESSMENT PROCESS OVERVIEW

Source: ECT 2016.

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To avoid these risks, FPL intends to convene the peer reviewers for an evaluation of the conceptual approach to assessing entrainment BTA prior to the completion of the analyses. The peer reviewers' input will be considered while finalizing the proposed approaches to reduce the potential for adverse comments on the overall approach toward the end of effort. Therefore, FPL intends to engage the peer reviewers at two stages in the effort: during planning in 2018 and following preparation of draft final reports. The results of both stages will be documented in the report called for under 40 CFR 122.21(r)(13).

3.3.4 PEER REVIEWER SELECTION

The final rule requires FPL propose peer reviewers to FDEP for the agency's consideration. FDEP may reject peer reviewers and/or suggest other ones. FPL understands this process and has proposed peer reviewers familiar with the rule, constraints on operation of cooling water intake structures (and in particular those at a nuclear facility), and the phenomena of impingement and entrainment. A biological peer reviewer was proposed to FDEP in December 2015 and was approved by FDEP on June 3, 2016. FPL subsequently submitted a letter to FDEP with its proposed peer reviewers for economics and engineering on March 1, 2017 (Figure 2). FPL intends to utilize this same panel of expert peer reviewers at the St. Lucie plant as well as its other five once-through generating facilities in Florida.

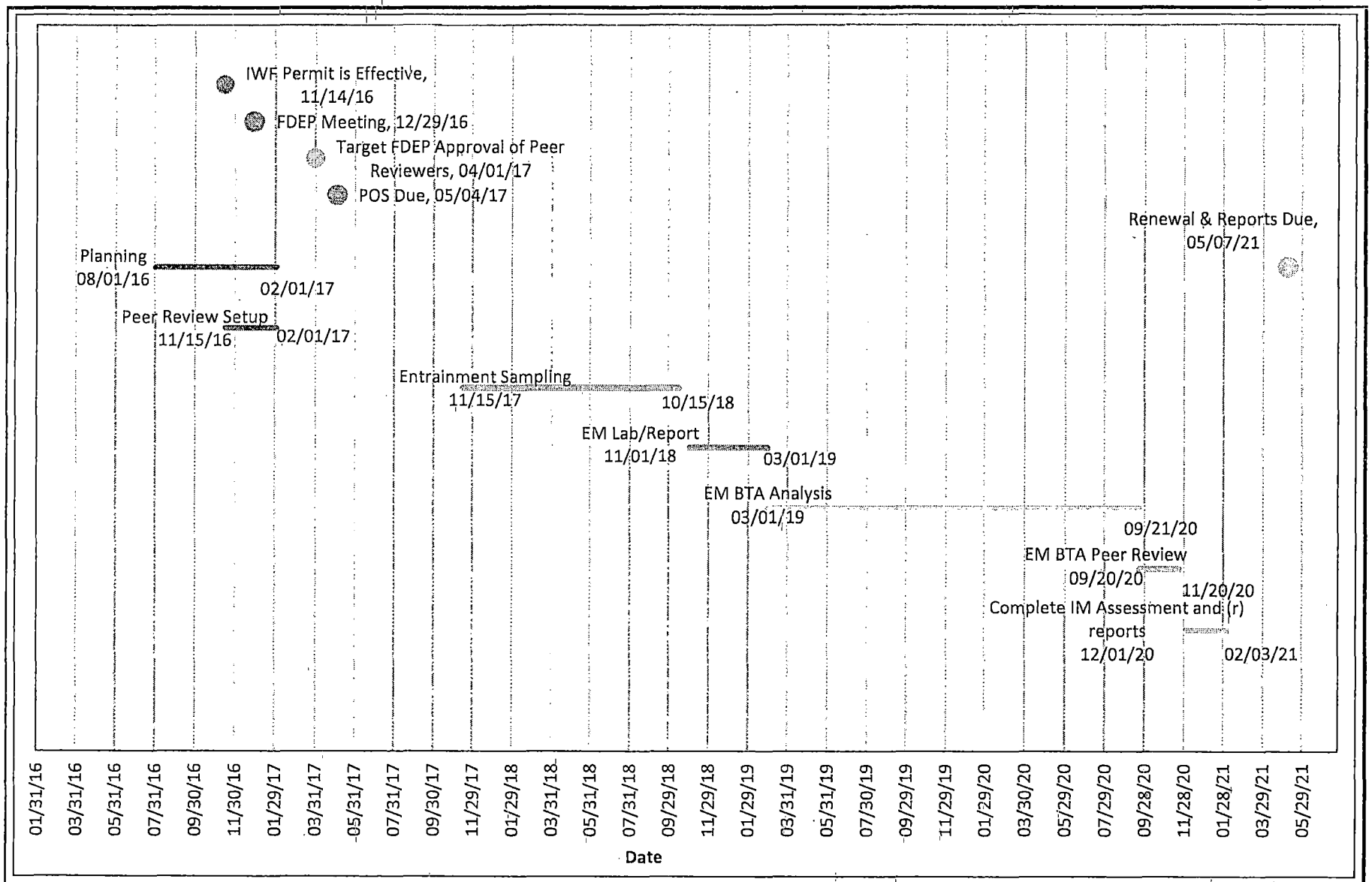

FIGURE 2.

ST. LUCIE ANTICIPATED PROJECT SCHEDULE

Source: ECT, 2017.

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4.0 PROJECT TEAM

Table 2 summarizes key staff for the St. Lucie plant's 316(b) effort.

Table 2. St. Lucie Power Plant 316(b) Compliance Project Key Staff Contacts

Staff	Company	Role	Telephone	Email
Tim Powell	FPL	Project manager	561-694-4015	timothy.powell@fpl.com
Ron Hix	FPL	Project advisor	561-691-7641	ron.hix@fpl.com
Steve Cibik	ECT	Project manager	919-861-8888	scibik@ectinc.com
Mark Gerath	ECT	Project director	978-263-3335	mgerath@ectinc.com

Source: ECT, 2017.

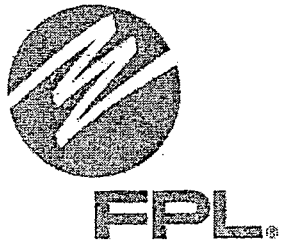
APPENDIX A

ENTRAINMENT CHARACTERIZATION STUDY PLAN

ENTRAINMENT CHARACTERIZATION STUDY PLAN

ST. LUCIE NUCLEAR POWER PLANT

Prepared for:



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April 2017

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This document has been authored and reviewed by the following employees:

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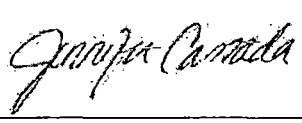	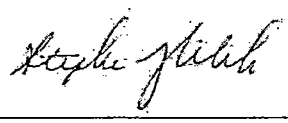
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LIST OF ACRONYMS AND ABBREVIATIONS

°C	degree Celsius
°F	degree Fahrenheit
AIF	actual intake flow
BTA	best technology available
CFR	Code of Federal Regulations
CWIS	cooling water intake structure
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act of 1973
FDEP	Florida Department of Environmental Protection
FNAI	Florida Natural Areas Inventory
FPL	Florida Power & Light Company
fps	foot per second
FR	Federal Register
ft	foot
gpm	gallon per minute
IM	impingement mortality
IPaC	USFWS Information Planning and Conservation
MGD	million gallons per day
MW	megawatt
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
ppt	part per thousand
SOP	standard operating procedure
St. Lucie Plant	St. Lucie Nuclear Power Plant
USFWS	U.S. Fish and Wildlife Service
WOUS	Waters of the United States

1.0 INTRODUCTION

Florida Power & Light Company (FPL) owns and operates the St. Lucie Nuclear Power Plant (St. Lucie Plant), a two unit nuclear-fueled electric generating facility on Hutchinson Island in St. Lucie County, Florida, that operates under National Pollutant Discharge Elimination System (NPDES) Permit No. FL0002208. The St. Lucie Plant is subject to the final Clean Water Act Section 316(b) rule for existing facilities[1], which was published August 15, 2014, by the U.S. Environmental Protection Agency (EPA).

The 316(b) rule regulates the location, design, construction, and operation of cooling water intake structures (CWIS). The rule applies to existing facilities that hold an NPDES permit, withdraw more than 2 million gallons-per-day (MGD) from Waters of the United States (WOUS), and use at least 25 percent of that water exclusively for cooling purposes. The rule supersedes the Phase II rule, which was remanded in 2007, and the remanded existing facility portion of the previously promulgated Phase III rule. The final 316(b) rule became effective on October 14, 2014. Compliance with the rule is linked to the facility's NPDES permit, and implementation of the NPDES program in Florida has been delegated by EPA to the Florida Department of Environmental Protection (FDEP).

The 316(b) rule requires each affected facility's application for renewal of their NPDES discharge permit include specific submittals and supporting information to demonstrate compliance with the performance standards. Facilities with design intake flows greater than 2 MGD must comply with the impingement mortality (IM) requirements of the rule, and facilities that withdraw more than 125 MGD of actual intake flow (AIF) are required to submit an entrainment characterization study to support the NPDES director's determination of best technology available (BTA) for entrainment mortality. This study plan has been prepared to support development of both the IM compliance strategy of Title 40, Section 122.21(r)(6), Code of Federal Regulations (CFR), and the entrainment characterization study required in 40 CFR 122.21(r)(9).

[1] Federal Register (FR), Volume 79, No. 158, Friday, August 15, 2014, pages 48300 through 48439; Title 40, Parts 122 and 125, Code of Federal Regulations (CFR), National Pollutant Discharge Elimination System—Final Regulations to Establish Requirements for Cooling Water Intake Structures at Existing Facilities and Amend Requirements at Phase I Facilities; Final Rule.

Section 2.0 describes the regulatory requirements for compliance with the final existing facilities rule, and Section 3.0 provides a description of the St. Lucie Plant. Section 4.0 summarizes historical impingement and entrainment data, and Section 5.0 discusses the potential for state and federally listed species to occur at the site. Section 6.0 presents the proposed entrainment sampling plan.

2.0 REGULATORY BACKGROUND

The final 316(b) rule establishes requirements for BTA in design and operation of the CWIS to minimize adverse environmental impacts due to impingement and entrainment of organisms. Impingement occurs when organisms are trapped against the outer part of an intake structure or screen, and entrainment is when organisms are drawn through the CWIS and into the cooling water system. The main objective of the final 316(b) rule is to reduce mortality from impingement and entrainment through establishing performance standards for BTA.

2.1 IMPINGEMENT

The rule's IM requirements apply to all existing facilities with design intake flows of greater than 2 MGD. There are nine alternatives for compliance:

1. Closed-Cycle Recirculating System; 40 CFR 125.94(c)(1)—A facility that operates a closed-cycle facility is considered compliant with IM requirements. The rule's definition of closed-cycle per 40 CFR 125.92(c) includes cooling towers, cooling ponds that are not WOUS, and existing impoundments of WOUS constructed for the purposes of serving as part of the cooling water system. There are no specific requirements for flow reduction or cycles of concentration. Facilities that comply under this alternative must monitor flow at least daily.
2. 0.5-Foot-per-Second Through-Screen Design Velocity; 40 CFR 125.94 (c)(2)—A facility may comply with BTA requirements by demonstrating the CWIS has a maximum design through-screen intake velocity of 0.5 foot per second (fps). The velocity must be achieved under all conditions, including during minimum ambient source water elevation and periods of maximum head loss across the screen.
3. 0.5-fps Through-Screen Actual Velocity; 40 CFR 125.94 (c)(3)—Facilities that can demonstrate the actual intake velocity does not exceed 0.5 fps can comply with the IM requirements under this alternative. As with the 0.5-fps through-screen design velocity, the velocity must be achieved under minimum ambient source water elevation and during periods of maximum

head loss across the screen. Compliance under this alternative requires daily monitoring of the intake velocity or monitoring of flow, water depth, and intake area to support calculation of the intake velocity.

4. Existing Offshore Velocity Cap; 40 CFR 125.94(c)(4)—Facilities with existing velocity caps located more than 800 feet (ft) offshore per 40 CFR 125.92(v) are compliant with the rule's IM requirements. Intake flow must be monitored on a daily basis.
5. Modified Traveling Screens; 40 CFR 125.94(c)(5)—This alternative requires installing and operating modified traveling screens and a fish return, as defined in 40 CFR 125.92(s). Facilities that select this compliance option must complete a two-year impingement technology performance optimization study per 40 CFR 122.21(r)(6)(i). This study must include two years of monthly (at minimum) monitoring of the latent survival of "nonfragile" species following impingement on the screens, with the stated goal of optimizing the performance of the technology.
6. Systems of Technologies as BTA for IM; 40 CFR 125.94(c)(6)—This alternative provides the NPDES director the discretion to determine a system of technologies, management practices, and operational measures are the BTA for reducing IM. This alternative requires a two-year impingement technology performance optimization study to optimize the selected compliance goal, either: (1) reduction in impingement rate, or (2) reduction in mortality after impingement per 40 CFR 122.21(r)(6)(ii).
7. IM Performance Standard; 40 CFR 125.94(c)(7)—This compliance alternative requires achieving IM rates of no more than 24 percent on an annual basis. This must be demonstrated with latent mortality monitoring conducted monthly on an ongoing basis through at least the initial permit term.
8. *De minimis* Rate of Impingement; 40 CFR 125.94(c)(11)—This alternative provides the NPDES director the discretion to conclude that the rates of impingement are so low that additional impingement controls are not justified. The 316(b) rule indicates this approach may only be used in limited circumstances.

9. Low-Capacity Power Generating Units; 40 CFR 125.94(c)(12)—The NPDES director has the discretion to establish less stringent IM standards for facilities with CWIS with capacity utilization rates of less than 8 percent averaged over a two-year period.

40 CFR 122.21(r)(6) requires the facility select an approach for compliance with IM requirements and, depending on the alternative selected, the required supporting information. For Alternatives 5, 6, and 7, biological monitoring data are to be collected after the selected compliance technology is installed to demonstrate the technology has been optimized and/or is meeting relevant performance standards.

2.2 ENTRAINMENT

The 316(b) rule does not establish specific entrainment performance standards but rather requires the NPDES director to establish BTA for each facility on a site-specific basis. 40 CFR 122.21(r)(9) requires an entrainment characterization study be conducted at facilities with an AIF greater than 125 MGD. The study is intended to provide the NPDES director with information needed to determine BTA for the facility. The study must include a minimum of two years of entrainment data collection and must include the following components:

(i) *"Entrainment Data Collection Method.* The study should identify and document the data collection period and frequency. The study should identify and document organisms collected to the lowest taxon possible of all life stages of fish and shellfish that are in the vicinity of the cooling water intake structure(s) and are susceptible to entrainment, including any organisms identified by the director, and any species protected under Federal, State, or Tribal law, including threatened or endangered species with a habitat range that includes waters in the vicinity of the cooling water intake structure. Biological data collection must be representative of the entrainment at the intakes subject to this provision. The owner or operator of the facility must identify and document how the location of the cooling water intake structure in the waterbody and the water column are accounted for by the data collection locations;

(ii) *Biological Entrainment Characterization.* Characterization of all life stages of fish, shellfish, and any species protected under Federal, State, or Tribal law (including threatened or endangered species), including a description of their abundance and their temporal and spatial characteristics in the vicinity of the cooling water intake structure(s), based on sufficient data to characterize annual, seasonal, and diel variations in entrainment, including but not limited to variations related to climate and weather differences, spawning, feeding, and water column migration. This characterization may include historical data that are representative of the current operation of the facility and of biological conditions at the site. Identification of all life stages of fish and shellfish must include identification of any surrogate species used, and identification of data representing both motile and non-motile life-stages of organisms;

(iii) *Analysis and Supporting Documentation.* Documentation of the current entrainment of all life stages of fish, shellfish, and any species protected under Federal, State, or Tribal law (including threatened or endangered species). The documentation may include historical data that are representative of the current operation of the facility and of biological conditions at the site. Entrainment data to support the facility's calculations must be collected during periods of representative operational flows for the cooling water intake structure, and the flows associated with the data collection must be documented. The method used to determine latent mortality along with data for specific organism mortality or survival that is applied to other life-stages or species must be identified. The owner or operator of the facility must identify and document all assumptions and calculations used to determine the total entrainment for that facility together with all methods and quality assurance/quality control procedures for data collection and data analysis. The proposed data collection and data analysis methods must be appropriate for a quantitative survey."

The entrainment study plan (Section 6.0) is intended to meet the submittal requirements for an entrainment characterization study plan and describes the approach and methods to collect entrainment data to support the site-specific determination of BTA for entrainment.

3.0 OVERVIEW OF THE ST. LUCIE PLANT

3.1 PLANT DESCRIPTION

FPL's St. Lucie plant is located on Hutchinson Island in St. Lucie County south of Fort Pierce, Florida (Figure 3-1). The plant consists of two nuclear-fueled generating units with a net generating capacity of 853 megawatts (MW) each unit. Unit 1 was placed in operation in March 1976, and Unit 2 was added in April 1983. St. Lucie was approved for an extended uprate in 2012 that increased generation capacity of each unit from 853 to 1,002 MW.

St. Lucie withdraws cooling water from the Atlantic Ocean through three offshore intakes equipped with velocity caps that meet the rule's definition in 40 CFR 125.92(v) (Figure 3-1). The design intake flow of the facility is 1,487 MGD (1,032,600 gallons per minute [gpm]) provided through eight circulating water pumps (1,404 MGD) and auxiliary equipment cooling pumps (four of six typically operate at 83 MGD). After passage through the facility, cooling water is discharged through a discharge canal and then two pipelines into the Atlantic Ocean. One discharge pipe extends approximately 1,500 ft from shore and has a Y-shaped diffuser. The other extends approximately 1,900 ft from shore with an additional 1,400 ft of 58-port multiport diffuser (FPL, 2016).

3.2 SOURCE WATERBODY DESCRIPTION

The St. Lucie plant withdraws water from the Atlantic Ocean (Class III Marine Waters) on the east side of Hutchinson Island approximately 8 miles southeast of Fort Pierce, Florida. The depth near the intake is approximately 20 ft and slopes to approximately 40 ft roughly 1 mile offshore, rises back to approximately 25 ft at Pierce Shoal almost 2.5 miles offshore, before deepening again out across the continental shelf to approximately 300 ft (National Oceanic and Atmospheric Administration [NOAA], 2017) then the open ocean with an average depth of approximately 11,000 ft (Britannica, 2017).

Currents in the nearshore area near the St. Lucie site are primarily influenced by winds and tides. Tides in this area are semidiurnal and have a relatively low tidal range with a mean

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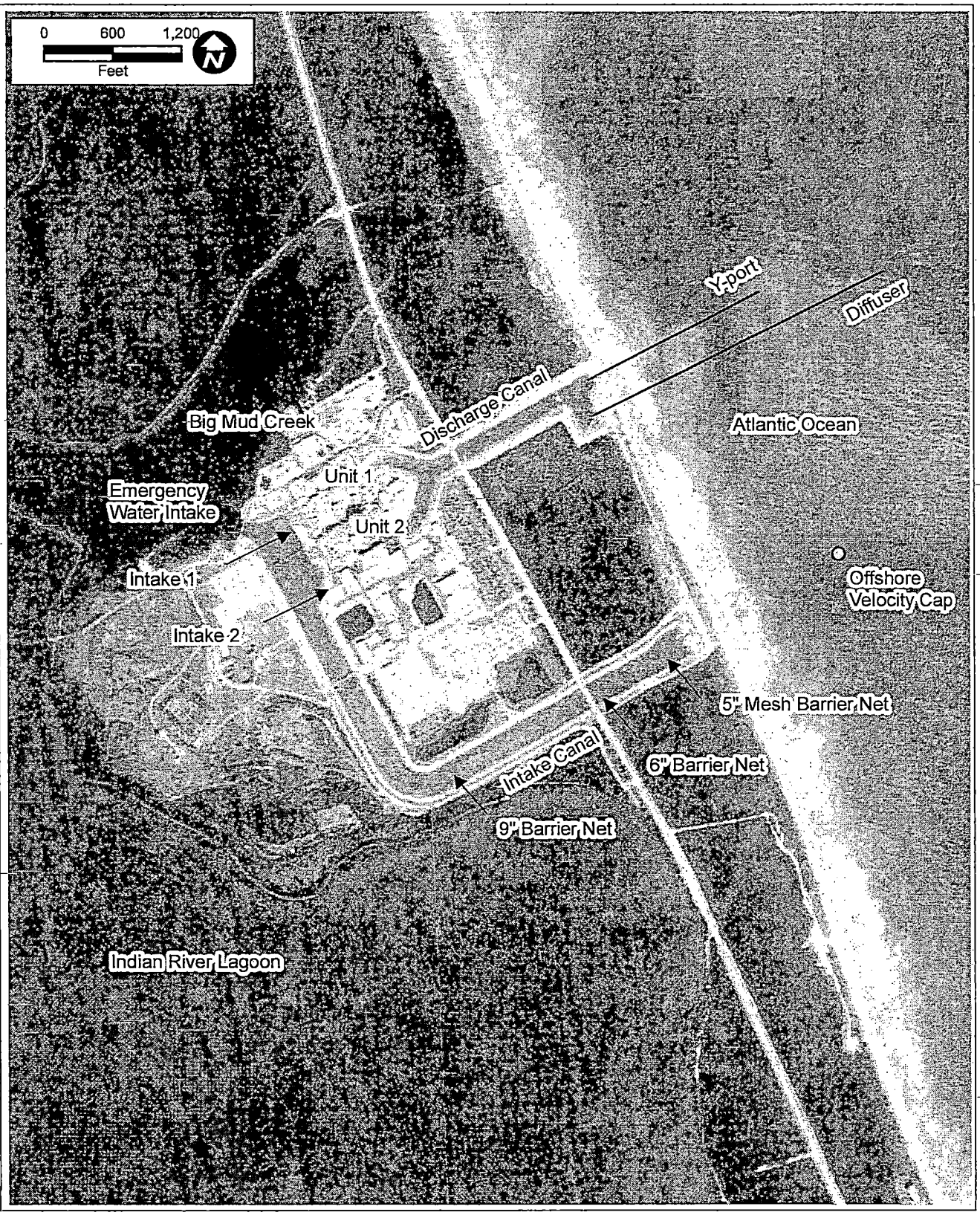

FIGURE 3-1.

SITE LOCATION MAP

Sources: ESRI World Imagery, 2014.

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of 2.56 ft and a spring tide range of 3.59 ft (NOAA Tide Station #8722212). The main ocean current along the Florida east coast is the Florida Gulf Stream, which flows northward farther offshore, beyond the 300-ft contour. Longshore currents were measured for the St. Lucie Plant Environmental Impact Statement in 1973 to 1975. Currents ranged from near zero to 1.6 fps and flowed to the north 49 percent of the time and to the south 35 percent of the time. The prevailing current direction is to the north at an average speed of 0.74 fps near the surface and 0.54 fps near the bottom (FPL, 1982).

Salinity in the nearshore waters adjacent to the St. Lucie Plant is typical of ocean waters and varies slightly between 34 and 36 parts per thousand (ppt) (Applied Biology, Inc., 1982). The Coastal Data Information Program buoy near Fort Pierce has recorded an average sea surface temperature for the period of record (September 29, 2006, to March 31, 2017) of 24.9 degrees Celsius (°C) (76.8 degrees Fahrenheit [°F]), with a range of 13.9°C (57.0°F) to 31.5°C (88.7°F).

3.3 CWIS CONFIGURATION

The St. Lucie intake is located at 27.347440 north, -80.233006 west, approximately 1,200 ft from the shoreline in the Atlantic Ocean, consists of three vertical concrete shafts that have concrete velocity caps to change the current direction from vertical to horizontal. This technology takes into account that fish are able to detect and avoid a horizontal velocity but not a vertical velocity. The intakes are located at mid-depth (approximately 7 ft below the water surface at mean low water). Water is gravity fed through the three offshore intakes into the three submerged pipes and then into an onshore intake canal. Two of the intake pipes have an inside diameter of 12 ft, while the third has an inside diameter of 16 ft. The onshore intake canal is L-shaped and is 5,000 ft long and 300 ft wide, with a maximum depth of 25 ft.

The velocity caps consist of large flat plates placed 6 to 7 ft above the vertical shaft of the intake structure. The velocity cap for the 16-ft pipe is 70 ft square, 5 ft thick, and has a vertical opening of 6.25 ft. The velocity caps for the two 12-ft diameter pipes are octagonal with the corners cut off; the long sides are 52 ft long, 5 ft thick, and have a vertical opening of 6.5 ft. Horizontal velocities at the two 12-ft pipes are estimated to be 0.4 fps; velocities

at the 16-ft pipe are estimated at 1 fps. In coordination with the National Marine Fisheries Service (NMFS), the velocity caps are being fitted with large animal exclusion devices.

There is a series of barrier nets along the intake canal designed to contain and reduce the residence time of sea turtles in the intake canal. A 5-inch barrier net is located downstream of the intake headwall. A second barrier net consisting of large-diameter polypropylene rope with a mesh size of 8 by 8 inches is located near the State Road A1A bridge. The third barrier net is located near the bend in the intake canal and is constructed of 9- by 9-inch mesh. Sea turtles captured in the nets or found in the intake canal are released back to the Atlantic Ocean.

Water entering the four intake bays passes through trash racks that consist of vertical bars at 3-inch spacing and through eight traveling screens (four per unit) with 0.375-inch mesh wire. The traveling screens are equipped with a spray wash system that removes debris and aquatic organisms. There is no fish return system at the St. Lucie Plant.

3.4 EMERGENCY WATER INTAKE

There is an emergency water intake structure located at the northwestern end of the intake canal that would allow water from Big Mud Creek, a cove of the Indian River Lagoon, into the intake canal. The intake consists of two 54-inch pipes with valves and is designed to provide emergency cooling water in the event that insufficient flow is available from the Atlantic. The system is tested quarterly by opening and closing each valve for a period of less than one minute. Depending on the head differential between Big Muddy Creek and the intake canal, the testing allows approximately 100,000 gallons per valve to flow into the intake canal.

4.0 HISTORICAL IMPINGEMENT AND ENTRAINMENT DATA

This section describes the historical impingement and entrainment studies conducted at the St. Lucie Plant in the 1970s and 2000s.

4.1 1976 TO 1983 STUDIES

Studies were conducted at the St. Lucie Plant in the 1970s and 1980s with Unit 1 being operational and prior to the construction of Unit 2.

4.1.1 IMPINGEMENT STUDIES

Impingement sampling was conducted at St. Lucie's Unit 1 intake from 1976 to 1978 as directed by the Nuclear Regulatory Commission (NRC) Unit 1 operating license. The travelling screens were sampled twice weekly for a 24-hour period divided into 8-hour samples, and annual impingement rates were estimated for the facility based on continuous operation of the one unit then in operation. There were 226 sampling events during this study.

Annual fish impingement was estimated to be between 34,000 (1978) and 131,000 (1976); annual shellfish impingement was estimated at 26,000 (1976) to 37,000 shellfish (1978). The mean number of fish impinged per 24-hour period was 222, and the mean number of shellfish was 82. The dominant taxa impinged included anchovy (*Anchoa* sp.), grunt (Haemulidae), jack (Carangidae), croaker (*Micropogonias* sp.), mojarro (Gerreidae), shrimp (Panaeidae), and blue crab (*Callinectes sapidus*). In 1979, the NRC amended the operating license for Unit 1 to discontinue the monitoring requirement, stating that impingement losses were insignificant when compared to the fish populations in the site vicinity and the number of commercially harvested shrimp on Florida's east coast.

With the addition of the second unit it was acknowledged that the impingement impacts would double with the doubling of the intake flow. However, the NRC estimated, even with doubling the weight of the organisms, impingement would only be equal to less than half of 1 percent of the commercial catch of fish and shellfish in either St. Lucie or Martin

counties. Therefore, the NRC concluded the combined estimates for impingement of the two units would still be insignificant.

4.1.2 GILL NETS

Gill-net sampling was conducted monthly in the intake canal from 1976 through 1984 to determine the number of fish and shellfish that become entrapped in the intake canal. Gill nets of 200 ft by 10 ft with 3-inch stretch mesh were fished in the intake canal for two consecutive 24-hour periods each month. The dominant organisms collected included grunt, drum, snapper, jack, porgy, mullet, and sea robin. The average catch rate was fairly consistent throughout the study period (3.5 to 12.5 fish per 30 meters of gill net per day).

Gill net samples were also collected at six ocean sampling locations once per month from April to September and twice per month from October through March with a 183-meter-long by 3.7-meter-deep with five mesh sizes in the end: 64, 74, 84, 97, and 117 millimeters (mm). The net was fished for 30 minutes per station. Catch rate and species collected were variable over the years with catch per unit effort ranging from 8 to 94 fish per net set.

These studies indicated there is not an accumulation of organisms in the intake canal. The low rate of entrapment was attributed to the velocity caps on the intakes that allow fish to detect and avoid the intake flow.

4.1.3 TRAWLS

Trawl samples were collected at six ocean stations using a 4.9-meter semiballoon trawl with 127-mm stretch mesh in the bag and 6.4 mm stretch mesh in the cod end. Each tow consisted of 15 minutes at 2 to 3 knots and was conducted at night to reduce the avoidance response of fish. These studies showed a high variability in percent composition (relative abundance) and overall abundance across the study period, within years, and spatially.

4.1.4 BEACH SEINES

Beach seine samples were collected once a month at three stations, near the intake, near the discharge, and north of the discharge. The beach seine was 30.5 meters long by

1.8 meters deep, with a stretch mesh of 25 mm. The net was deployed at 1.2 meters from shore and fished for three replicate hauls during each sampling period.

4.1.5 ENTRAINMENT STUDIES

Paired bongo nets were used to collect ichthyoplankton in the intake canal and nearshore habitats. Six ocean stations, one station in the intake canal, and one station in the discharge canal were sampled twice a month during the day using paired 20-centimeter, 505-micron mesh bongo nets. In the offshore stations the nets were towed for 15 minutes just below the surface. A mid-depth sample was taken near the intake, and oblique tows were taken in the canals.

Sample analysis showed the mid-water samples near the intake had lower densities of ichthyoplankton than the surface samples, the intake canal had lower densities than the ocean, and the discharge canal had lower densities than the intake canal. It was also noted most of the larval fish collected in the intake canal were damaged. The most common larval fish collected were herrings and anchovies, suggesting the unidentifiable eggs collected were likely the same species. Blennies, gobies, mojarras, drums, and jacks were also dominant.

Entrainment at the St. Lucie Plant was estimated based on localized densities of entrainable organisms near the intake. Entrainment sampling was conducted over a five-year period and concluded, under normal conditions, approximately 0.4 percent of the fish eggs and larvae passing the intake would be subject to entrainment. Therefore, the NRC determined the St. Lucie Plant would a minimal effect on the local fish populations.

4.2 PHASE II STUDIES

Studies were conducted in January 2006 to October 2007 in response to the release of the Phase II rule to characterize the biological community in the vicinity of the St. Lucie Plant.

4.2.1 NEARFIELD TRAWLS

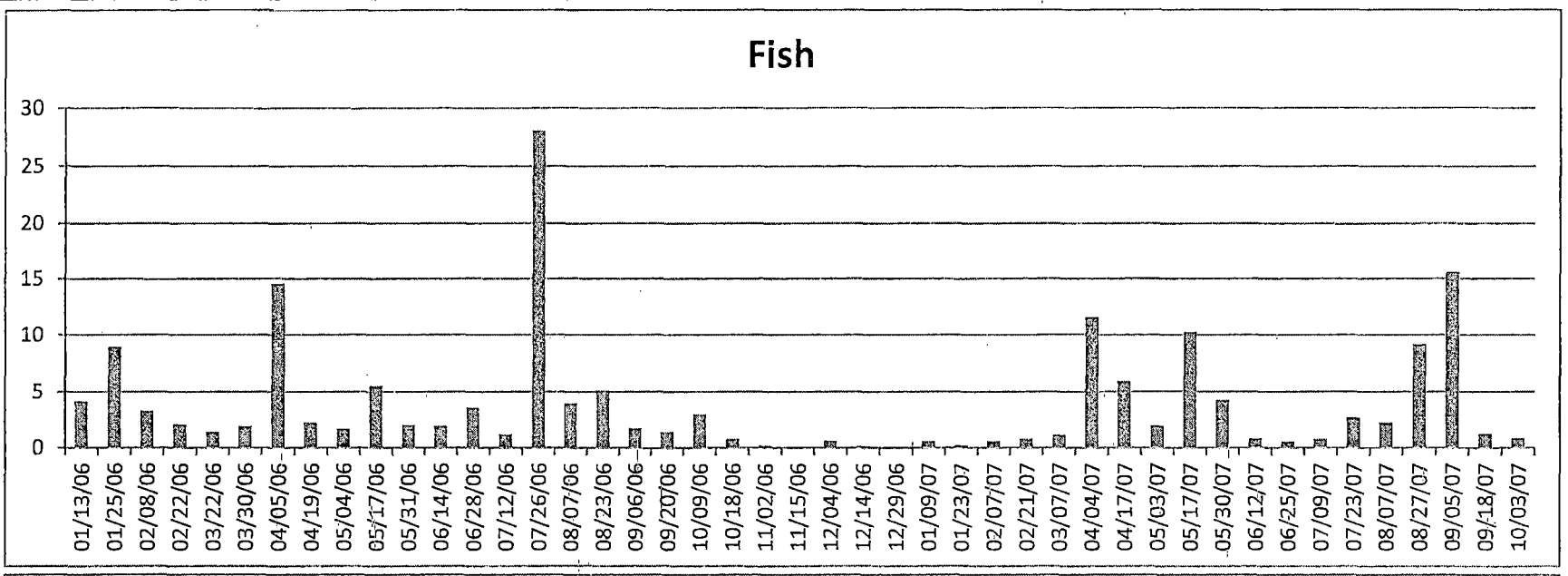
Bottom and midwater trawl samples were collected from the ocean near the intakes at three transects parallel to the shore using a 4.9-meter by 0.9-meter otter trawl. Fish densities

were generally higher in the summer than the winter and higher in 2006 than 2007. Dominant fish collected in the trawls were anchovies (especially *Anchoa hepsetus* and *A. lamprotenia*), comprising 89 percent of the catch, followed by herrings (Clupeidae) with 5 percent. Shellfish densities were low (less than one per 100 cubic meters) throughout the study and were dominated by commercial shrimp (Penaeidae) and swimming crabs (*Portunus* spp.).

4.2.2 PLANKTON COLLECTIONS

Plankton samples were collected by pumping intake water as it is drawn into the intake canal through a 1-meter diameter plankton net with 30-micron mesh. The plankton net was suspended at mid-depth and fished for 5 or 10 minutes, depending on whether one or two units were operating. Fish densities from plankton collections peaked in the late spring and late summer. Densities in the intake canal were low throughout the study. A high percentage of the catch in the intake canal was unidentifiable (74.5 percent) due to developmental stage (35 percent undeveloped), damaged (24 percent), or otherwise unidentifiable (15 percent). Drums (9.5 percent) and anchovies (4 percent) were the most commonly identified.

Densities of shellfish in the intake canal were also low throughout the study and dominated by brachyuran crabs (Brachyura, 64 percent), sergestid shrimp (Sergestoidea, 9 percent), and caridean shrimp (Caridea, 7 percent). Figure 4-1 depicts the seasonality of fish and shellfish entrainment, and Figure 4-2 shows the species composition.



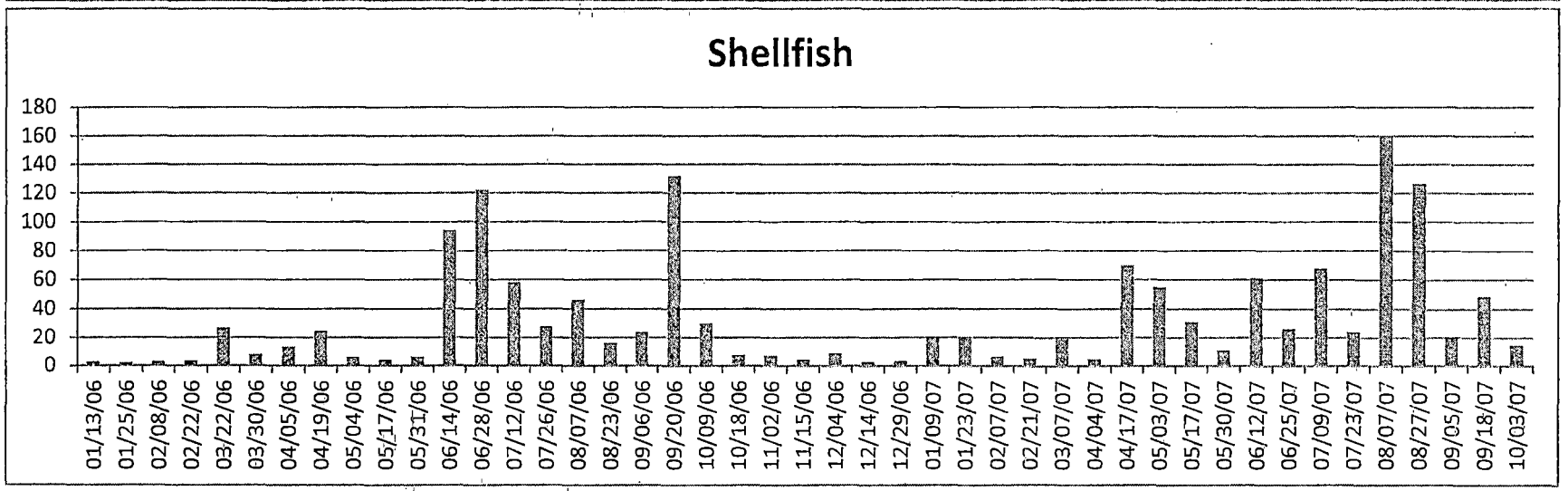


FIGURE 4-1.

2006-2007 ST LUCIE ENTRAINMENT STUDY RESULTS SEASONALITY

Source: EAI, 2008.

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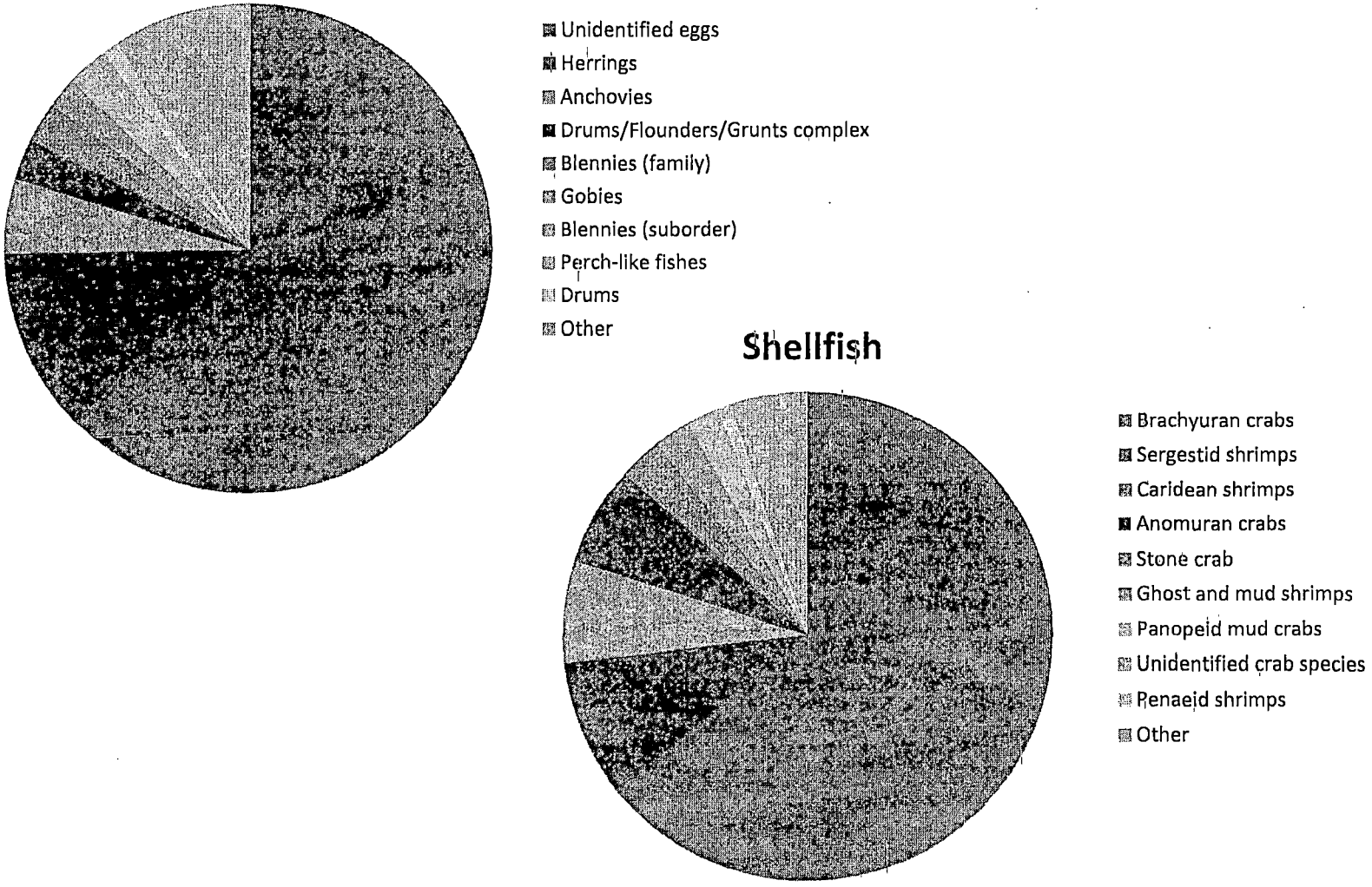

FIGURE 4-2.

2006-2007 ST LUCIE ENTRAINMENT SPECIES COMPOSITION

Source: EAI, 2008.

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5.0 THREATENED AND ENDANGERED SPECIES

Federally listed threatened and endangered species and designated critical habitat are protected by the Endangered Species Act of 1973 (ESA) and subsequent amendments. The ESA is administered by two federal agencies: the U.S. Fish and Wildlife Service (USFWS) and NMFS. NMFS oversees marine species, and USFWS has responsibility over freshwater fish and all other terrestrial and aquatic species.

During preparation of the final 316(b) rule, EPA conducted an ESA consultation with USFWS and NMFS. As a result, NMFS and USFWS issued a joint biological opinion commenting on the proposed rule's potential effects on listed species and/or critical habitat that stated the rule is not likely to result in jeopardy to any federally listed species, because it includes provisions for USFWS and NMFS review and requires the applicant to identify "based on readily available information...all federally listed threatened and endangered species and/or designated critical habitat that are or may be present in the action area."

Information regarding the potential presence of federally listed species or critical habitat was obtained from online databases including the USFWS Information Planning and Conservation (IPaC) website, NMFS website, and Florida Natural Areas Inventory (FNAI) biodiversity matrix. Table 5-1 includes federally and state-listed species that have the potential to occur near the St. Lucie Plant, as well as habitat preferences for each listed species. Critical habitat for loggerhead sea turtle (the beaches along Hutchinson Island) and West Indian manatee (Indian River Lagoon) is found near the St. Lucie Plant.

While it is unlikely federally listed species will be entrained during the planned sampling efforts, any such occurrence will be reported to FPL and the appropriate agency promptly after the organism is identified, as well as reported in the entrainment characterization study report.

Table 5-1. List of State- and Federally Listed Species in the Vicinity of the St. Lucie Plant

Scientific Name	Common Name	Status*		Habitat
		State	Federal	
Rynchops niger	Black skimmer	SC		Coastal and inland waters, nests on sandy beaches and islands and also rooftops
Sternula antillarum	Least tern	T		Coastal areas, nests on well-drained sand or gravel with little vegetation
Halophila johnsonii	Johnson's seagrass	E	T	Shallow tidal inlets, sandy shoals, and mouths of canals
Mycteria americana	Wood stork	T	T	Nests in inundated forested wetlands, forages in shallow water
Dermochelys coriacea	Leatherback sea turtle	E	E	Oceanic waters; nests on coastal sand beaches
Caretta	Loggerhead sea turtle	T	T	Marine coastal and oceanic waters; nests on coastal sand beaches; juveniles frequent coastal bays, inlets, and lagoons
Chelonia mydas	Green sea turtle	E	E	Estuarine and marine coastal and oceanic waters; nests on coastal sandy beaches; juveniles frequent coastal bays, inlets, and lagoons
Acipenser oxyrinchus	Atlantic sturgeon	E	E	Primarily marine, nearshore; migrates to rivers for spawning
Pristis pectinata	Smalltooth sawfish	E	E	Juveniles: estuaries, river mouths, and bays. Adults: open water.
Aphelocoma coerulescens	Florida scrub-jay	T	T	Fire-dominated oak scrub on well-drained sandy soils
Chamaesyce cumulicola	Sand-dune spurge	E		Coastal scrub and stabilized dunes
Charadrius melodus	Piping plover	T	T	Open sandy beaches and tidal mudflats
Cladonia perforata	Perforate reindeer lichen	E	E	Rosemary scrub
Coelorachis tuberculosa	Piedmont jointgrass	T		Shallow areas in lakes and ponds or wet savannahs in karst areas
Conradina grandiflora	Large-flowered rosemary	T		Sandy flats or sandhills
Drymarchon couperi	Eastern indigo snake	T	T	Broad range of terrestrial habitats
Glandularia maritima	Coastal vervain	E		Sandy clearings in coastal scrub and forested habitats

Table 5-1. List of State- and Federally Listed Species in the Vicinity of the St. Lucie Plant (Continued, Page 2 of 2)

Scientific Name	Common Name	Status*		Habitat
		State	Federal	
Gopherus polyphemus	Gopher tortoise	T	C	Variety of terrestrial habitats with well-drained sandy soils
Lechea cernua	Nodding pinweed	T		Deep sands in openings in scrub oak or mixed forests
Lechea divaricata	Pine pinweed	E		Scrub and scrubby flatwoods
Lepidochelys kempii	Kemp's ridley sea turtle	E	E	Marine coastal waters, nests on sandy beaches
Linum carteri var. *smallii*	Small's flax	E		Pine rocklands, pine flatwoods and adjacent disturbed areas
Peromyscus polionotus niveiventris	Southeastern beach mouse	T	T	Sand dunes with moderate vegetated cover and adjacent palmetto flats
Pituophis melanoleucus mugitus	Florida pine snake	SC		Open areas with dry sandy soils; sandhills, fields, scrub
Polygala smallii	Tiny polygala	E	E	Pine rocklands, scrub, sandhills
Rivulus marmoratus	Mangrove rivulus	SC	SC	Coastal brackish and saltwater especially mangrove and saltmarsh
Rostrhamus sociabilis	Snail kite		E	Large open freshwater marshes or shallow lakes with apple snails
Schizachyrium niveum	Scrub bluestem	E		White sand patches in rosemary scrub; also sand pine scrub and oak scrub
Tephrosia angustissima var. *curtissii*	Coastal hoary-pea	E		Pine rocklands
Trichechus manatus	West Indian manatee	E	E	Coastal waters

*C = candidate species. T = threatened.
E = endangered. SC = species of concern.

Source: FNAI within 7-square-mile matrix units (67302, 67476, 67477, 67478, 67645, 67646, 67647), including St. Lucie plant, intake and discharge canals, and into the Atlantic Ocean. http://www.fnai.org/biointro.cfm. Accessed April 6, 2017. IPaC Application Accessed April 6, 2017.

The operating license for Unit 1 was issued by the NRC in 1976, but no ESA consultation was conducted. In 1982, 1997, 2001, and 2016, NMFS issued biological opinions to the NRC for the operation of the St. Lucie Plant. The 1982 biological opinion concluded Unit 2 was not likely to jeopardize the continued existence of any listed species under NMFS jurisdiction, but no estimate of incidental take was made.

Due to the incidence of sea turtle takes at the facility, the NRC reinitiated consultations in 1995. NMFS issued a biological opinion in 1997 with the conclusion that continued operation of the St. Lucie Plant was not likely to jeopardize the continued existence of listed species under NMFS jurisdiction. NMFS also issued anticipated annual incidental take numbers for five sea turtle species: loggerhead (*Caretta caretta*), Kemp's ridley (*Lepidochelys kempii*), green (*Chelonia mydas*), leatherback (*Dermochelys coriacea*), and hawksbill (*Eretmochelys imbricata*).

In 1999, the St. Lucie Plant exceeded the anticipated incidental take of green sea turtles, and the NRC reinitiated consultation again. NMFS issued a biological opinion in 2001 that concluded the continued operation of the St. Lucie Plant was not likely to jeopardize the continued existence of green, leatherback, hawksbill, or Kemp's ridley sea turtles or loggerhead sea turtles, and an incidental take authorization for these species was issued.

FPL, NRC, and NMFS interacted throughout the 2000s and 2010s, and smalltooth sawfish was added to the biological opinion that was issued in 2016. This biological opinion concluded the continued operation of the St. Lucie Plant is not likely to jeopardize the continued existence of green, hawksbill, Kemp's ridley, or leatherback sea turtle; northwest Atlantic distinct population segment of loggerhead sea turtle; or United States distinct population segment of smalltooth sawfish. NMFS also found the St. Lucie Plant is not likely to destroy or adversely modify the designated critical habitat of the loggerhead northwest Atlantic distinct population segment. An incidental take statement was included for sea turtles and smalltooth sawfish.

6.0 ENTRAINMENT STUDY PLAN

This section provides an overview of the entrainment sampling to be conducted at the St. Lucie Plant. A site-specific standard operating procedure (SOP) will be developed prior to the initiation of sampling activities, along with a site-specific health and safety plan.

6.1 ENTRAINMENT CHARACTERIZATION

The objective of the entrainment sampling program is to identify and quantify organisms that pass through the intakes' screening systems and become entrained during normal plant operations. Vulnerability to entrainment is related to size, motility, and habitat preferences, but entrainable organisms generally include fish eggs, larvae, small juveniles, and larval stages of shellfish. Data collected within this sampling program will be used to identify species and life stages affected, characterize temporal trends in entrainment rates (both diel and seasonal), and support the site-specific determination of BTA for entrainment.

Entrainment will be considered in absolute terms and extrapolated to a common-age basis to estimate loss of standing stock and/or monetized loss. The data on entrainment will also inform the evaluation of the effectiveness of fine-mesh screens and potential for seasonal deployment of entrainment mitigation measures (e.g., flow reduction, fine-mesh screens that are deployed for portions of the year). Consistent with these goals, entrainment samples will be enumerated, identified, and subjected to length measurements.

6.1.1 SAMPLING FREQUENCY AND METHODOLOGY

Entrainment sampling will occur every two weeks (biweekly) over a 24-hour period, with entrainment subsamples being collected approximately every six hours. The sampling program will include one year of entrainment sampling to supplement the 21 months of data collected during the Phase II rule. Sampling methodology will therefore, to a great extent, follow the Phase II study protocols. Samples will be collected at the seaward end of the intake canal as water first enters the cooling system, which is defined by the rule to include the canal. This represents the best location to define the rate of entrainment from the source water into the cooling system. Samples will be collected twice during the day and twice at night to approximately coincide with periods of high and low tide. The high-

and low-tide samples for each photoperiod will be composited in the laboratory, yielding a total of two entrainment samples per sampling event (i.e., a day and night sample).

Samples will be collected using a plankton net lowered into the intake canal. The net will have a 1-meter diameter mouth, 5:1 length-to-diameter ratio, and 300-micron mesh and will be fished at mid-depth for approximately 5 minutes if both units are running or 10 minutes if only one unit is running. This method will sample approximately 130 to 200 cubic meters, and the actual sample volume will be measured using a flow meter at the mouth of the net. At the conclusion of each sample collection, the contents of the plankton net will be rinsed down with source water from the outside of the net and carefully transferred to labeled sample jars and preserved for analysis.

6.1.2 SAMPLE ANALYSIS

In the laboratory, ichthyoplankton and targeted shellfish meroplankton will be separated from detritus (sorted), identified to the lowest practical taxon, and enumerated by life stage (e.g., egg, yolk-sac larvae, post-yolk-sac larvae, or juvenile for fish; zoea or megalopa for shellfish). For ichthyoplankton, notochord length and the greater of either body depth or head capsule height will be measured to the nearest 0.1 mm for a subset of 30 individuals of each taxon of fish larvae to allow for assessment of fine-mesh screen performance. For shellfish meroplankton taxa, the greatest body dimension will be measured for a sufficient number of each life stage to characterize the number of meroplankters in size classes of less than 1 mm, 1 to 2 mm, 2 to 9 mm, and greater than 9 mm. Ecological Associates Inc.'s laboratory SOP provides a detailed description of laboratory procedures.

6.2 SUPPORTING DATA COLLECTION

Supporting data collection will include *in situ* measurements of pH, temperature, salinity, and dissolved oxygen during each sample collection. Field notes will be taken to note wind and weather conditions, tide stage, departures from the standard sampling protocol, and observed departures from normal plant operations (e.g., circulating water pump or screen wash operations, etc.). Daily circulating water pump rates will be obtained from plant operators for normalization of results to actual flow rates.

6.3 QUALITY CONTROL

The field data will be collected in compliance with the quality assurance protocols established in the site-specific SOP. The SOP establishes consistent, accurate, and reliable methods for data capture and outlines general procedures used programwide to ensure data are scientifically valid and defensible.

Included in the SOP are procedures to ensure the sorting of entrainment samples is performed consistently, and sorters are provided initial training and certification so each sorter achieves at least 95-percent sorting efficiency. In addition, taxonomic quality assurance is conducted by a second taxonomist for 10 percent of the samples. Percent taxonomic disagreement (number of taxonomic disagreements divided by the total number of organisms in the sample) must be below 15 percent. Identifications in disagreement are discussed between the taxonomists, and an agreement is reached through consultation with the scientific literature, comparison with reference specimens, and/or verification by additional taxonomists.

In addition to the quality assurance measurements described herein, the data, from collection through reporting, go through a series of verification checks. Prior to leaving the field, the field team leader reviews the field data sheets to ensure the required data have been collected and the forms are complete. In the laboratory, data are entered into electronic databases, and entries are verified against the original field data sheets. Once the data are assembled into report tables, the tables are checked against the electronic database to ensure the summaries are correct.

6.4 REPORTING

Reports from the laboratory will be generated to include electronic databases (Microsoft® Excel™ or Access™) containing the resulting sample data along with relevant metadata (e.g., sample volume, date and time, water quality). The sample results will then be summarized in the entrainment characterization report called for under 40 CFR 122.21(r)(9).

6.5 HEALTH AND SAFETY

A site-specific health and safety plan will be developed prior to field sampling to ensure the safety of both individuals collecting the samples as well as plant staff. Prior to conducting the first field sampling at the plant, employees will undergo training required for working at the nuclear plant. During each sampling event and prior to initiating a sampling activity onsite, the field team leader will also conduct a safety tailgate meeting with the field team members to review expected weather conditions, sampling procedures, potential hazards and risks, and pertinent field safety issues prior to the commencement of field operations. Personnel involved in sampling and relevant hazard/safety issues discussed prior to work onsite will be recorded for each event.

6.6 SCHEDULE

Entrainment sampling is tentatively scheduled to begin in November 2017 and will continue through mid-October 2018.

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