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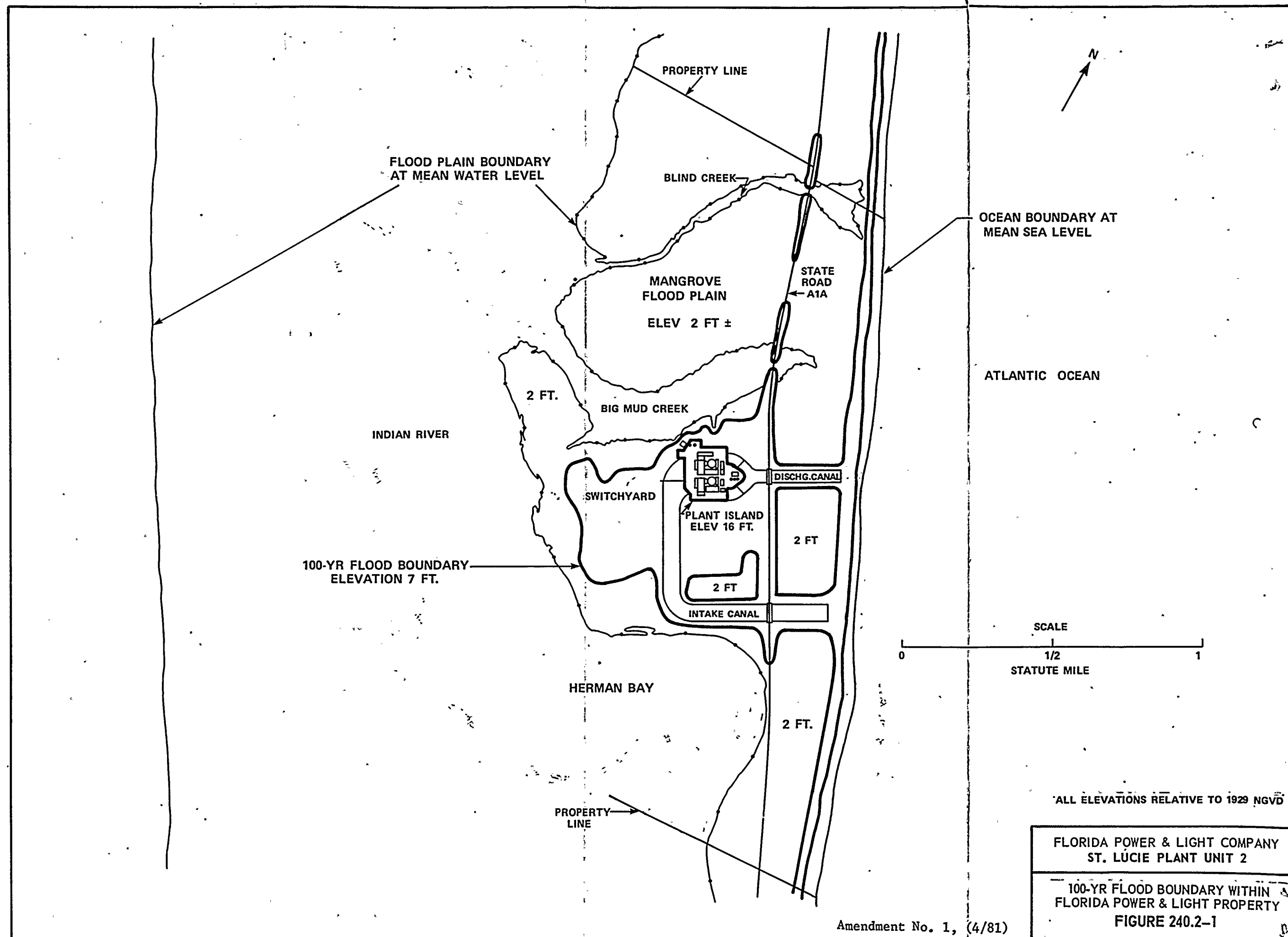
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Amendment No. 1, (4/81)

ALL ELEVATIONS RELATIVE TO 1929 NGVD

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

100-YR FLOOD BOUNDARY WITHIN
FLORIDA POWER & LIGHT PROPERTY
FIGURE 240.2-1

Question No.

1. Identify your latest scheduled commercial operating date for St Lucie Unit 2.

Response

The present scheduled date for commercial operation of St Lucie Unit 2 is May, 1983. This date is based on the receipt of an operating license in November, 1982 followed by core load and low power testing.

No ER-OL revisions are required.

Question No.

2. Discuss status of your proposed sale of 55 MW of St Lucie Unit 2 and your planned firm purchase of capacity from Tampa Electric Co in the 1985-87 timeframe. Is it a correct interpretation of Table 1.1-9 that the proposed sale has been deducted from capacity but the proposed purchase has not been added to capacity, and if so, why?

Response

It is a correct interpretation of Table 1.1-9 that FP&L's offer for sale of 55 MW to other utilities has been deducted from capacity.

The planned purchase from Tampa Electric was not contracted at the time of printing of this report, and therefore, could not be shown as an addition to generation capacity.

Subsequent to the data filed in the Environmental Report-Operating License, a joint motion by Justice Department, NRC Staff and FP&L was filed with the Atomic Safety and Licensing Board of NRC on September 12, 1980 in Docket No. 50-389A seeking the approval of a settlement agreement and proposed license conditions for St Lucie Unit 2.

Included in the license conditions is a provision for 16 certain utility systems to have an opportunity to participate in the ownership of St Lucie Unit 2 of up to 15.14557 percent in the aggregate. Additionally, in a separate agreement, the Company has offered Seminole Electric Cooperative a 6 percent ownership share. Thus, should the Licensing Board implement the proposed license conditions, approximately 21 percent of St Lucie Unit 2 could be offered to the various participants. Based on the 802 MW rating of the unit, total participation shares to be offered would be approximately 170 MW. One of the utilities included in the above, Orlando Utilities Commission, entered a participation agreement with FP&L for a 6.08951 percent ownership share, and on January 13, 1981 an initial closing took place. Negotiations with some of the other potential participants are pending.

With respect to the capacity purchases from Tampa Electric Company, FP&L entered a unit power purchase agreement with TECO on September 10, 1979 regarding TECO's proposed Big Bend Unit 4. The unit with an anticipated rating of 417 MW is scheduled for operation beginning in 1985. In accordance with the agreement, FP&L would be entitled to capacity and associated energy in the following amounts and timeframe:

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<u>From</u>	<u>Through</u>	<u>% Capacity</u>	<u>Approximate MW</u>
In Service Date	12/31/85	70	292
1/1/86	12/31/86	50	209
1/1/87	12/31/87	25	104

No ER-OL revisions are required.

Question No.

3. What reserve margin as a percentage of peak load demand does FP&L view as necessary to maintain minimum reliability conditions on its system in 1983-85 timeframe?

Response

For capacity expansion planning purposes, FP&L considers reserve margins of 20 percent to 25 percent an acceptable range to insure an adequate and reliable system for its customers. These reserve margins are based on summer net continuous ratings and summer peak loads.

No ER-OL revisions are required.

Question No.

4. For the year 1980 show (a) breakdown of electric energy generated by FP&L by fuel (i.e., gas, oil, nuclear, etc) and (b) the average production cost (fuel and O & M) by fuel type. Identify any availability problems you anticipate may occur in the foreseeable future with respect to any of the fuels you are currently dependent on.

Response

See attached tables for responses to (a) and (b) above.

While shortage of a specific quantity fuel, namely low sulphur fuel oil, may occur from time to time, FP&L does not anticipate encountering fuel supply availability problems with any of its operating electric generating plants (i.e., gas, oil, nuclear). This statement is based on the experience to date that while fuel costs are high, availability is adequate.

No ER-OL revisions are required.

UTILITY: FLORIDA POWER & LIGHT COMPANY

ENERGY SOURCES

<u>ENERGY SOURCES</u>		<u>Actual</u> <u>1979</u>	<u>Actual</u> <u>1980</u>
(1)	ANNUAL ENERGY INTERCHANGE	GWH 592.3	1,885.4
(2)	NUCLEAR	GWH 11,615.1	13,439.8
(3)	COAL	GWH -----	-----
(4)	RESIDUAL-TOTAL	GWH 24,491.8	24,159.3
(5)	Steam	GWH 23,869.3	23,421.8
(6)	CC	GWH 622.5	737.5
(7)	CT	GWH -----	-----
(8)	Diesel	GWH -----	-----
(9)	DISTILLATE-TOTAL	GWH 248.2	310.1
(10)	Steam	GWH -----	-----
(11)	CC	GWH -----	36.4
(12)	CT	GWH 248.2	273.7
(13)	Diesel	GWH -----	-----
(14)	NATURAL GAS-TOTAL	GWH 8,394.9	8,655.4
(15)	Steam	GWH 7,818.7	8,041.9
(16)	CC	GWH -----	-----
(17)	CT	GWH 576.2	613.5
(18)	Diesel	GWH -----	-----
(19)	OTHER	GWH -----	-----
(20)	NET ENERGY FOR LOAD	GWH 45,342.3	48,450.0

SL2-ER-OL
TABLE 4-2

FLORIDA POWER & LIGHT
AVERAGE PRODUCTION COSTS (FUEL AND O & M)

	<u>NUCLEAR</u>		<u>FOSSIL/STEAM*</u>	
			<u>OIL</u>	<u>GAS</u>
Fuel Expenses	\$ 53,359,115		\$ 846,899,377	\$ 88,122,595
Operation Expenses	\$ 25,143,062		\$ 31,702,960	
Maintenance Expenses	\$ 38,881,446		\$ 39,680,611	
	<u>GAS TURBINE*</u>		<u>COAL-OIL MIX*</u>	<u>OTHER*</u>
	<u>OIL</u>	<u>GAS</u>		<u>OIL</u> <u>GAS</u>
	\$21,168,203	\$ 11,064 214	\$ 13,888,283	\$ 39,111,046 320
	\$ 1,304,914		\$ 11,565,737	\$ 4,213,495
	\$ 6,356,569		-----	\$ 2,546,681

*Some Expenses By Fuel Type Not Available

Question No.

5. In Tables 1.1-2 and 1.1-3, identify where actual values end and projections begin. If actual energy and peak load values only go thru 1978 or 1979, provide actual values thru 1980. Also, in Table 1.1-3 indicate whether the peak load values include the interruptible loads.

Response

See revised ER-OL Tables 1.1-2 and 1.1-3.

Question No.

6. Explain your assumption that a delay in St Lucie 2 will precipitate a delay in the Martin Coal Unit 3.

Response

The assumption was: if St Lucie Unit 2 was delayed for reasons of financial, environmental, regulatory, or political issues, then it would be reasonable to assume that a similar delay could occur for Martin Coal Unit 3.

No ER-OL revisions are required.



Question No.

7. What percentage of St Lucie Unit 2 is currently completed (specifically, what portion of the \$925 million estimated capital cost has been spent)?

Response

The January 1981 estimated capital cost for St Lucie Unit 2 is \$1.1 billion. Of this amount, \$661,921,000 or 60.2 percent of the estimated cost has been spent to date.

No ER-OL revisions are required.

Question No.

8. Provide assumptions and trace through the calculations performed in your conclusions in Subsection 8.1.2 that, "The operation of St Lucie Unit 2 will result in an annual savings of an estimated 8.5 million barrels of crude oil per year. This annual saving translates into a dollar saving of \$137 million per year (1978 delivered price)".

Response

The methodology used to calculate the fuel oil required to replace other types of generation is as follows:

$$\text{bbls/yr} = \frac{(\text{Unit MWH rating/hr}) \times (24 \text{ hrs/day}) \times (\text{days/yr}) \times (\text{capacity factor})}{\text{Fossil eq. MWH/bbl}}$$

Assuming:

St Lucie Unit 2 rating: 850 MW gross
 Capacity factor: .72
 Fossil eq. MWH/bbl: .63

$$\text{bbls/yr} = \frac{(850 \text{ MWH/hr}) \times (24 \text{ hrs/day}) \times (365 \text{ days/yr}) \times (.72)}{.63}$$

bbls/yr = 8.5 million

This annual saving today translates into a dollar saving of \$306 million per year (January 1981 fuel price of \$36.00/bbl).

See amended ER-OL Subsection 8.1.2.



Question No.

9. Present a production cost analysis which shows the difference in system production costs associated with the availability vs unavailability of St Lucie Unit 2 for the years 1983 thru 1987 (first five years of proposed operation). Perform analysis assuming electrical energy demand grows at (a) FP&L's official forecasted growth rate, and (b) one-half FP&L's official forecasted growth rate. Show all underlying assumptions used in the production cost analysis, and identify sources of all replacement energy.

Response

FP&L's current minimum system demand exceeds the capacity of its three existing nuclear units plus the addition of St Lucie Unit 2. FP&L, therefore, intends to base load all of its nuclear units when available. This fact precludes the need to perform a cost analysis based on a 50 percent growth rate.

The following cost analysis of St Lucie Unit 2 was performed taking into account the offer for sale of 168 MW of its capability.

The operation of St Lucie Unit 2 will result in a annual fuel saving to FP&L of an estimated 6.3 million barrels of oil per year. This annual savings translates into a dollar saving to FP&L and its customers of an estimated \$227 million per year (1981 delivered price).

Assumptions:

1. FP&L share of St Lucie Unit 2 = 634 MW
2. St Lucie Unit 2 capacity factor = 72%
3. Nuclear equivalent conversion factor = 6.32 MBTU/BBL
4. System average fossil Heat Rate = 10,000 BTU/KWH
5. Price of Oil = $\frac{\$36.00}{\text{BBL}}$ (1981)
6. Fuel escalation rate = 8%

Expected Average Annual
Generation @ 72% Capacity Factor

3.998×10^9 KWH

SL2-ER-OL

Expected Average Annual
Fossil Fuel Savings

6.272×10^6 BBL

Expected Average Annual
Dollar Savings (1981 Dollars)

\$227.78 million

See revised ER-OL Subsection 8.2.1.

Question No.

10. Provide a compact updated table showing all environmental costs associated with operation (information should be of summary nature identifying the impact, unit of measurement, magnitude of impact, and evaluation of impact, (i.e., whether its negligible, or significant, etc.)). This information is typically presented in tabular form in ER Chapter 11.

Response

The environmental costs associated with (plant) operation cannot be monetized because of the incommensurable nature of environmental costs. In the truest sense, only the costs for mitigating certain adverse environmental impacts can be monetized.

Operation of St Lucie Unit 2 will have insignificant environmental impacts on the surrounding area, which do not require any mitigation costs. Plant components are designed to meet/surpass all applicable federal and state environmental regulations and/or standards, as shown in the attached table.

No ER-OL revisions are required.

SUMMARY OF ENVIRONMENTAL IMPACTS ASSOCIATED WITH OPERATION OF ST LUCIE UNIT 2

	<u>Magnitude with Units</u>	<u>Impacted Area</u>	<u>Evaluation</u>
<u>I. Impacts on Water and Aquatic Communities</u>			
a) Circulating Water System			
i) Intake - flow	520,000 gpm (Average)	Atlantic Ocean	Intake effects are negligible since flow is withdrawn and returned to Atlantic Ocean with insignificant consumptive use (Section 3.4.2)
- Entrainment	1.8 percent of offshore nearfield population	Atlantic Ocean	Assuming 100 percent mortality of plankton entrained through Unit 2, Loss of 1.8 percent will impose no significant adverse effect (Section 5.1.3.1.1)
- Impingement	160,000 finfish/yr 60,000 shellfish/yr	Atlantic Ocean	Projected biomass of impinged finfish and shellfish represent less than 0.04 and 0.005 percent, respectively, of the commercial catches in either St Lucie or Martin County. This overstates the adverse effects because species impinged do not correlate with typical, commercial and recreational species off Hutchinson Island (Section 5.1.3.1.2).
ii) Discharge - thermal	For two (2) °F isotherm: Max. plume size - 677 Acres Max. volume - 1889 Ac-ft	Atlantic Ocean	Underworst condition, maximum temperature rise will be 32°F. Maximum plume size and volume enclosed by a two (2) °F isotherm are as indicated. Thermal effects on the receiving water body, the Atlantic Ocean, are insignificant (Section 5.1).
- Benthos	--	Atlantic Ocean	Thermal plume will not cause bottom scour (Section 3.4); operation will not induce any adverse effects on the Benthic community (Section 5.1.3.2.1).
- Plankton	Table 5.1-17 lists thermal tolerance for plankton	Atlantic Ocean	Based on thermal tolerance and avoidance behavior of resident - species, and durations of exposure to thermal isotherms, no lethal responses in planktonic and nektonic species are anticipated (Section 5.1.3.2.1).
- Fish	25.5 Ac-ft plume for sum of 20°, 10° and 5°F isotherms (Table 5.1-11)	Atlantic Ocean	Same as above

SL2-ER-OL
TABLE 10-1 (Cont'd)

Sheet 2 of 2

	<u>Magnitude with Units</u>	<u>Impacted Area</u>	<u>Evaluation</u>
I. <u>Impacts on Water and Aquatic Communities</u> (Cont'd)			
b) Chemical and Biocide Waste Discharges	Concentrations of constituents are given in Table 3.6-1 and 5.3-1 (with dilutions)	Intake canal and Atlantic Ocean	Specifically, maximum total residual chlorine (TRC) concentration of 0.08 mg/l will meet EPA Effluent Limitations of 0.1 mg/l at point of discharge (40CFR 423). Concentrations of other treated effluents also comply with Effluent Limitations and Florida state water quality standards. No significant effects on the receiving water body (Sections 3.6 and 5.3)
c) Sanitary Waste Discharges	17,000 gpd	Intake canal	Treated effluent will meet EPA Secondary Treatment Criteria (40CFR133) and Florida state standard (FAC 17-6) and will be further diluted by some 10 ⁴ times prior to discharging to Atlantic Ocean (Section 5.4).
II. <u>Radiological Impact</u>			
- Man	Dose rates: In-plant area-0.1 mrem/yr per individual Within 50 mile radius - 10 ⁻³ mrem/yr per individual		Effects are insignificant: i) predicated dose is 20 percent of the limits defined in Appendix I, 10CFR50, and ii) natural background radiation and medical exposure result in doses exceeding 60,000 mrem/yr to populations within a 50 mile radius (Section 5.2.5)
- Biota	Total dose rate for <u>Chelonia mydas</u> : 2.0 mrem/yr		Effects are considered negligible because doses are within comparable guide for man (Section 5.2.3)
III. <u>Other Impacts</u>			
a) Transmission Lines	--	--	None. Licensed in St Lucie Unit 1 stage (Section 5.5)
b) Noise	Maximum shift two (2) dB above ambient	Area within five (5) mile radius	Maximum shift (less than five (5) dB) is not considered significant. (Table 5.6-2 and Section 5.6.2.6)
c) Fogging	Ten (10) hours/yr	State Route AIA discharge canal area	Low fogging potential based on maximum condenser (temperature) rise of 32°F of Unit 2 operation (Section 5.1.4)

Q10-3

Amendment No. 1, (4/81)

Question No.240.1
(2.4)

Descriptions of floodplains, as required by executive Order 11988, Floodplain Management, have not been provided. The definition used in the Executive Order is:

Floodplain: The lowland and relatively flat areas adjoining inland and coastal waters including floodprone areas of off-shore islands, including at a minimum that area subject to a one percent or greater chance of flooding in any given year.

- a. Provide descriptions of the floodplains adjoining the Atlantic Ocean, the Indian River and of all other water bodies, including intermittent water courses, within or adjacent to the site. On a suitable scale map, provide delineations of those areas that will be flooded during the one-percent chance flood in the absence of plant effects (i.e., pre-construction floodplain).
- b. Provide details of the methods used to determine the floodplains in response to a. above. Include your assumptions of and bases for the pertinent parameters used in the computation of the one-percent flood flow and water elevation. If studies approved by Flood Insurance Administration (FIA), Housing and Urban Development (HUD) or the Corps of Engineers are available for the site or adjoining area, the details of analyses need not be supplied. You can instead provide the reports from which you obtained the floodplain information.
- c. Identify, locate on a map, and describe all structures and topographic alterations in the floodplains.

Response

Development of the St Lucie site on Hutchinson Island was essentially completed before St Lucie Unit 1 became operational in 1976. Since Executive Order 11988 was promulgated in May, 1977, floodplain topography that existed then included the 16 foot elevation of the plant island, relative to National Geodetic Vertical Datum (NGVD). Based on pre-construction U S Geological Survey topographic maps of the site area, floodplain elevations prior to construction varied between 2 and 5 feet.

Hutchinson Island, where the St Lucie Plant is sited, is a coastal barrier island fronting the Atlantic Ocean between Stuart and Fort Pierce, Florida. It is separated from the Florida mainland by a tidal lagoon, the Indian River. The 23 mile long island is bounded to the north by Fort Pierce Inlet and to the south by St Lucie Inlet. Site topography is shown in Figures 2.3-1 and 2.3-2 of the St Lucie Unit 2 Environmental Report - Operating License.

On the ocean side of the island, a long straight beach front extends between the two inlets, backed by a barrier dune with crest elevation varying from 10 to 14 feet along most of the island. Width of the barrier dune is relatively narrow and is usually less than 200 feet. Topography on the Indian River side of Hutchinson Island is more irregular. Along narrow sections, where mangroves are absent, the island width is generally 400 to 600 feet. Where the barrier dune is backed by mangroves, the width increases to more than a mile.

The 100-year preconstruction flood event would have inundated all the mangrove floodplain and the narrow sections of the island along the Indian River up to the west side of the narrow barrier dune. On the ocean side storm surge elevation would reach 7 feet Mean Sea Level (approximately 8 1/2 feet Mean Low Water). At a 100-year flood event elevation of 7 feet above Mean Sea Level, most of the Hutchinson Island floodplain would be under 2 to 4 feet of water.

The basis of the 100-year flood level is a preliminary flood insurance study of St Lucie County, Florida, prepared by the Flood Insurance Administration (FIA) in 1978. Flood insurance maps were prepared from USGS topographic maps of the area. The 100-year flood boundary was established at 7 feet (NGVD) for both Indian River and Atlantic Ocean sides of Hutchinson Island.

The principal structures at the St Lucie Plant are the Reactor Building, Auxiliary Reactor Building and Turbine Generator Building for St Lucie Units 1 and 2. These and auxiliary structures are shown in Figures 3.1-1 and 3.1-2 of the St Lucie Environmental Report - Operating License. Topographic alterations are indicated for the various plant elevations, relative to the 4-foot mangrove elevation shown in Figure 2.4-15 of the St Lucie Plant Unit 2 Final Safety Analysis Report.

The area of landfill including the plant island is less than a 0.6 by 1.0 statute mile section of the floodplain between Big Mud Creek and Herman Bay. The plant island is at an elevation of at least 16 feet relative to NGVD. This elevation is at least nine feet above the FIA flood level for the 100-year event. Additional flood protection for St Lucie Units 1 and 2 is provided to more than 17.5 feet NGVD.

No ER-OL revisions are required.

Question No.240.2
(5.0)

- a. Discuss the hydrologic effects of all items identified in response to Question 240.1c. Discuss the potential for altered flood flows and levels, offsite. Discuss the effects on offsite areas of debris generated from the site during flood events.
- b. Provide the details of your analysis used in response to a. above. The level of detail is similar to that identified in Question 240.1b.

Response

Hydrologic effects of floodplain modification at the St Lucie plant site were evaluated using a "displacement volume and equivalent rise" calculation. For this calculation, the region of impact was defined as that segment of the Indian River extending from Statute Mile (SM) 965 of the Intracoastal Waterway near Fort Pierce Inlet to SM 988 at the St Lucie Inlet. The displacement volume for plant construction was defined as a 0.6 by 1.0 mile area of landfill for the St Lucie Plant and flood rise of 7 feet for the 100-year event.

The displacement rise within the Indian River segment was calculated with the equation,

$$\text{Plant Area} \times \text{Flood Rise} = \text{Region Area} \times \text{Displacement Rise},$$

where the region area was determined for an average width of the 23 mile segment of the Indian River. The average width was based on 22 measurements at one statute mile intervals from SM 975, opposite Herman Bay Point, extending north to the Fort Pierce Inlet and south to the St Lucie Inlet. The average width of the Indian River at Mean Low Water is 1.49 statute miles.

The displacement rise calculated with this approach was 0.12 feet. Figure 240.2-1 shows the 100-year flood boundary for Florida Power & Light St Lucie Site. The 100-year flood boundary contour is 7 feet relative to NGVD.

No ER-OL revisions are required.

Question No.

- 240.3
(7.1) Calculate the radiological consequences of a liquid pathway release from a postulated core melt accident. The analysis should assume, unless otherwise justified, that there has been a penetration of the reactor basemat by the molten core mass, and that a substantial portion of radioactively contaminated sump water was released to the ground. Doses should be compared to those calculated for the Liquid Pathway Generic Study (NUREG-0440, 1978) land-based coastal site. Provide a summary of your analysis procedures and the values of parameters used (such as permeabilities, gradients, populations affected, water use).

Response

An analysis of potential consequences of a liquid pathway release from a postulated core melt accident has been performed. The results are presented in the following report entitled "Comparability of St. Lucie Site And Liquid Pathway Generic Study from the Standpoint of Liquid Pathway".

No ER-OL revisions are required.

COMPARABILITY OF ST LUCIE SITE AND LIQUID PATHWAY
GENERIC STUDY FROM THE STANDPOINT OF LIQUID PATHWAY

1. Introduction

This report presents an evaluation of the offsite radiological impacts which are unique to a hypothetical accident that results in temperatures inside the reactor core which are sufficiently high to cause core melting and subsequent penetration of the basemat underlying the reactor. Such an accident creates the potential for releases of radioactive material into the hydrosphere through contact with groundwater, which in turn may lead to external exposure to radiation and internal exposures if contaminated food or water is ingested. A discussion is also presented of engineered systems which could be effective in mitigating the impacts of such an accident by isolating the contaminated groundwater aquifer from the hydrosphere.

The penetration of the basemat of the Reactor Building can release molten core debris to the strata beneath the plant. Soluble radionuclides in this debris can be leached and transported with groundwater downgradient to surface water bodies used for aquatic food and recreation. In pressurized water reactors, such as the St Lucie Unit 2 plant, there is an additional opportunity for groundwater contamination due to the release of contaminated sump water to the ground through a breach in the containment.

An analysis of the potential consequences of a liquid pathway release of radioactivity for generic sites was presented in the "Liquid Pathway Generic Study" (LPGS).⁽¹⁾ The LPGS compared the risk of accidents involving the liquid pathway (drinking water, irrigation, aquatic food, swimming and shoreline usage) for four conventional, generic land-based nuclear plants and a floating nuclear plant, for which the nuclear reactors would be mounted on a barge and moored in a water body. Parameters for the land-based sites were chosen to represent averages for a wide range of real sites and are thus "typical," but represented no real site in particular.

This report presents an analysis to determine whether or not the St Lucie site liquid pathway consequences would be unique when compared to land-based sites considered in the LPGS. The method consists of comparing key parameters which characterize the St. Lucie site and the "typical" land based ocean site evaluated in the LPGS. The parameters which are compared include groundwater travel time, sorption on geologic media, surface water transport, aquatic food consumption and shoreline usage.

Doses to individuals and populations were calculated in the LPGS without consideration of interdiction methods such as isolating the contaminated groundwater or denying use of the water. In the event of surface water contamination, commercial and sports fishing, as well as many other water-related activities would be restricted. The consequences would therefore be largely economic or social, rather than radiological. In any

event, the individual and population doses for the liquid pathway range from fractions to very small fractions of those that can arise from the airborne pathways.

2. Comparison of St. Lucie Site to LPGS

Figures 1 and 2 (taken from the St. Lucie 2 FSAR) present scaled diagrams of the relevant features of the site. The plant is located on Hutchinson Island, a barrier island bounded along the east by the Atlantic Ocean and on the west by the Indian River which, in fact, is not a river but a tidal lagoon. The distance from the Reactor Building to the ocean is about 2500 feet. The distance to the closest water body (i.e., Big Mud Creek) is about 700 feet.

The plant grade around the structure is at elevation plus 18.5 feet mean low water (MLW). The facility is underlain by Class I, high grade, compacted fill to a depth of -60 feet MLW. The base mat beneath the Reactor Building is at elevation -25.5 MWL⁽²⁾.

The groundwater study region beneath the Class I fill includes a shallow, non artesian aquifer and a deep artesian aquifer. The top of the deep aquifer is typically 600 to 800 feet beneath the surface and therefore is not considered further in this study⁽³⁾.

The unconfined aquifer beneath the Class I fill is the Anastasia formation. This formation extends to elevation -135 to -155 feet and consists of grey slightly silty fine to medium sand with varying amounts of fragmented shells. It also contains discontinuous pockets of cements sand with shells and sandy limestone. Occasionally, discontinuous thin plastic clay lenses are found in the upper part of the formation.

The Anastasia formation is the relevant strata in the evaluation. It is divided into three zones. The upper zone which extends to about -60 feet is a loose to medium dense sand with small amounts of silt and clay and containing isolated pockets of shell fragments and limestone nodules. The intermediate zone begins at about -60 feet and extends to about -150 feet. It is denser than the upper zone, contains a greater percentage of fines and very few pockets of shells and limestone fragments. This zone would probably receive the melted core and sump water because it covers the range of depths over which a molten core may penetrate.

The characteristics of the intermediate zone are as follows:

Water Content	25% ⁽⁴⁾
Dry Unit Wt	107 lbs per ft ³ ⁽⁴⁾
Wet Unit Wt	133 lbs per ft ³ ⁽⁴⁾
Specified Gravity	2.73 ⁽⁴⁾
Relative Density	77% ⁽⁴⁾
Void Ratio	0.66 ⁽⁴⁾
Effective Porosity	40% ⁽⁴⁾
Grain Size	Sand (~90%) (.1 to .10 mm) ⁽⁵⁾ Silt (~5%) (.1 to .001 mm) ⁽⁵⁾

Slope	.00016 (toward ocean)
Permeability	5×10^{-3} cm/sec ⁽⁶⁾
Dispersivity	2 ft ⁽⁷⁾
Distance to Ocean	2444 ft

The groundwater gradient of .00016 towards the ocean is obtained from Figures 3 and 4. Figure 3 shows certain piezometer locations, originally installed in the initial subsurface investigation of the site. Figure 4 shows the range of piezometer levels and average level for the month of April 1968. Also shown on this figure is the slope of the groundwater towards the Atlantic Ocean. The piezometer used for this determination is found at approximately the depth the molten core may penetrate and therefore indicates the groundwater gradient at that elevation.

These parameters establish that the groundwater flows generally toward the ocean and would require about 1164 years to flow from a location immediately beneath the Reactor Building to the ocean.

There exists the possibility of an alternative pathway for contamination of surface water via ground water travel to Big Mud Creek. A phenomenon present on most islands is the presence of a fresh water lens in the water table which floats over the salt water. Extending the procedures presented in "Hydraulics of Groundwater" by Jacob Bear the following equation has been derived and is used to calculate the travel time to Big Mud Creek.

$$t = n \sqrt{\frac{1+\delta}{Nk}} \left\{ L \left[\ln \left(\frac{L + \sqrt{L^2 - (L-d)^2}}{L-d} \right) \right] - \sqrt{L^2 - (L-d)^2} \right\}$$

where t = travel time (years)

n = effective porosity = 0.40

$\delta = (\delta_s - \delta_f) / \delta_f = 40$

δ_s = Specific Gravity of Salt Water

δ_f = Specific Gravity of Fresh Water

N = infiltration rate of precipitation = 0.33 (ft/year)

k = permeability = 5×10^{-3} cm/sec

L = 1/2 width of island = 2000 ft.

d = distance of reactor from shore = 700 ft.

Inserting the appropriate values into the equation, a travel time of 29 years is obtained.

The effective travel time of radionuclides which may contaminate the aquifer regardless of the flow path following a core melt through would be considerably greater due to absorption and ion exchange on the sand. The distribution coefficients (K_d) for cesium and strontium, the critical radionuclides, and assumed to be 20 and 2, respectively. These values were taken from Table VII 3-7 of Appendix VII of WASH-1400 and are conservative when compared to values reported in the literature⁽⁸⁾. The calculated retention factors using these values for K_d , a porosity (n) of 0.4 and a bulk dry weight density of 1.7, are 86 for cesium and 9.5 for strontium. Using these retention factors, the travel time for

Cs-137 and Sr-90 for transport to the Atlantic Ocean and Big Mud Creek are given in the Table below.

A comparison of the above parameters to those used in the LPGS is presented below:

<u>Parameter</u>	<u>LPGS</u>	<u>St Lucie (towards Atlantic Ocean)</u>	<u>St. Lucie (towards Big Mud Creek)</u>
Groundwater velocity to surface water	6.7 feet/day	0.00568 feet/day	N/A
Distance to surface water	1500 feet	2,444	700
Porosity	0.2	0.4	0.4
Sediment retention factor:			
Sr-90	9.2	9.5	9.5
Cs-137	83	86	86
Time to Surface Water (yrs):			
Sr-90	5.7	11,000	275
Cs-137	51	99,000	2500
Number of half lives to reach surface water:			
Sr-90	0.2	380	10
Cs-137	1.7	3,300	83

Based on this comparison, the time for contaminated groundwater to reach a surface water location at the St. Lucie site is considerably greater than travel time which characterizes the ocean site in the LPGS.

Once the contaminated water reaches the ocean, it is reasonable to assume that dilution for St. Lucie site is represented by the LPGS since the standard land based ocean site in the LPGS is located on the east coast of Florida. Accordingly, dilution factors can be considered comparable. For example, the offshore current of 0.4 to 1.6 feet per second at the St. Lucie site is comparable to the velocity used in the LPGS. The only comparison which remains is the fishery catch and shoreline usage factors.

The annual commercial and recreational finfish and shellfish catch within 50 miles of the St. Lucie site, including brackish inland waterways, is estimated to be the following (kg/yr)⁽⁹⁾.

	<u>0-3 miles</u>	<u>>3 miles</u>
Commercial		
Finfish	8.26×10^6	-
Shellfish	1.58×10^6	
Recreational*	9.55×10^6	6.84×10^6

The recreational use of the beaches within a 50 mile radius of the site has been estimated from the data presented in Table 2.1-26 in the St. Lucie Unit 2 Environmental Report (O.L. Stage). Based on an annual per capita participation rate of 6.57 days for residents and 13 days for tourists, assuming 3 hours of beach activities per beach day, the annual beach usage by the year 2000 population is estimated to be approximately 3.3×10^7 user-hours.

The following presents a comparison of the values to those used in the LPGS:

	<u>LPGS</u>	<u>St. Lucie</u>
Fishery (kg/ha/yr)		
0-5 Km	120	227
5-19 Km	7.3	30
19-80 km	1.1	-
Beach Activities	1.1×10^7 user hrs/yr	3.3×10^7 user hrs/yr

These results reveal that the usage factors for the St. Lucie site are somewhat higher than those used in the LPGS for a land based ocean site. However, factoring in the transport time, the aquatic radiological impact of a core melt accident at the St. Lucie site is estimated to be less than the impact derived in the LPGS for a "typical" coastal land based site. Thus, the St. Lucie site is not unique in its liquid pathway contribution to risk.

3. Mitigative Measures

The minimum groundwater travel time from the St. Lucie site to the Atlantic Ocean and Big Mud Creek was estimated to be roughly 1164 and 29 years, respectively, and because of the filtering properties of soil the holdup of much of the radioactivity would be even greater. This would allow ample time for engineering measures, such as slurry walls, to isolate the radioactive contamination near the source.

As means of isolating contaminated groundwater in the St. Lucie site area, the feasibility of constructing an impermeable membrane was investigated. Alternate means, such as pumping or sheet piling were also considered.

* The recreational catch is based on the number of fish estimated in Referenced 9 and assuming an average of 0.43 kg/fish.

Pumping a large volume of water would impose unreasonable treatment requirements. Sheet piles will corrode in the salt water. A slurry trench was thought to be the most efficient method of isolation for this site. Two types of slurry trenches are available, cement bentonite and soil bentonite.

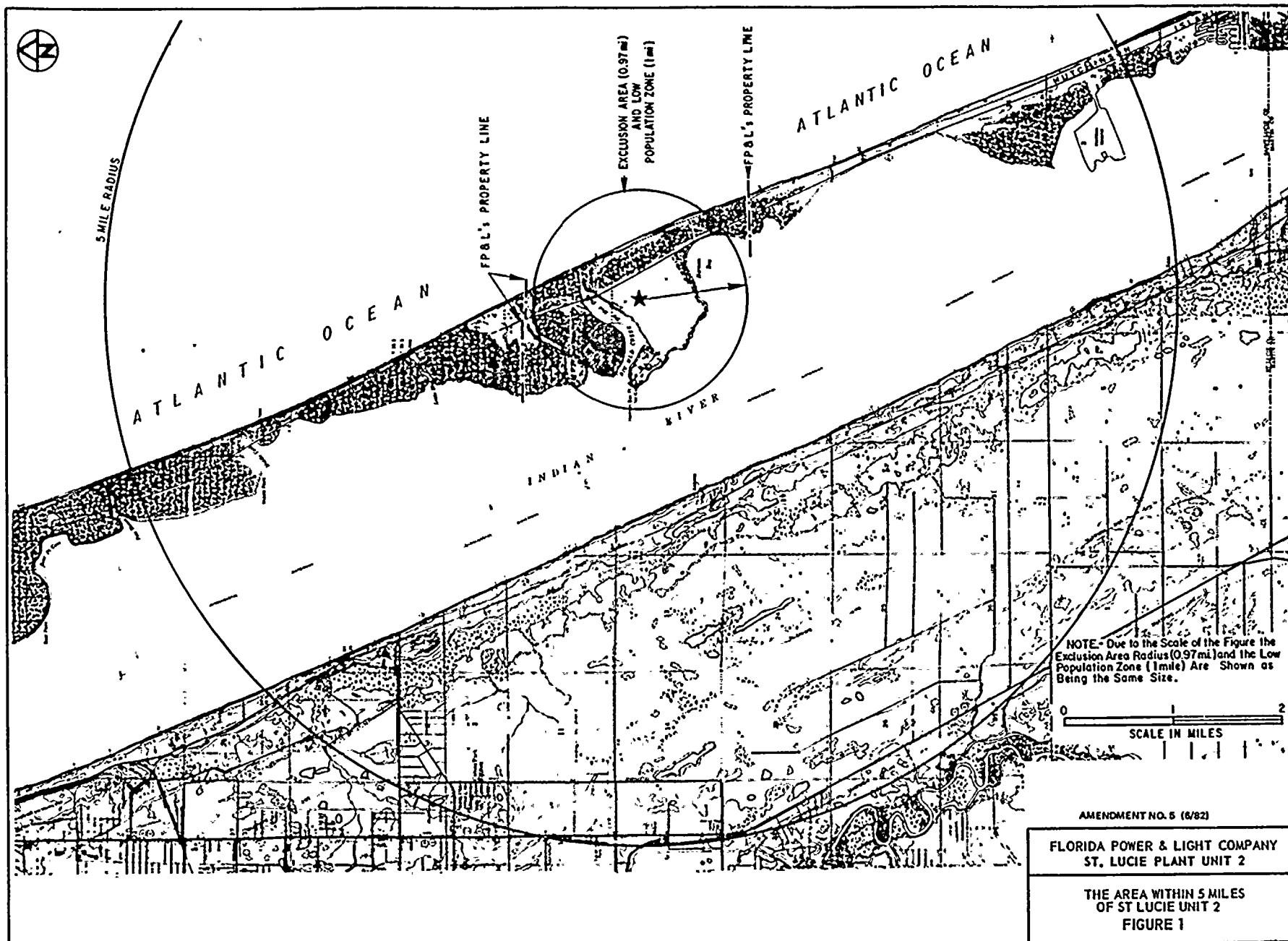
Based upon previous experience, a cement bentonite slurry wall was investigated. Cement bentonite is used where slope support is needed for dewatering excavation sites and for groundwater control. The cement bentonite requires 24 hours to cure. The bentonite can either be installed into 2-3 foot wide trenches directly, or pumped by use of adapters to drive piles. Cement bentonite construction is a much slower and expensive process than for soil bentonite but provides added strength.

Soil bentonite is more flexible and less expensive since the trenching soil is used in the backfilling. Soil bentonite is quicker to install but must be installed in a continuous fashion. The native material can be used in the backfilling operation if it is sand, such as exists at St Lucie, preferably a poorly graded mixture. No curing time is required for the soil bentonite and dewatering can begin immediately after construction whereas cement bentonite requires 24 hours for curing prior to any dewatering measures.

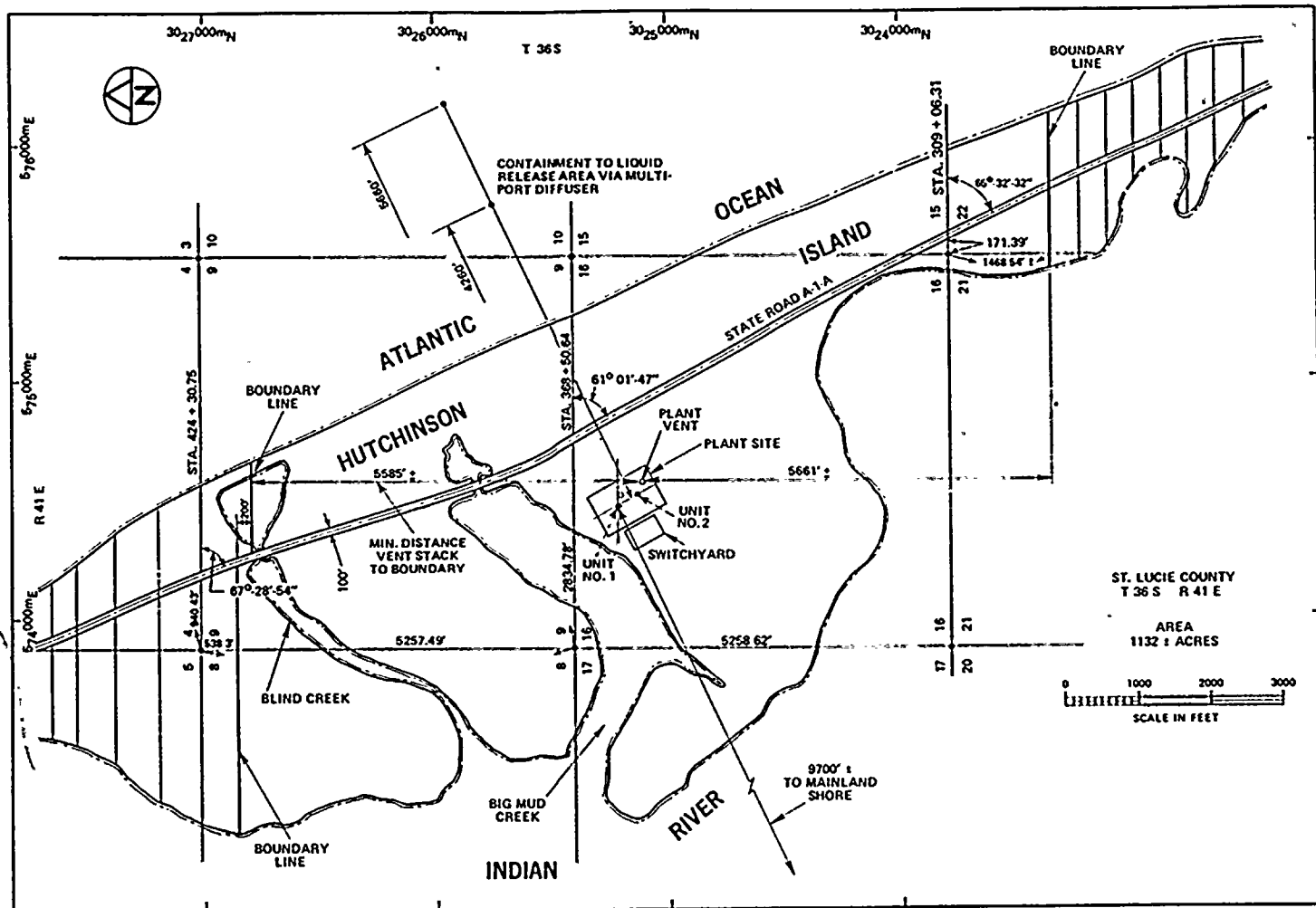
Since the St. Lucie Site consists of fine sands, excavation in this material would be relatively easy and the excavated material could be mixed with the bentonite to produce a soil bentonite mixture. There is nothing at the St. Lucie Site that would preclude the use of this method of groundwater isolation.

References

- (1) NUREG-0440 Liquid Pathway Generic Study. February 1978.
- (2) See Figure 2.4-1 of FSAR
- (3) See FSAR Subsection 2.4.13.1 (pg 2.4-40)
- (4) See Table 2.5-5 of the FSAR (pg 2.5-93)
- (5) See Appendix 2.5.A of the FSAR
- (6) See Subsection 2.5.4.2.2 of the FSAR
- (7) See Subsection 2.4.13.3 (pg 2.4-45) of the FSAR
- (8) NUREG/CR-0912 Volume 1. Geoscience Data Base Handbook for Modeling a Nuclear Waste Repository. January 1981.
- (9) Response to NRC Questions 291.8 and 291.10.

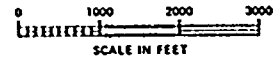






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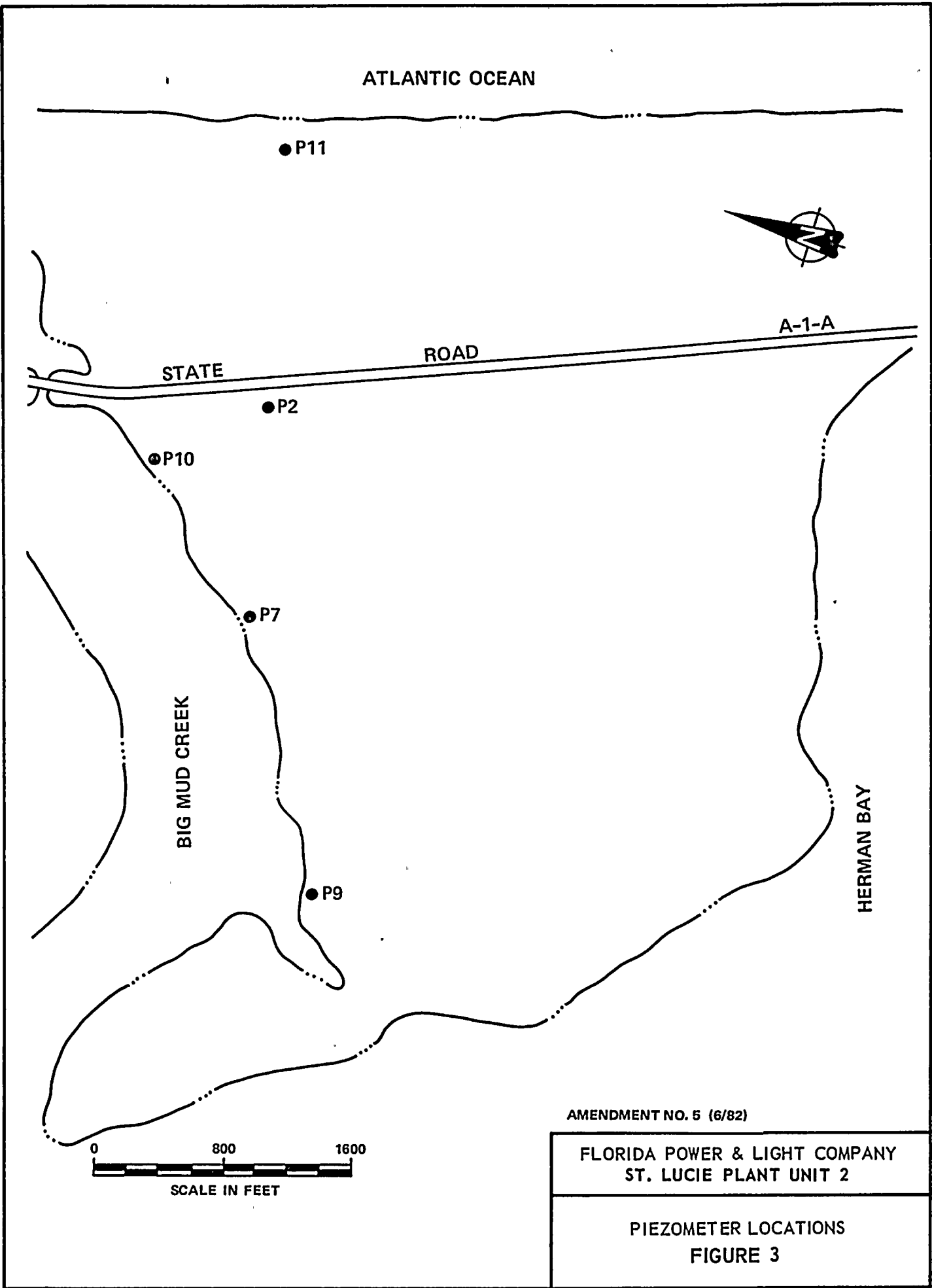
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AMENDMENT NO. 5 (6/82)

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

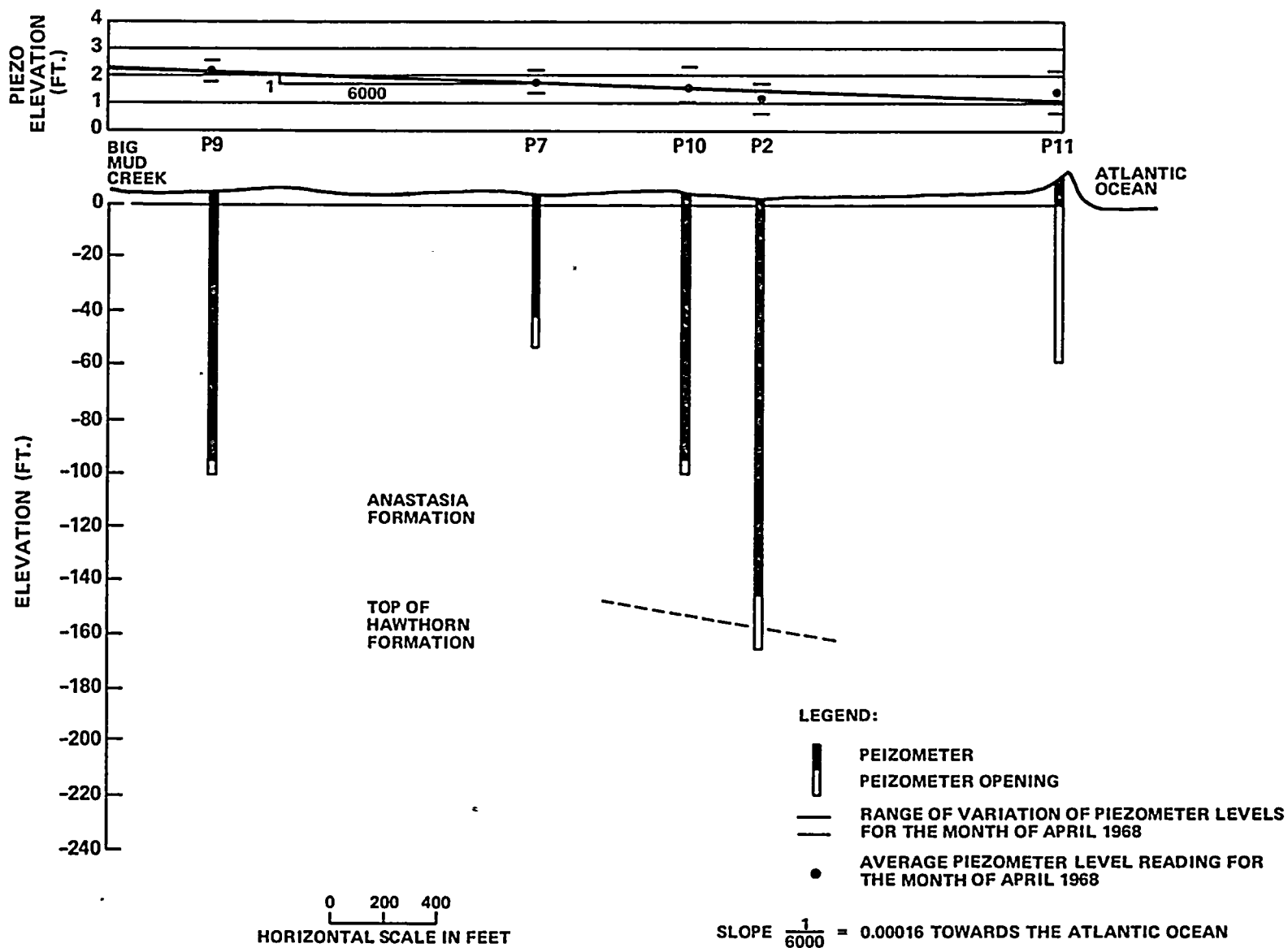
PROPERTY PLAN
FIGURE 2



PIEZOMETRIC CROSS SECTIONS
FIGURE 4

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

AMENDMENT NO. 5 (6/82)



Question No.

291.1 Provide a table summarized by date listing sea turtle captured or otherwise taken from the intake canal and intake structure since commencement of Unit 1 operation. Indicate the date collected, the species, length, weight and condition at the time of capture.

Response

Table 291.1-1 summarizes the requested information on sea turtles collected in the intake canal since commencement of St Lucie Unit 1 operation.

No ER-OL revisions are required.

2000

1000

500

0

1000

500

0

TABLE 291.1-1
MARINE TURTLES COLLECTED AT
THE ST LUCIE PLANT

Measurements

CL	Straight-line carapace length in centimeters (cm)
CW	Straight-line carapace width in centimeters (cm)
PL	Straight-line plastron length in centimeters (cm)
WT	Weight in pounds (lbs)

Comments

A	Alive, released in ocean
B	Dead
C	Found floating
D	Found on intake screens, grizzlies or barrier nets
E	Found in turtle net
F	Found in various stages of decomposition (generally buried)
G	Found in fresh condition
	G-1 given to Ross Witham, Fla. DNR
	G-2 given to NMFS
	G-3 given to University of California at request of NMFS
H	Cause of death unknown
I	Water in lungs
J	No water in lungs
K	No abnormalities
L	Abnormalities (lacerations, emaciated, etc.)
N	Released back into intake canal for recapture studies
O	Found in fish survey gill nets
P	Tagged for identification purposes after death
(M)	Male
(F)	Female



TABLE 291.1-1

MARINE TURTLES COLLECTED
AT THE ST LUCIE PLANT

SEFC SEA TURTLE DATA BASE

SL/Ei-1

SPECIES: Hawksbill (Eretmochelys imbricata)

SITE: FPL St. Lucie Plant Intake Canal

May 1976 - Present

Date	Tag (s)	CL (cm)	CW (cm)	PL (cm)	Wt (lbs)	Comments
03/06/78	A-8287	46	35	-	28	A



SL2-ER-OL

TABLE 291.1-1

MARINE TURTLES COLLECTED
AT THE ST LUCIE PLANT

Sheet 3 of 22

SEFC SEA TURTLE DATA BASE

SL/Lk-1

SPECIES: Atlantic ridley (Lepidochelys kempi)

SITE: FPL St. Lucie Plant Intake Canal

May 1976 - Present

Date	Tag (s)	CL (cm)	CW (cm)	PL (cm)	Wt (lbs)	Comments
02/06/81	B-2874 B-2875	32	31.5	25.5	10.1	A



MARINE TURTLES COLLECTED
AT THE ST LUCIE PLANT

SEFC SEA TURTLE DATA BASE

SL/Dc-1

SPECIES: Leatherback (Dermochelys coriacea)

SITE: FPL St. Lucie Plant Intake Canal

May 1976 - Present

Date	Tag (s)	CL (cm)	CW (cm)	PL (cm)	Wt (lbs)	Comments
11/28/77	HI-2098	142	79.5	-	-	A
03/07/78	HI-2187	150	82	-	-	A
03/08/78	HI-2165	144.5	93	-	-	A
03/13/78	HI-2192	118.5	71	-	-	A
02/03/81	HI-3605					
	HI-3606	124	68	97	-	A, (M)
03/13/81	AAH-027					
	AAH-028	134.5	72.5	105	515	A, (M)

TABLE 291.1-1

MARINE TURTLES COLLECTED
AT THE ST LUCIE PLANT

SEFC SEA TURTLE DATA BASE

SPECIES: Green (Chelonia mydas)

SITE: FPL St. Lucie Plant Intake Canal

SL/Cm - 1

May 1976 - Present

Date	Tag (s)	CL (cm)	CW (cm)	PL (cm)	Wt (lbs)	Comments
01/27/77	A-6601	20	16	-	3.8	A
01/31	415	27	22	-	4	A
02/10	A-6602	28.5	18	-	3.3	A
02/14	-	36	27	-	10	B,H,K
04/21	-	35	28	-	15	B,E,I
01/31/78	HI-2145	56.5	46	-	-	A
02/09	HI-2158	64	49	-	-	A
02/17	HI-2159	26.3	21.8	-	5	A
03/03	HI-2160	40	34.5	-	-	A
03/07	A-8288	26	21	-	5.6	A
05/26	-	34.5	30	-	-	B,C,F,H
02/04/79	HI-2295	30	24	23	4	A
04/13	B-1	35	29	29	12.9	B,E,G-2,I,K
06/21	HI-2353	93	70	71	-	A, (M)
02/04/80	A-8289	35.5	28	28	12	A
02/22	HI-3075	40.5	35	34	18	A
02/22	HI-3100	36	30.5	30	14	B,E,G-3,I
02/27	HI-3072	44	36	36.5	29	A
02/28	HI-3074	51.5	42.5	45	49	A
06/03	HI-3115	26	21	22	5	B,E,F,L,P
01/08/81	HI-3171					
	A-8300	30.5	24.5	25.5	8.8	A
01/13	B-2791					
	B-2792	25.2	19	21.8	5.1	A
01/13	B-2793					
	B-2794	28.8	23.4	25	7.3	A
01/13	B-2795					
	B-2796	28	23.5	24	5.7	A
01/13	B-2797					
	B-2798	27	21.5	22.5	5.5	A
01/14	B-2799					
	B-2800	48.5	39	40	38	A
01/15	B-2803					
	B-2804	31	26.5	25.5	7.7	A
01/15	B-2805					
	B-2806	26	21.5	22	5.5	A
01/16	B-2807					
	B-2808	27	22.5	22.6	5.9	A
01/18	B-2809					
	B-2810	30	26.5	24	7.7	A
01/19	B-2815					
	HI-3623	53.5	43.5	43	47	A
01/19	B-2811					
	B-2812	24	24.5	25	8.1	A

TABLE 291.1-1

MARINE TURTLES COLLECTED
AT THE ST LUCIE PLANT

SEFC SEA TURTLE DATA BASE

SL/Cm - 2

SPECIES: Green (*Chelonia mydas*)

SITE: FPL St. Lucie Plant Intake Canal

May 1976 - Present

Date	Tag (s)	CL (cm)	CW (cm)	PL (cm)	Wt (lbs)	Comments
01/19/81	B-2813					
	B-2814	29	23.9	23.7	7.3	A
01/19	HI-3625					
	HI-3624	47.5	38	39.5	36	A
01/21	B-2863					
	B-2864	37.5	28	30	12.1	A
01/21	B-2865					
	B-2866	28	24.5	24.5	7.5	A
01/21	B-2867					
	B-2868	30.5	26	25.5	7.9	A
01/21	B-2869					
	B-2870	31	25	26	8.8	A
01/27	B-2871	28.4	23	24.2	6.8	B,E,G-1,I,P
01/28	B-2872					
	B-2873	31	26	27.5	9.2	A
02/13	B-2876					
	B-2877	27	22.5	22.5	5.1	A
02/13	B-2878					
	B-2879	27	21.5	22.5	6.2	A
02/13	B-2880					
	B-2881	26.5	25	24.5	-	A
02/15	B-2882					
	B-2883	28.5	23	23.5	6.6	A
02/17	B-2884					
	B-2885	31.5	25	26.5	9.5	A
02/26	B-2886					
	B-2887	29	24	24	5.9	A
02/27	B-2888					
	B-2889	32	28.5	27.5	8.8	A
03/10	NNC-326					
	NNC-327	27.5	21.5	23	-	A

TABLE 291.1-1

MARINE TURTLES COLLECTED
AT THE ST LUCIE PLANT

SEFC SEA TURTLE DATA BASE

SPECIES: Loggerhead (*Caretta caretta*)

SITE: FPL St. Lucie Plant Intake Canal

SL/Cc - 1

May 1976 - Present

Date	Tag (s)	CL (cm)	CW (cm)	PL (cm)	Wt (lbs)	Comments
05/20/76	not tagged	-	-	-	-	A
05/26	not tagged	-	-	-	-	A
07/08	not tagged	-	-	-	-	A
07/09	131 (301?)	-	-	-	-	A
07/13	not tagged	80	60	-	-	A
07/14	302	-	-	-	-	A
07/15	not tagged	61	45	-	-	A
07/16	303	63	55	-	-	A
07/27	-	-	-	-	-	B,C,F,H
08/03	307	56.5	51	-	-	A
08/04	308	53	46.5	-	-	A
09/23	not tagged	65	52	-	-	A
10/06	309	54	44	-	-	A
10/07	311	75	56	-	-	A
10/27	312	63	54	-	-	A
10/27	313	70	60	-	-	A
10/27	314	61	55	-	-	A
10/28	315	61	51	-	-	A
10/29	316	104	76	-	-	A
11/18	315	61	51	-	-	A
11/23	317	59	50	-	-	A
11/24	-	61	51	-	76	B,I
11/29	-	60	53	-	-	B,C,F,H
11/29	-	88	66	-	-	B,C,F,H
12/10	not tagged	-	-	-	-	A
12/15	318	53.5	45	-	-	A
12/15	319	55	43.5	-	-	A
12/15	320	53	49	-	-	A
12/15	321	60	50	-	-	A
12/15	323	60	53	-	-	A
12/16	324	54	47	-	-	A
12/16	325	60	51	-	73	A
12/17	315	59	50	-	73	A
01/18/77	401	71	60	-	-	A
01/18	403	64	55	-	90	A
01/18	404	52	46	-	50	A
01/18	405	53	48	-	55	A
01/18	406	52.5	61.5	-	90	A

MARINE TURTLES COLLECTED
AT THE ST LUCIE PLANT

SEFC SEA TURTLE DATA BASE

SL/Cc - 2

SPECIES: Loggerhead (*Caretta caretta*)

SITE: FPL St. Lucie Plant Intake Canal

May 1976 - Present

Date	Tag (s)	CL (cm)	CW (cm)	PL (cm)	Wt (lbs)	Comments
01/20/77	313	69	58	-	-	A
01/20	407	60	54	-	85	A
01/21	409	66	57	-	-	A
01/21	410	60	51	-	73	A
01/21	411	47	41	-	38	A
01/21	412	69	57	-	88	A
01/21	413	61	52	-	53	A
01/21	414	58	49	-	48	A
02/01	422	59	48	-	60	A
02/03	416	58	50	-	74	A
02/14	not tagged	-	-	-	-	A
02/14	417	71.5	61	-	145	A
02/17	419	69	60.5	-	-	A
02/17	421	66	57.5	-	-	A
02/27	423	60.5	50.5	-	55	A
02/28	-	49	39	-	35	B,C,F,H
03/02	426	60	52	-	60	A
03/02	428	68	56	-	-	A
03/08	429	61.5	51.5	-	85	A
03/10	431	56.5	47.5	-	64	A
03/11	432	58.5	49.5	-	-	A
03/14	433	67	56.5	-	-	A
04/13	434	64	54.5	-	68	A
04/13	-	64	55	-	-	B,C,F,H
04/21	HI-1001	66	58	-	115	A
04/21	HI-1002	64	53	-	-	A
04/21	433	66.5	56	-	-	A
04/28	-	70	55	-	-	B,C,F,H
06/01	HI-1572	62	53	-	-	A
06/01	HI-1573	53	49	-	-	A
06/02	HI-1574	62	51	-	-	A
06/05	HI-1638	57	48	-	-	A
07/05	HI-1857	60	53	-	-	A
07/06	HI-1860	65	57.5	-	-	A
07/14	HI-1870	58	46	-	-	A
07/20	HI-2012	105.5	81	-	-	A
08/17	HI-2074	65.5	-	-	-	A
08/23	HI-2069	59	52	-	-	A
08/23	HI-2070	72	61	-	-	A

TABLE 291.1-1

MARINE TURTLES COLLECTED
AT THE ST LUCIE PLANT

SEFC SEA TURTLE DATA BASE

SL/Cc - 3

SPECIES: Loggerhead (*Caretta caretta*)

SITE: FPL St. Lucie Plant Intake Canal

May 1976 - Present

Date	Tag (s)	CL (cm)	CW (cm)	PL (cm)	Wt (lbs)	Comments
09/08/77	HI-1875	57	49.5	-	-	A
09/08	HI-2071	60	53	-	-	A
09/08	HI-2072	54	51	-	-	A
09/08	HI-2073	73	60.5	-	-	A
09/09	HI-1876	68.5	56.5	-	-	A
09/09	HI-1877	53.5	43.5	-	-	A
09/10	HI-2078	70.5	58.5	-	-	A
09/10	HI-2079	67	57.5	-	-	A
09/10	HI-2080	66	57.5	-	-	A
09/10	HI-2081	62.5	52.5	-	-	A
09/13	HI-2082	68	56.5	-	-	A
09/13	HI-2083	57	52	-	-	A
09/14	HI-2084	71	58	-	-	A
09/15	HI-2085	85	68	-	-	A
09/29	-	53	63.5	-	84	B,I
10/03	-	85.5	64	-	-	B,C,F,H
10/07	HI-2086	47	-	-	-	A
10/11	HI-2087	60	-	-	-	A
10/11	HI-2088	53	-	-	-	A
10/11	HI-2089	74	-	-	-	A
10/11	HI-2090	63	54.5	-	84	A
10/13	HI-2091	57	47	-	59	A
10/20	HI-2092	64	57	-	-	A
10/27	HI-2093	59.5	49	-	-	A
11/08	HI-2095	62	50	-	-	A
11/08	HI-2096	54	44	-	-	A
11/09	HI-2097	66	54.5	-	-	A
11/29	HI-2100	66.5	56	-	-	A
11/30	HI-2126	79.5	64	-	-	A
12/01	HI-2099	71	60.5	-	-	A
12/02	not tagged	61.5	52	-	64	A
12/08	HI-2128	56.5	48	-	55	A
12/09	HI-2129	62	52	-	77	A
12/12	HI-2130	58	49.5	-	-	A
01/01/78	not tagged	-	-	-	-	A
01/02	HI-2151	129(?)	121(?)	-	-	A
01/08	HI-2131	55	46	-	-	A
01/09	HI-2132	-	-	-	-	A
01/09	HI-2152	56	47	-	70	A
01/09	HI-2153	58	50	-	80	A

TABLE 291.1-1

SEFC SEA TURTLE DATA BASE
 SPECIES: Loggerhead (Caretta caretta)
 SITE: FPL St. Lucie Plant Intake Canal

MARINE TURTLES COLLECTED
 AT THE ST LUCIE PLANT

SL/Cc - 4

May 1976 - Present

Date	Tag (s)	CL (cm)	CW (cm)	PL (cm)	Wt (lbs)	Comments
01/10/78	HI-2133	52.5	46	-	49	A
01/10	HI-2134	62	57	-	81	A
01/10	HI-2135	69	59	-	120	A
01/11	HI-2136	58	49	-	61	A
01/13	HI-2137	57	53	-	72	A
01/24	HI-2138	54	46	-	55	A
01/24	HI-2139	55	49	-	64	A
01/24	HI-2140	60	50	-	71	A
01/24	HI-2141	62	53.5	-	86	A
01/25	HI-2142	49	44	-	48	A
01/26	HI-2143	67	55.5	-	105	A
01/27	HI-2154	59	52	-	-	A
01/27	HI-2155	50	49	-	-	A
02/01	HI-2146	63	53.5	-	-	A
02/02	HI-2147	60	50	-	-	A
02/08	HI-2156	59.5	50.5	-	-	A
02/09	HI-2157	68	59	-	-	A
02/13	-	125	114	-	-	B,C,F,H
02/14	HI-2148	71	59.5	-	-	A
02/15	HI-2149	59	51	-	-	A
02/17	HI-2150	65	55.5	-	-	A
02/24	-	93	-	-	-	B,C,F,H
02/28	HI-2176	63.5	56	-	-	A
02/28	HI-2177	-	53.5	-	-	A
03/01	-	82	64	-	-	B,D
03/01	HI-2178	69	57	-	-	A
03/01	HI-2179	62	54	-	-	A
03/01	HI-2180	61.5	52.5	-	75	A
03/01	HI-2181	73	60	-	-	A
03/02	HI-2182	55	47.5	-	68	A
03/02	HI-2185	61.5	54.5	-	84	A
03/06	HI-2162	54	50	-	-	A
03/06	not tagged	64	54	-	-	A
03/07	-	93.5	68	-	-	B,D
03/07	HI-2186	65	53	-	90	A
03/08	HI-2163	78	62	-	-	A
03/08	HI-2164	65	53.5	-	-	A
03/10	HI-2188	59	51.5	-	73	A
03/11	HI-2189	65	55	-	83	A
03/13	HI-2191	57.5	48	-	65	A
03/14	HI-2193	62.5	55	-	87	A
03/14	HI-2194	55	47	-	61	A



TABLE 291.1-1

MARINE TURTLES COLLECTED
AT THE ST LUCIE PLANT

SEFC SEA TURTLE DATA BASE

SL/Cc - 5

SPECIES: Loggerhead (Caretta caretta)

SITE: FPL St. Lucie Plant Intake Canal

May 1976 - Present

Date	Tag (s)	CL (cm)	CW (cm)	PL (cm)	Wt (lbs)	Comments
03/15/78	HI-2175	-	-	-	-	A
03/20	HI-2166	72	62	-	-	A
03/21	HI-2195	62	51	-	69	A
03/21	HI-2196	64	56	-	88	A
03/21	HI-2197	73.5	65	-	-	A
03/23	HI-2198	67	54	-	90	A
03/23	HI-2199	74	61	-	-	A
03/23	HI-2200	61.5	54	-	77	A
03/31	HI-2172	75.5	61	-	-	A
04/06	not tagged	-	-	-	-	A
04/12	HI-2202	60.5	51	-	61	A
04/12	HI-2203	66	54.5	-	86	A
04/13	-	63	55.5	-	-	B,C,F,H
04/13	HI-2204	69.5	61.5	-	-	A
04/14	HI-2205	74	64.5	-	-	A
04/14	not tagged	67.5	56	-	85	A
04/18	-	70	58	-	-	B,C,F,H
04/19	-	70.5	58	-	-	B,C,F,H
04/19	-	71.5	61	-	-	B,C,F,H
04/20	HI-2207	49.5	42	-	42	A
04/24	-	67	54	-	97	B,C,F,H
04/26	HI-2208	64.5	56	-	98	A
05/04	-	57	46	-	-	B,C,F,H
05/11	HI-2209	-	51.5	-	71	A
05/16	HI-2210	63	52.5	-	85	A
06/07	HI-2226	72	62	-	-	A
06/13	HI-2212	61.5	48	-	63	A
06/13	HI-2213	67.5	57.5	-	-	A
06/13	HI-2214	99	76.5	-	-	A
06/15	HI-2215	67	56	-	95	A
06/15	HI-2216	58	45	-	57	A
06/23	HI-2227	58.5	51	-	76	A
06/28	HI-2217	90.5	68.5	-	-	A
08/02	HI-2218	100	76	-	-	A
08/10	HI-2228	66.5	57.5	-	-	A
08/10	HI-2229	67	56.5	-	-	A
08/10	HI-2230	62	53	-	85	A
08/10	HI-2231	67	56	-	97	A
08/11	HI-2251	60.5	53.5	-	79	A
08/15	HI-2219	88	70	-	-	A

TABLE 291.1-1
MARINE TURTLES COLLECTED
AT THE ST LUCIE PLANT

SEFC SEA TURTLE DATA BASE

SL/Cc - 6

SPECIES: Loggerhead (Caretta caretta)

SITE: FPL St. Lucie Plant Intake Canal

May 1976 - Present

Date	Tag (s)	CL (cm)	CW (cm)	PL (cm)	Wt (lbs)	Comments
08/22/78	HI-2221	83	66.5	-	-	A
08/22	HI-2222	47	42	-	-	A
08/23	HI-2223	50	44	-	50	A
08/24	HI-2232	-	-	-	-	A
08/30	HI-2233	61	51	-	83	A
09/01	HI-2235	58.5	51.5	-	80	A
10/18	HI-2224	66	55	-	-	A
10/18	HI-2225	63	53.5	-	83	A
10/19	HI-2252	56	48	-	65	A
10/19	HI-2253	76	57.5	-	-	A
10/19	HI-2254	72	61	-	-	A
10/19	HI-2255	55	50	-	70	A
10/19	HI-2256	81	67.5	-	-	A
10/20	-	53	51	-	75	B,E,I
10/20	HI-2257	64	58	-	120	A
10/24	HI-2258	60	52	-	78	A
10/24	HI-2259	64.5	55	-	89	A
10/24	HI-2260	70	58	-	112	A
10/25	HI-2261	57	49	-	65	A
10/26	HI-2262	56.5	48.5	-	63	A
10/26	HI-2236	56	50.5	-	63	A
10/27	HI-2237	75	57.5	-	130	A
10/31	-	65	57.5	-	87	B,D,I
11/02	-	63.5	52.5	-	-	B,C,F,H
11/02	-	72.5	57.5	-	-	B,C,F,H
11/10	-	76	64	-	-	B,C,F,H
11/14	HI-1004	91	65	-	-	A
11/16	HI-1005	65	55	-	-	A
11/17	-	75	-	-	-	B,C,F,H
11/17	-	-	-	-	-	B,C,F,H
11/17	HI-2238	63	55	-	81	A
11/17	HI-2239	56.5	48.5	-	57	A
11/17	HI-2240	77	65.5	-	130	A
11/17	HI-2242	67	54	-	98	A
11/28	-	-	-	-	-	B,C,F,H
11/28	HI-2243	57	51	-	67	A
11/30	-	65	56	-	87	B,E,I
11/30	HI-2244	58	51	-	77	A

MARINE TURTLES COLLECTED
AT THE ST LUCIE PLANT

SEFC SEA TURTLE DATA BASE

SL/Cc - 7

SPECIES: Loggerhead (Caretta caretta)

SITE: FPL St. Lucie Plant Intake Canal

May 1976 - Present

Date	Tag (s)	CL (cm)	CW (cm)	PL (cm)	Wt (lbs)	Comments
12/01/78	HI-2246	-	51	-	68	A
12/05	HI-2276	91	65	-	-	A
12/08	HI-2277	57	47	-	80	A
12/16	HI-2278	67	56	-	95	A
01/04/79	HI-2263	64	56	51	-	A
01/05	-	61	48	-	-	B
01/06	-	60	50	39	-	B
01/10	HI-2264	56	46.5	46.5	68	A
01/10	HI-2265	54	47.5	40.5	62	A
01/10	HI-2266	60	54	48	83	A
01/10	HI-2267	54	48	43	61	A
01/10	HI-2268	60	51.5	45	74	A
01/10	HI-2269	63	55	50.5	97	A
01/10	HI-2270	66.5	54	51	95	A
01/11	HI-2271	62	50.5	50	84	A
01/11	HI-2272	62.5	56	49	89	A
01/11	HI-2273	59.5	51	47.5	76	A
01/11	HI-2274	68.5	58	52	105	A
01/12	-	62.5	48	45	-	B
01/12	HI-2275	57	47.5	48	60	A
01/12	HI-2279	71	59	54.5	115	A
01/12	HI-2280	71	61.5	56.5	133	A
01/31	not tagged	64	53	-	92	A
01/31	HI-2281	64.5	54.5	49	86	A
01/31	HI-2282	66	56.5	54.5	119	A
01/31	HI-2283	56	49.5	43.5	69	A
01/31	HI-2284	71.5	60.5	54.5	124	A
01/31	HI-2285	69.5	57.5	52.5	105	A
02/01	HI-2286	69	58.5	52.5	103	A
02/01	HI-2287	58.5	48.5	45	74	A
02/01	HI-2288	-	-	-	-	A
02/02	HI-2289	63.5	55.5	50	95	A
02/02	HI-2290	64	55.5	49.5	90	A
02/02	HI-2291	62	53.5	47.5	83	A
02/02	HI-2292	55.5	47	45.5	67	A
02/02	HI-2294	52.5	45	-	55	A
02/04	HI-2296	55.5	44	43	-	A
02/05	-	63	54.5	-	84	B
02/06	HI-2297	67.5	57	54	119	A
02/07	HI-2298	77.5	61	54	150	A
02/08	HI-2299	71.5	59	55.5	120	A
02/12	HI-2300	63	55	50	95	A
02/13	HI-2302	89	64.5	65	-	A

MARINE TURTLES COLLECTED
AT THE ST LUCIE PLANT

SEFC SEA TURTLE DATA BASE

SL/Cc - 8

SPECIES: Loggerhead (*Caretta caretta*)

SITE: FPL St. Lucie Plant Intake Canal

May 1976 - Present

Date	Tag (s)	CL (cm)	CW (cm)	PL (cm)	Wt (lbs)	Comments
02/14/79	HI-2303	67	60	55	111	A
02/15	HI-2304	53	48	42.5	67	A
02/15	HI-2305	56.5	47.5	44.5	71	A
02/19	HI-2306	64	52	48	85	A
02/20	HI-2307	62	52.5	48	93	A
02/20	HI-2308	50	48	44	-	A
02/21	HI-2309	68.5	58	53	115	A
02/22	HI-2310	55	47	44	66	A
02/23	HI-2311	69	58	53	-	A
02/23	HI-2312	59	50.5	47.5	-	A
02/26	HI-2313	69	59	52	110	A
02/28	HI-2141	60.5	52.5	50	88	A
	(2314?)					
02/28	HI-2315	60	50.5	46.5	87	A
02/28	HI-2316	66.5	55.5	52.5	118	A
03/01	HI-2317	54	44	43	65	A
03/01	HI-2318	69	62	55	125	A
03/01	HI-2319	57	49	44	68	A
03/02	HI-2320	55.5	49	43.5	69	A
03/02	HI-2321	57	49	45	78	A
03/08	HI-2322	54	46	42	59	A
03/15	HI-2323	65.5	54.5	50	89	A
03/28	HI-2302	94	64.5	66	-	A
03/28	HI-2324	52.5	44	41.5	63	A
03/28	HI-2325	58.5	51	44.5	61	A
03/29	HI-2326	55	47.5	45.5	70	A
04/03	HI-2327	63.5	53.5	49.5	95	A
04/03	HI-2328	57	51	49.5	75	A
04/03	HI-2329	85	67.5	63	-	A, (M)
04/03	HI-2330	52.5	47.5	43	45	A
04/04	HI-2331	62.5	54	49	-	A
04/04	HI-2332	53.5	48.5	43.5	68	A
04/04	HI-2333	73.5	59.5	55	120	A
04/04	HI-2334	64	50	46	82	A
04/04	HI-2335	64	55	51.5	120	A
04/05	not tagged	62.5	54	48.5	95	A
04/05	not tagged	71	59.5	54.5	125	A
04/05	not tagged	79.5	61	63	187	A
04/05	not tagged	62.5	52	49	81	A
04/09	not tagged	73.5	59	58	-	A
04/09	not tagged	83.5	65.5	63	-	A, (F)
04/10	HI-2337	84	64	65	-	A, (F)
04/10	HI-2338	67	55	53	105	A

MARINE TURTLES COLLECTED
AT THE ST LUCIE PLANT

SEFC SEA TURTLE DATA BASE

SL/Cc - 9

SPECIES: Loggerhead (*Caretta caretta*)

SITE: FPL St. Lucie Plant Intake Canal

May 1976 - Present

Date	Tag (s)	CL (cm)	CW (cm)	PL (cm)	Wt (lbs)	Comments
06/05/79	HI-2351	66.5	55.5	51.5	-	A
06/06	HI-2352	71	62	57	132	A
06/21	HI-2354	47.5	41	37	47	B,E,G-2,I,K,P
07/10	HI-2356	52	46.5	42.5	49	A
07/10	HI-2357	59.5	48.5	48	63	A
07/10	HI-2376	71.5	60.5	55.5	130	A
07/10	HI-2377	59.5	49	45.5	75	A
07/10	HI-2378	65	53	48.5	87	A
07/10	HI-2379	59	48.5	45.5	-	A
07/10	HI-2380	61.5	51.5	49.5	81	A
07/11	HI-2381	73.5	63.0	58.5	155	A
07/11	HI-2382	56.5	49.0	44.5	60	A
07/11	HI-2383	56	48	43	61	A
07/11	HI-2384	55	50.5	43.5	77	N,A on 7/17/79
07/12	HI-2427(?)	112	83	83	-	A,(F)
07/13	-	69	53.5	51.5	89	B,I,O
07/16	11446(?)	56.5	49	44.5	75	A
07/17	HI-2385	51	44	42	-	A
07/18	HI-2386	58	51	47	-	A
07/18	HI-2387	59	51	47	-	A
07/19	HI-2341	62.5	53.5	47.5	91	A
07/19	HI-2342	58	50	44.5	65	A
07/19	HI-2358	54	52	46	54	A
07/24	HI-2360	88.5	66.5	68.5	-	A,(F)
07/24	HI-2359	63.5	55.5	48.5	79	A
07/25	HI-2341	65	53	47	92	A
07/26	HI-2342	-	-	-	-	B,F,H
07/27	not tagged	85.5	65.5	65	-	A,(F)
07/27	HI-2468(?)	80	60	61	-	A,(F)
07/31	HI-2343	68	58	52	107	A
08/01	HI-2344	55.5	47.5	44.5	69	A
08/02	HI-2345	63	54.5	50.5	95	A
08/07	HI-2346	61	52.5	48.5	88	A
08/08	not tagged	59.5	51	46.5	80	A
08/08	HI-2363	70.5	55	51	112	A
08/14	HI-2347	69.5	58.5	56.5	105	N,A on 08/28/79
08/15	HI-2361	67	57.5	55	113	A
08/16	HI-2362	53	45.5	42.5	57	A
08/17	HI-2314	61.5	52	-	72	B,C,H
08/21	HI-2365	75.5	62.5	60	145	A
08/21	HI-2364	64.5	55.5	51	86	A
08/23	not tagged	97.5	75	69.5	300	A

TABLE 291.1-1

MARINE TURTLES COLLECTED
AT THE ST LUCIE PLANT

SEFC SEA TURTLE DATA BASE

SL/Cc - 10

SPECIES: Loggerhead (*Caretta caretta*)

SITE: FPL St. Lucie Plant Intake Canal

May 1976 - Present

Date	Tag (s)	CL (cm)	CW (cm)	PL (cm)	Wt (lbs)	Comments
08/23/79	not tagged	100	73	71	-	A, (F)
08/24	HI-3050	63	54	48.5	90	A
08/24	HI-3049	60	54	47	85	A
08/27	-	-	-	-	-	B, C, F, H
09/10	HI-2366	98	70.5	-	-	B, C, H, P
09/11	HI-2878(?)	94.5	72	71.5	222	A, (F)
09/17	HI-2247	71.5	55	54.5	107	A
09/18	HI-2349	88.5	71	67.5	198	A
09/25	HI-2248	65.5	55.5	51.5	83	A
09/25	HI-3031	100	72	-	-	N, A on 11/27/79
09/25	HI-3030	63.5	54	51.5	78	A
10/01	-	73.5	60	23	-	B, F, H
10/04	HI-2631	103	-	-	-	B, F, H
10/05	HI-2367	62	52	48	-	A
10/10	HI-2389	71.5	56.5	53	123	A
10/10	HI-2350	72.5	58	54.5	96	A
10/12	HI-2393	56	44.5	45	58	A
10/16	HI-2368	69	59	57.5	112	A
10/17	HI-2371	62	52	48.5	62	A
10/17	HI-2370	73.5	61	56	105	A
10/17	HI-2369	62	53.5	49.5	73	A
10/18	HI-2372	60	56	52	81	A
10/19	HI-2373	74	65	59.5	133	A
10/25	-	76.5	60.5	57.5	-	B, F, H
10/25	HI-3047	68	56.5	53.5	97	A
11/01	HI-3048	52	46	42	61	A
11/03	HI-2396	75	61	58.5	128	A
11/06	HI-3042	52	45	41	57	A
11/06	HI-2394	66	53	49	87	A
11/07	HI-2374	60.5	56	49.5	95	A
11/09	HI-3052	52	45	41	46	A
11/09	HI-3051	52	47.5	41	44	A
11/09	HI-3053	75	62.5	56.5	125	A
11/16	HI-2395	58	51.5	49	73	A
11/27	HI-2398	67.5	58	52.5	105	A
11/27	HI-2399	76.5	63.5	57.5	155	A
11/27	HI-3031	95	68.5	69	255	A, (F), see 09/25/79
11/30	HI-3076	71	62.5	56	118	A
12/07	HI-3055	60.5	51.5	49	80	A
12/07	HI-3054	57	50.5	45	68	A

TABLE 291.1-1

MARINE TURTLES COLLECTED
AT THE ST LUCIE PLANT

SEFC SEA TURTLE DATA BASE

SL/Cc - 11

SPECIES: Loggerhead (*Caretta caretta*)

SITE: FPL St. Lucie Plant Intake Canal

May 1976 - Present

Date	Tag (s)	CL (cm)	CW (cm)	PL (cm)	Wt (lbs)	Comments
12/07/79	HI-3056	56	45	43.5	63	A
12/13	HI-2400	63.5	54.5	50	104	A
12/13	HI-3055	61	51.5	49	76	A
12/13	HI-3057	70	60.5	54	105	A
12/14	HI-3058	70.5	59	55	118	A
12/18	HI-3077	71	58	52.5	125	A
12/19	HI-3078	53.5	46.5	42	62	A
12/21	HI-3059	57.5	49	44	79	A
12/27	HI-3101	62.5	52	46.5	85	A
01/08/80	HI-3060	65.5	55.5	50	118	A
01/08	HI-3061	57	45	43.5	66	A
01/08	HI-3062	53.5	46.5	41.5	62	A
01/08	HI-3063	58	50.5	47	85	A
01/09	HI-3064	63	51.5	48	94	A
01/09	HI-3065	56	48	45	71	A
01/09	HI-3066	60.5	53	47.5	92	A
01/15	HI-3079	68.5	57.5	55	115	A
01/15	HI-3080	51.5	45.5	41.5	52	A
01/18	HI-3081	73	62	59	134	A
01/18	HI-3082	71	56	55	115	A
01/18	HI-3083	72	59	56	130	A
01/22	HI-3084	57	48	46	82	A
01/22	HI-3085	58.5	50	46.5	77	A
01/24	HI-3086	61	49	47	72	A
01/28	HI-3087	57.5	48	46	79	A
02/01	HI-3088	62	50.5	46	83	A
02/01	HI-3089	67.5	57	52	110	A
02/01	-	68.5	57.5	53	115	B,E,I
02/04	HI-3090	60	51.5	45	68	A
02/07	HI-3091	-	58	53	99	A
02/11	HI-3092	57.5	49.5	46.5	76	A
02/11	-	57.5	49	44.5	56	B,D,I
02/14	HI-3093	60.5	53	48.5	90	A
02/14	HI-3094	65	52	48	63	A
02/14	HI-3095	61.5	52	46.5	78	A
02/19	HI-3096	56	50	45.5	81	A
02/19	HI-3097	52	51	47	69	A
02/21	HI-3098	71	58	55.5	107	A
02/22	HI-3099	55	49	44	62	A
02/26	HI-3067	62.5	52.5	49	88	A
02/26	HI-3068	65.5	58	51	117	A
02/27	HI-3069	62.5	51.5	48	79	A
02/27	HI-3070	74	58.5	56	124	A

TABLE 291.1-1
MARINE TURTLES COLLECTED
AT THE ST LUCIE PLANT

SEFC SEA TURTLE DATA BASE

SPECIES: Loggerhead (*Caretta caretta*)

SITE: FPL St. Lucie Plant Intake Canal

SL/Cc - 12

May 1976 - Present

Date	Tag (s)	CL (cm)	CW (cm)	PL (cm)	Wt (lbs)	Comments
02/27/80	HI-3071	58.5	50	48	87	A
02/28	HI-3073	65	52	50.5	98	A
02/29	HI-3103	47	40.5	37.5	48	A
05/13	HI-3123 3125	93	75	70	300	A
05/16	HI-3126	86	64.5	66	235	A, (F)
05/20	HI-3152	87	65	70	275	A
	HI-3153					
05/22	HI-3154	65	56	51	100	A
	HI-3155					
05/28	HI-3127	73	60.5	58	135	A
	HI-3128					
05/28	HI-3158	70.5	59.5	55	128	A
	HI-3159					
05/28	HI-3156	65.5	54	53.5	91	A
	HI-3157					
06/03	HI-3129	62	52.5	48	83	A
	HI-3130					
06/03	HI-3131	61	53	50	80	A
	HI-3133					
06/10	HI-3156	67	55	53	101	A
	HI-3157					
06/12	HI-3161	104	80.5	78.5	425	A
	HI-3162					
06/16	HI-3134	58	51.5	46	72	B, C, K, P
06/17	HI-3165	65	55	54	101	B, C, K, P
06/17	HI-3163	-	-	-	-	A
	HI-3164					
06/19	HI-3166	77	60	53	-	B, E, L, P
08/06	HI-3170	59.5	50	45.5	51	A
	3172					
08/06	HI-3173	60	51	45.5	65	A
	3174					
08/06	HI-3175	59	51	46	71	A
	3176					
08/18	HI-3177	62.5	52	48.5	69	A
	3178					
08/27	HI-3179	57	52	46	72	A
	3180					
08/27	HI-3181	52	45	42.5	61	A
	3182					
08/27	HI-3183	60	53	47	73	A
	3184					

MARINE TURTLES COLLECTED AT
THE ST LUCIE PLANT

SEFC SEA TURTLE DATA BASE

SL/Cc - 13

SPECIES: Loggerhead (*Caretta caretta*)

May 1976 - Present

SITE: FPL St. Lucie Plant Intake Canal

Date	Tag (s)	CL (cm)	CW (cm)	PL (cm)	Wt (lbs)	Comments
08/28/80	HI-3185	88	72	66	250	A, (M)
	3186					
08/28	HI-3187	76	58	59	147	A
	3188					
08/28	HI-3189	68	59	51	117	A
	3190					
08/28	HI-3191	55	47	44	66	A
	3192					
08/29	HI-3195	59.5	52.5	47	70	A
	3196					
09/03	HI-3156	67	55	53.5	85	A
	3157					
09/03	HI-2369	59	51	47.5	65	A
	3140					
09/04	HI-3141	55	45.5	42	59	A
	3142					
09/04	HI-3143	60	49	46.5	70	A
	3144					
09/04	HI-3146	53.5	43.5	42	51	A
	3147					
09/04	HI-3201	81.5	64.5	63.5	192	A, (F)
	3202					
09/09	HI-3203	64	55	51	85	A
	3204					
09/19	HI-3205	51	44.5	40	45	A
	3206					
09/22	HI-3168	57.5	49.5	46.5	65	A
	3169					
09/22	HI-3148	58	48.5	46.5	61	A
	3149					
09/22	HI-3150	61.5	51.5	49.5	69	A
09/23	HI-3207	101.5	72	74.5	308	A, (F)
	3208					
09/23	HI-3209	70	58.5	55.5	116	A
	3210					
09/24	HI-3211	57	52	44	55	A
	3212					
09/24	HI-3213	55.5	47.5	45	56	A
	3214					
09/25	HI-3215	57.5	50.5	46	70	A
	3216					
09/25	HI-3217	56	49.5	44.5	66	A
	3218					
09/26	HI-3219	69.5	56.5	53.5	118	A
	3220					



TABLE 291.1-1

MARINE TURTLES COLLECTED AT
THE ST LUCIE PLANT

SEFC SEA TURTLE DATA BASE

SL/Cc - 14

SPECIES: Loggerhead (Caretta caretta)

SITE: FPL St. Lucie Plant Intake Canal

May 1976 - Present

Date	Tag (s)	CL (cm)	CW (cm)	PL (cm)	Wt (lbs)	Comments
09/29/80	HI-3126 3226 3227	86.5	66	67.7	220	A, (F)
10/01	HI-3228 3229	84	69.5	66	215	A, (F)
10/01	HI-3230 3231	55.5	51	44.5	55	A
10/08	HI-3232 3233	92	58	58	215	A, (F)
10/10	HI-3234 3235	55	47	44	58	N, A on 01/09/81
10/14	HI-3261 3273	67	54	49	86	N, A on 12/16/80
10/14	HI-3263 3274	69	59	54	100	N, A on 11/14/80
10/27	HI-3156 3157	67	55	53.5	85	A
11/01	HI-3221 3276	78.5	62	58	160	N, (F), A on 12/08/80
11/06	HI-3264 3277	55.5	47	44	57	N, A on 12/11/80
11/11	HI-3262 HI-3275	86	62.5	64	215	N, (F), A on 11/14/80
11/24	HI-3236 3237	46.5	39	39	37	N, A on 12/09/80
12/01	HI-3222 3238	51	43.5	42	44	N, B on 01/06/81, G-1, 0
12/03	HI-3278 3279	91	65	61	180	N, (M), A on 12/08/80
12/04	HI-3280 3281	70	61	54.5	115	N, (M), A on 12/12/80
12/05	HI-3282 3283	61	47.5	44	56	N, A on 12/10/80
12/08	HI-3284 3285	52.5	44	41.5	50	A
12/09	HI-3286 3287	62.5	51.5	48.5	82	A
12/10	HI-3289 3290	67	56	51.5	97	A
12/15	HI-3291 3292	72.5	60	53.5	105	A, (M)



TABLE 291.1-1

MARINE TURTLES COLLECTED
AT THE ST LUCIE PLANT

SEFC SEA TURTLE DATA BASE

SL/Cc - 15

SPECIES: Loggerhead (*Caretta caretta*)

SITE: FPL St. Lucie Plant Intake Canal

May 1976 - Present

Date	Tag (s)	CL (cm)	CW (cm)	PL (cm)	Wt (lbs)	Comments
01/05/81	HI-3239 3240	61.5	51.5	47	85	A
01/06	HI-3241 3242	57.5	49.5	45.5	66	A
01/08	HI-3243 3244	60	50	48	78	A
01/13	HI-3245 3246	63	53.5	49	81	A
01/14	HI-3247 3248	55	45.5	43	53.5	A
01/14	HI-3249 3250	46	41.5	37	41	A
01/16	HI-3296 3297	70	60	56	112	A, (F)
01/19	HI-3294 3295	60.5	53.5	47.5	71	A
01/21	HI-3601 3602	51.5	45.5	41.5	51.5	A
01/26	HI-3603 3604	60	50.5	47	85	A
02/04	HI-3607 3608	63.5	55	49.5	76	A
02/06	HI-3609 3610	50	45	42	46	A
02/12	HI-3315 3316	64	55	51	94	A
02/13	HI-3317	47.5	41	38	40	B, D, F, P
02/17	HI-3318	83.5	62.5	64	170	B, D, F, P, (F)
02/17	HI-3319	70.5	53	54.5	110	B, D, F, P, (F)
02/23	HI-3621 3622	60	51	45	65	A
02/25	HI-3321 3322	58	50	48	-	A
02/27	HI-3611 3612	56	48.5	45.5	68	A
02/27	HI-3613 3614	52.5	45	40.5	49	A
02/27	HI-3215 3216	58	50.5	46	75	A
03/06	AAH-001 002	56.5	45.5	45	59	A

MARINE TURTLES COLLECTED
AT THE ST LUCIE PLANT

SEFC SEA TURTLE DATA BASE

SPECIES: Loggerhead (Caretta caretta)

SITE: FPL St. Lucie Plant Intake Canal

SL/Cc - 16

May 1976 - Present

Date	Tag (s)	CL (cm)	CW (cm)	PL (cm)	Wt (lbs)	Comments
03/08/81	AAH-003 004	53	43.5	40.5	55	A
03/15	HI-3173 3174	58	50	45	59	A
03/15	AAH-029 030	65	55	51.5	96	A
03/30	AAH-006 007	62.5	52.5	49.5	77	A
03/30	AAH-008 009	56	47	44	66	A

Question No.

291.2. Describe in more detail the configuration of the velocity cap intake structure. Provide a schematic drawing of the velocity cap, one of more detail than that presented as Figure 3.4-2 in the CP-ER. Provide the free open area dimensions of the ports on the velocity cap and describe any mitigative measures taken to reduce entrainment of organisms in the CWS.

Response

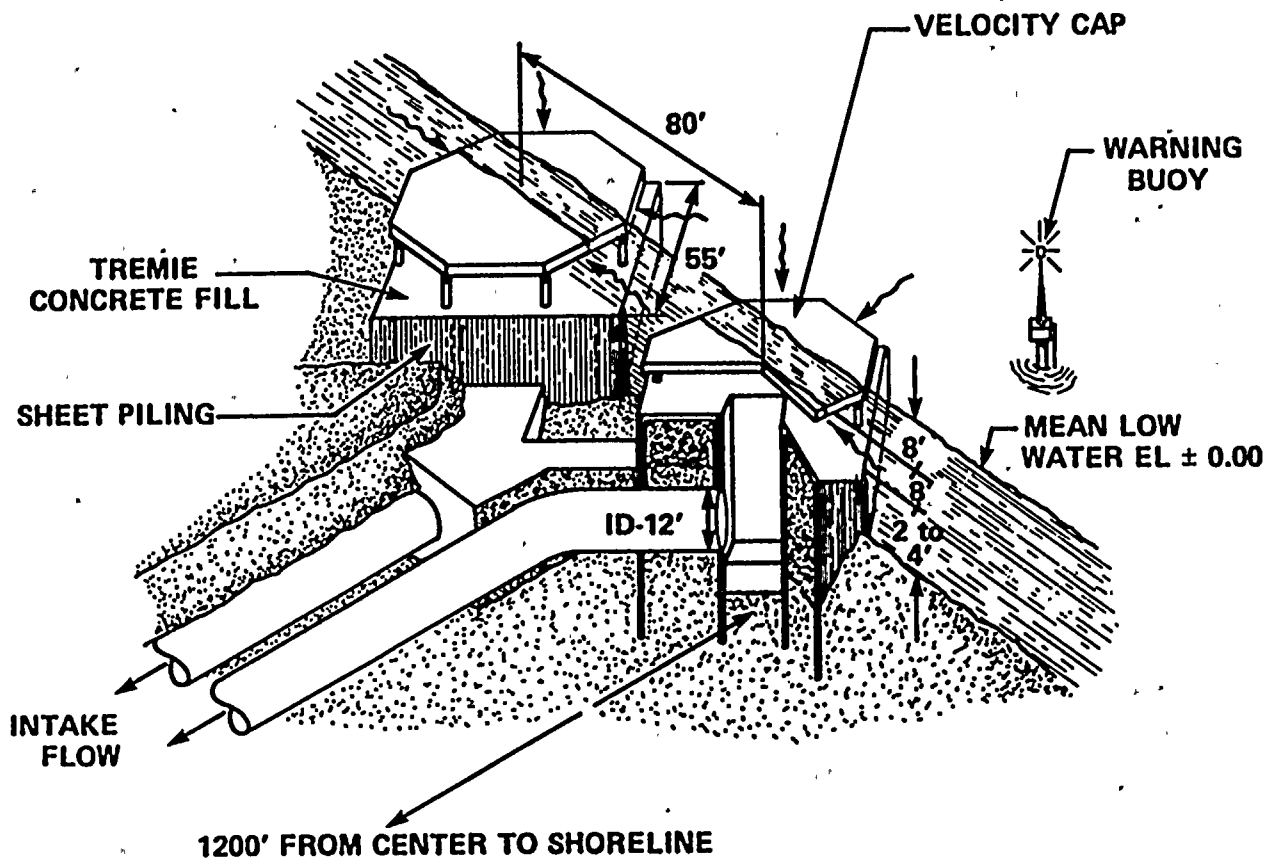
The ocean intake system for the St Lucie Plant was constructed during the St Lucie Unit 1 stage, and consists of two 12 foot diameter pipelines and two independent, but identical intake velocity caps. These velocity caps are located in approximately 20 foot depth of water about 1200 feet offshore.

As shown in Figures 291.2-1 and 291.2-2, the velocity cap is an octagonal horizontal concrete slab, 15 inches thick, measuring 52 feet by 52 feet in plan. The cap is supported by 16 concrete columns (eight on the exterior periphery and eight on the interior) which extend from its underside into a 55 foot square concrete base.

The base rises four feet above the ocean bottom. The center of this base is an open shaft, approximately 20 feet square, which conveys water from the velocity cap to the buried intake pipe.

Each intake structure has eight rectangular openings. Four of these openings have a width of 24 feet each and the remaining four are 20 feet wide. The depth of each port is eight feet. Gross open area is $[(24 \times 4) + (20 \times 4)] \times 8 = 1408$ sq feet. The net (free).open area is 1246 square feet per cap, after deducting the cross-sectional area for the eight exterior columns. For an ocean water withdrawal rate of 1159 cfs per unit, a net entrance velocity of slightly less than a foot per second will result. The velocity caps at St Lucie Plant were designed with an approximate one fps approach velocity to reduce entrainment of marine organisms.

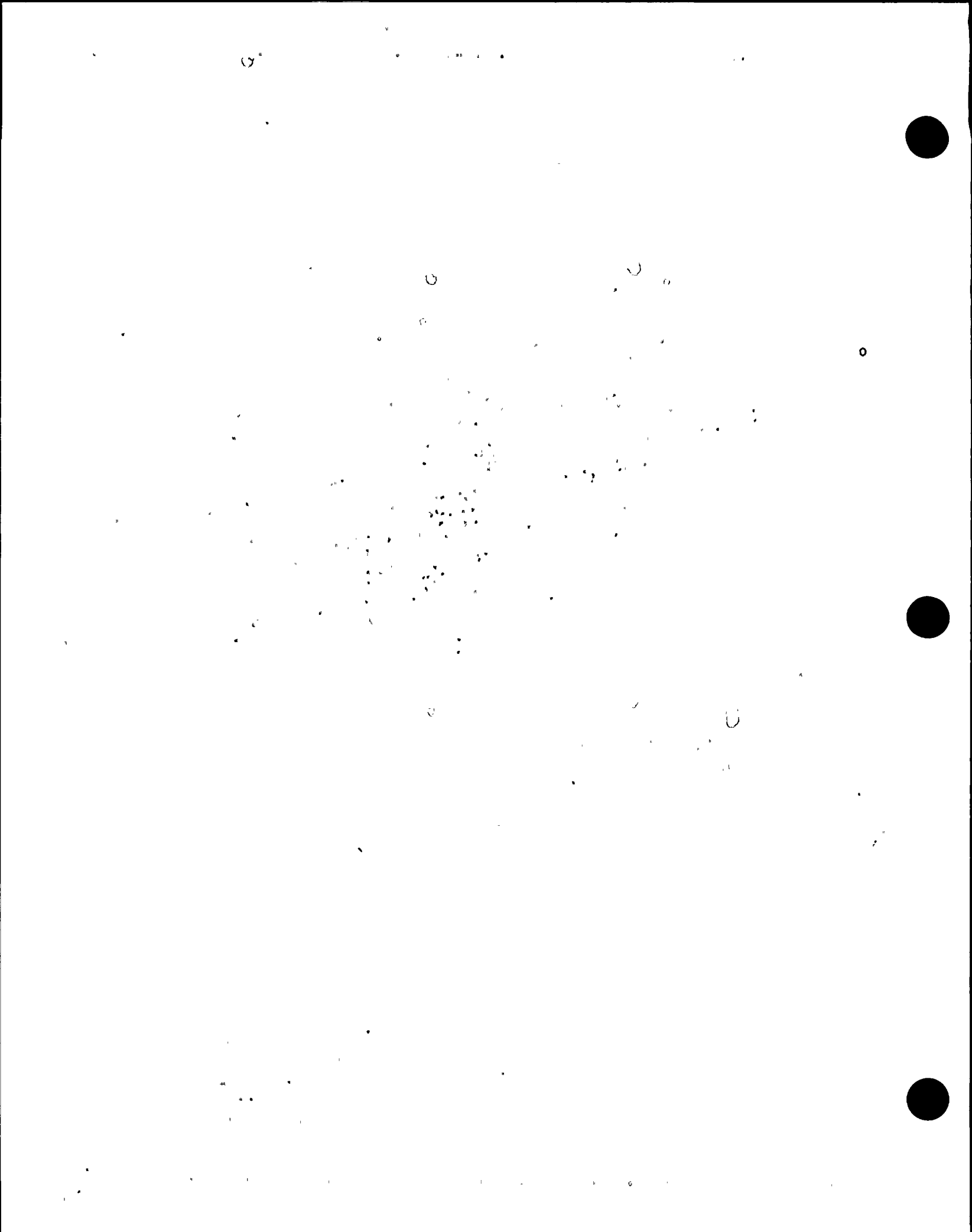
No ER-OL revisions are required.

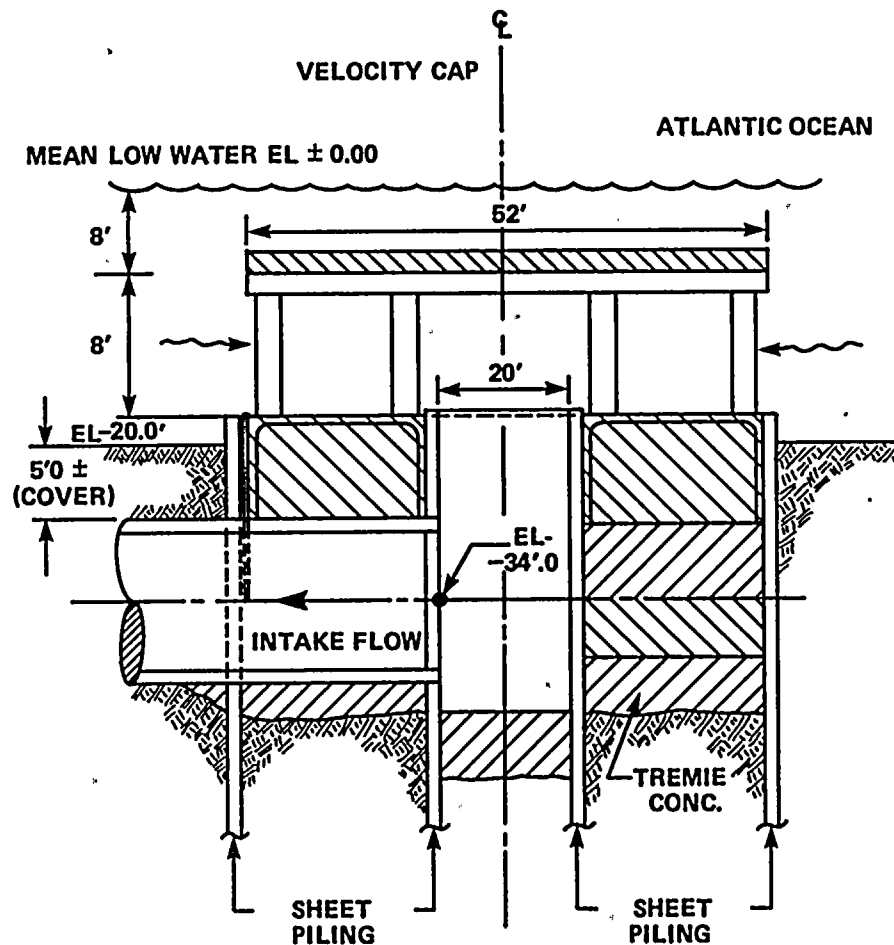


AMENDMENT NO. 2 (6/81)

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

OCEAN INTAKE STRUCTURE
FIGURE 291.2-1





AMENDMENT NO. 2 (6/81)

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

SIDE VIEW OF THE OCEAN
INTAKE STRUCTURE
FIGURE 291.2-2

Question No.

- 291.3 Provide records of any sightings of the West Indian Manatee from the St Lucie area.

Response

Florida Audubon Society, under contract with Florida Power & Light Company, has conducted an annual aerial census program for the endangered West Indian Manatee at various FP&L plants with once-through cooling. The program began in December of 1977 and is on-going. The Audubon Society has submitted a final report for the first two-and-one-half years of the program⁽¹⁾.

During the December 1977 - March 1980 period, weekly surveys were conducted during the winter months (i.e. December - March) and biweekly flights were conducted during the spring, summer and fall months (April - November). The flights were conducted in a Cessna 172 with one or more observers. Counts were made at airspeeds of 90-150 km/hr at 90-200 m altitudes.

The St Lucie Plant was one of the ten plants surveyed by the Florida Audubon Society. During the first year of survey (December 1977 - November 1978) no manatees were sighted in the ocean discharge of the plant or within an approximate five mile radius of the plant, which would include segments of the Indian River. Therefore, surveys at this plant were discontinued. Based on this finding, it was concluded that the St Lucie Plant should not presently be considered a warm-water refuge for manatees⁽¹⁾.

The Henry D. King (Fort Pierce) Power Plant discharge, approximately 15 km north of the St Lucie Plant and located on the Indian River, is considered a warm-water refuge with 44 manatees sighted in that area. Based upon one confirmed sighting of a known individual⁽²⁾ it is inferred that manatees migrate past the St Lucie Plant using the Indian River as the migratory route. Movement is south from the Cape Canaveral area to areas that may include the Hobe Sound Region during the November-January period. The pattern is reversed during the March-May period. At this time, it is not possible to quantify the numbers showing this pattern.

No ER-OL revisions are required.

References

1. Rose, P.M. and S.P. McCutcheon, 1980. Manatees (Trichechus manatus) abundance and distribution in and around several Florida power plant effluents. Report prepared for Florida Power & Light Company contract #31534-86626, 128 p.
2. Shane, S.H. 1980. Abundance, distribution and use of power plant effluents by manatees (Trichechus manatus) in Brevard County, Florida. Report prepared for Florida Power & Light Company contract #61552-86540, 240 p.

Question No.

- 291.4 Provide the estimated flow rate through the emergency water supply system from Big Mud Creek during test conditions. Provide a range of expected values of water quality withdrawn from Big Mud Creek specifically, but not limited to, total suspended solids, dissolved oxygen, salinity and temperature. Compare these values to values obtained from water withdrawn from the Atlantic Ocean.

Response

1. Emergency Water Supply System

To assure that the system is operational, routine tests of the two emergency valves are performed during normal plant operation. During the test, water is drawn into the intake canal from Big Mud Creek at a rate dependent upon the "head" differential between the canal and the creek. Figure 291.4-1 presents the head-discharge curve for each of the two 54 inch pipe/valve assemblies. As an example, for a head differential of four feet, a flow of approximately 63,000 gpm will pass through each valve.

2. Water Quality

Water quality of the Indian River including Big Mud Creek is influenced mostly by tidal exchange with the Atlantic Ocean through Fort Pierce and St Lucie Inlets. Some fresh water dilution occurs due to runoff from the Lake Okeechobee drainage system.

Temperature and dissolved oxygen measurements within the Indian River averaged 24.3° F and 6.4 mg/l, respectively⁽¹⁾. The temperature data were collected at Indian River Station 34 (see Figure 291.4-2 for location) from June 1972 to March 1973. The dissolved oxygen average was calculated for Stations 19 and 22, located approximately four and 22 kilometers north of Fort Pierce Inlet, respectively, since no measurements were taken at Station 34. These measurements are in close agreement with the ocean data reported in Section 2.4.4 of the St Lucie Unit 2 ER-OL.

SL2-ER-OL

The average salinity calculated at Station 34⁽¹⁾ is 28.1 ppt, approximately seven ppt lower than the ocean average. This can be attributed to fresh water runoff into the Indian River.

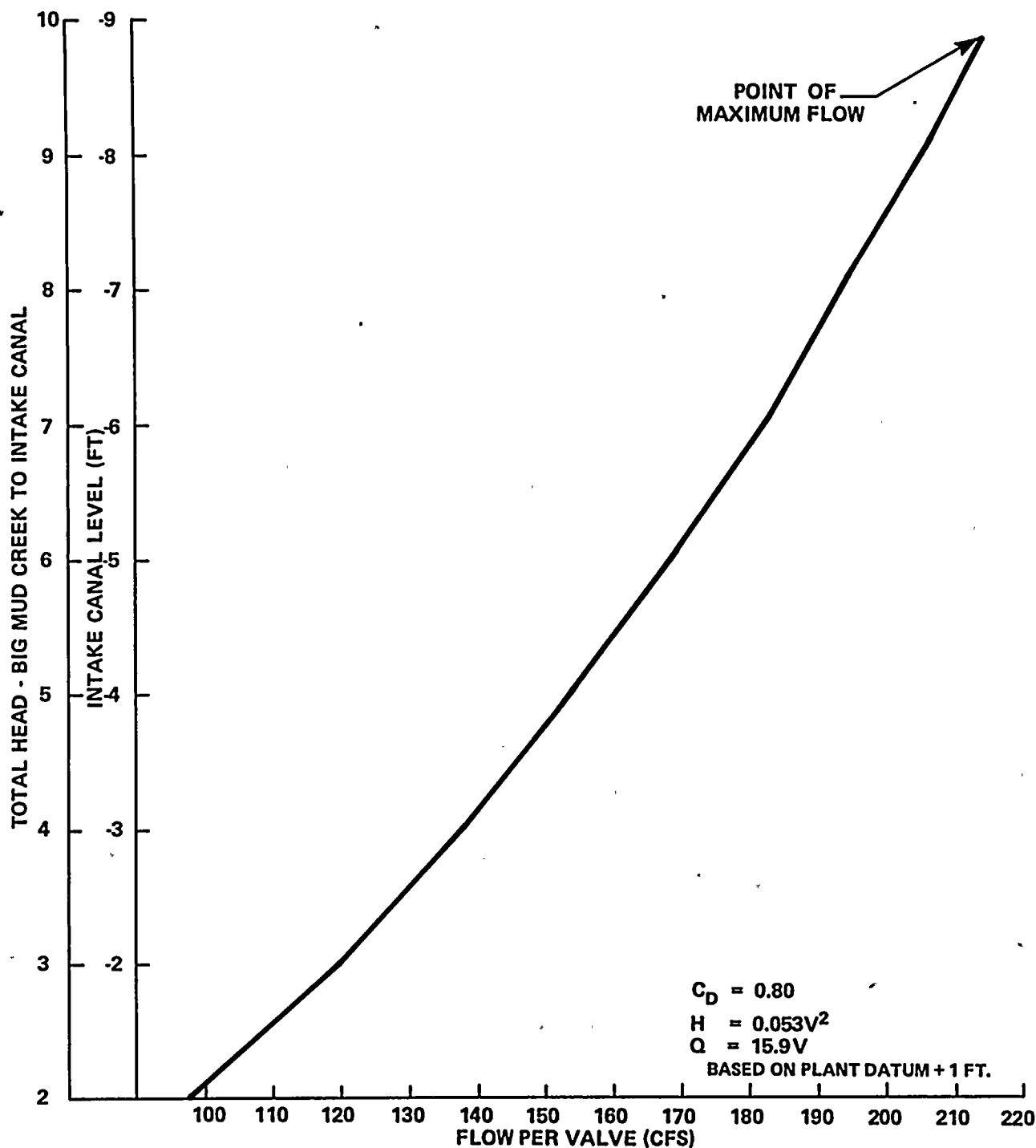
At a depth of 12-13 meters for Stations 1 and 2⁽²⁾ within Big Mud Creek, as shown in Figure 291.4-2, temperature was measured at 13-15° C, dissolved oxygen at 3.4-3.5 mg/l and salinity at 31 ppt. For depths less than four meters at Stations 1 and 5 water temperature at 21° to 24° C, dissolved oxygen from 6.8 to 8.9 mg/l and salinity ranging from 14 to 32 ppt are in agreement with values measured by the Harbor Branch Foundation⁽¹⁾. Data for Stations 1, 2 and 3 are recollected data, since the original data were lost.

Total particulates for all stations⁽²⁾ ranged from less than one to 25 mg/l averaging about 7.5 mg/l. This average is comparable to the oceanic average total particulates of 6.65 mg/l reported by Worth and Hollinger⁽³⁾.

No ER-OL revisions are required.

References

1. Wilcox, J R and R G Gilmore, 1976. Some hydrological data from the Indian River between Sebastian and St Lucie Inlets, Florida. Tech Report 17, Harbor Branch Foundation, Inc, Fort Pierce, Florida, 104 pp.
2. Law Engineering Testing Company, 1980. Water quality analyses at St Lucie Nuclear Plant. Law Engineering Job No. MH 0143, Marietta, Georgia.
3. Worth, D F and M L Hollinger, 1977 Nearshore marine ecology at Hutchinson Island, Florida: 1971-1974 III, Physical and Chemical Environment. Fla Mar Res Publ No. 23, FLorida Dept of Natural Resources, St Petersburg, Fla.



AMENDMENT NO. 2 (6/81)

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

HEAD DISCHARGE CURVE -
54" PIPE/VALVE ASSEMBLY
FIGURE 291.4-1

Question No.

- 291.5 Provide a chart of the bathymetry of Big Mud Creek and nearby Indian River to and including the intercoastal (sic) waterway.

Response

Near the St Lucie plant site the Indian River is a long shallow body of water. The average width is about 1.5 statute miles based on NOS Nautical Chart 11472. The west shoreline topography is straight, whereas the east shoreline is irregular with scattered mangroves protruding into the river. Depths are generally less than six feet below Mean Low Water (MLW) except for the dredged channel of the Intracoastal Waterway, which is maintained to minus 10 feet MLW.

Near Herman Bay Point, the section of Big Mud Creek between State Highway 1A and the Point was dredged to a depth of approximately minus 45 feet MLW. A channel connecting the Intracoastal Waterway and Big Mud Creek, as shown in Figure 291.4-2, was dredged to minus 12 feet MLW⁽¹⁾.

No ER-OL revisions are required.

Reference

1. Continental Shelf Associates, Inc, 1977. Bathymetric survey of Florida Power and Light Barge Canal. Tequesta, Florida.



Question No.

291.6 Indicate the maximum and average duration of flow through the Big Mud Creek intake during quarterly testing.

Response

Reference is made to the response to Question No. 291.4. The flow rate from Big Mud Creek through the valves would depend on the "head" differential between the canal and the creek. As the opening and closing test is performed within a minute or two per valve, only 100,000 gallons or so would be withdrawn per valve. St Lucie Unit 1 Environmental Technical Specifications restrict annual water withdrawal to four million gallons from Big Mud Creek (see Section 5.5.2.9 of St Lucie Unit 2 Final Environmental Statement - Construction Permit Stage). This valve test is currently performed on a semi-annual basis.

No ER-OL revisions are required.



Question No.

291.7 In addition to responses to other specifically requested information provide a summary and brief discussion in table form, by section, of differences between currently projected environmental effects of the nuclear power station (including those that would degrade, and those that would enhance environmental conditions) and the effects discussed in the environmental report submitted at the construction stage.

Response

See Table 291.7-1 attached.

No ER-OL revisions are required.

1. The first part of the document is a list of names and addresses of the members of the committee. The names are listed in alphabetical order, and the addresses are given in full. The list is as follows:

Name	Address
Mr. A. B. C.	123 Main St., New York, N. Y.
Mr. D. E. F.	456 Elm St., New York, N. Y.
Mr. G. H. I.	789 Broadway, New York, N. Y.
Mr. J. K. L.	1010 Fifth Ave., New York, N. Y.
Mr. M. N. O.	1111 Third St., New York, N. Y.
Mr. P. Q. R.	1212 Second St., New York, N. Y.
Mr. S. T. U.	1313 First St., New York, N. Y.
Mr. V. W. X.	1414 West St., New York, N. Y.
Mr. Y. Z. A.	1515 East St., New York, N. Y.
Mr. B. C. D.	1616 North St., New York, N. Y.
Mr. E. F. G.	1717 South St., New York, N. Y.
Mr. H. I. J.	1818 Central St., New York, N. Y.
Mr. K. L. M.	1919 Union St., New York, N. Y.
Mr. N. O. P.	2020 Madison St., New York, N. Y.
Mr. Q. R. S.	2121 Park St., New York, N. Y.
Mr. T. U. V.	2222 Madison St., New York, N. Y.
Mr. W. X. Y.	2323 Park St., New York, N. Y.
Mr. Z. A. B.	2424 Madison St., New York, N. Y.
Mr. C. D. E.	2525 Park St., New York, N. Y.
Mr. F. G. H.	2626 Madison St., New York, N. Y.
Mr. I. J. K.	2727 Park St., New York, N. Y.
Mr. L. M. N.	2828 Madison St., New York, N. Y.
Mr. O. P. Q.	2929 Park St., New York, N. Y.
Mr. R. S. T.	3030 Madison St., New York, N. Y.
Mr. U. V. W.	3131 Park St., New York, N. Y.
Mr. X. Y. Z.	3232 Madison St., New York, N. Y.
Mr. A. B. C.	3333 Park St., New York, N. Y.
Mr. D. E. F.	3434 Madison St., New York, N. Y.
Mr. G. H. I.	3535 Park St., New York, N. Y.
Mr. J. K. L.	3636 Madison St., New York, N. Y.
Mr. M. N. O.	3737 Park St., New York, N. Y.
Mr. P. Q. R.	3838 Madison St., New York, N. Y.
Mr. S. T. U.	3939 Park St., New York, N. Y.
Mr. V. W. X.	4040 Madison St., New York, N. Y.
Mr. Y. Z. A.	4141 Park St., New York, N. Y.
Mr. B. C. D.	4242 Madison St., New York, N. Y.
Mr. E. F. G.	4343 Park St., New York, N. Y.
Mr. H. I. J.	4444 Madison St., New York, N. Y.
Mr. K. L. M.	4545 Park St., New York, N. Y.
Mr. N. O. P.	4646 Madison St., New York, N. Y.
Mr. Q. R. S.	4747 Park St., New York, N. Y.
Mr. T. U. V.	4848 Madison St., New York, N. Y.
Mr. W. X. Y.	4949 Park St., New York, N. Y.
Mr. Z. A. B.	5050 Madison St., New York, N. Y.

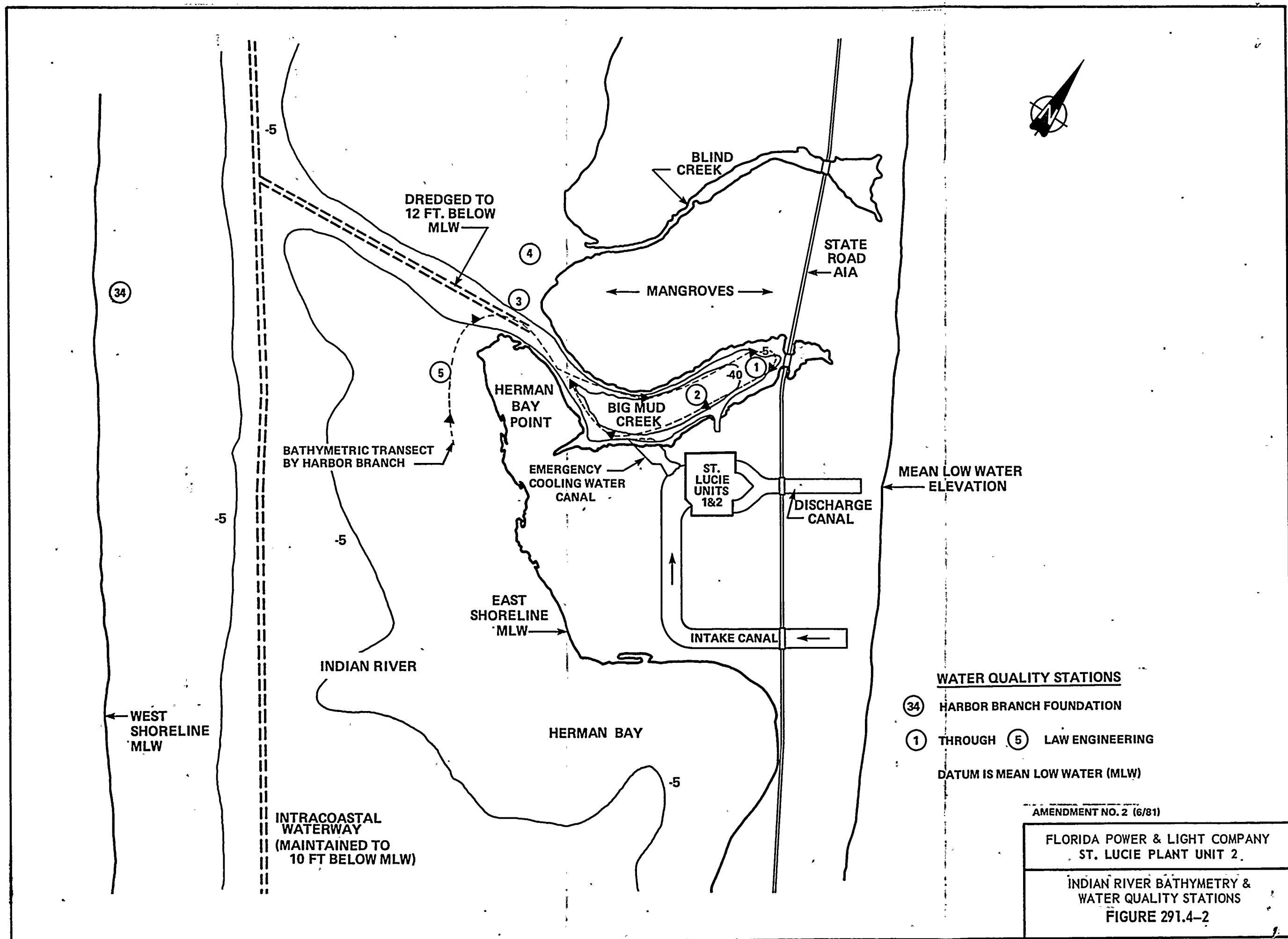


TABLE 291.7-1

SUMMARY AND DISCUSSION OF DIFFERENCES BETWEEN THE ENVIRONMENTAL EFFECTS PROJECTED IN ST LUCIE UNIT 2 ENVIRONMENTAL REPORT - CONSTRUCTION
PERMIT STAGE (ER-CP) AND THOSE SET FORTH IN ENVIRONMENTAL REPORT - OPERATING LICENSE STAGE (ER-OL)

ER-CP		ER-OL		COMMENTS
SECTION	HEADING AND SUMMARY	SECTION	HEADING AND SUMMARY	
4.1	<u>Site Preparation and Plant Construction</u>	4.1	<u>Site Preparation and Plant Construction</u>	
4.1.1	<u>Summary of Plans and Schedules</u> Major construction activities to be completed in 1979. Peak manpower requirement: 1400 (12/77 - 12/78)	4.1.1	<u>Construction Schedule</u> Major construction activities are scheduled to complete by early 1981. Peak manpower requirement (1980): 2025 (Section 4.1.3.1)	
4.1.2	<u>Cut and Fill Areas</u> All St Lucie Unit 2 structures and related facilities are contained within a 300 acre area which was previously cleared and drained during St Lucie Unit 1 construction stage; approximately 100 of these acres were anticipated for St Lucie Unit 2.	4.1.2	<u>Description of Site Preparation and Construction</u> a) Permanent facilities including plant, canals, roads, etc. (Units 1 and 2) - 166 acres b) Disturbed areas for concrete storage and fabrication, fill storage and fill borrow (Units 1 and 2) - 134 acres	St Lucie Unit 2 construction required only three (3) acres of land (mangrove) not cleared previously during Unit 1 construction.

TABLE 291.7-1

ER-CP		ER-OL		COMMENTS
SECTION	HEADING AND SUMMARY	SECTION	HEADING AND SUMMARY	
	Same headwall structure in discharge canal is shared by Units 1 and 2 discharge pipelines. No additional mangrove swamp will be cleared for St Lucie Unit 2.	c)	Additional mangrove swamp cleared for a separate headwall (Unit 2) - 3 acres	Separate headwall will allow the more efficient St Lucie Unit 2 diffuser to be used, whenever possible, for one unit operation (see also Section 5.1.2 of ER-OL).
			Total area affected by plant construction (Units 1 and 2) - 303 acres	
4.1.3	<u>Construction Force</u> Minor burden on schools and public services by work force (peak = 1400)	4.1.3	<u>Effects of Site Preparation and Construction</u>	Construction force estimate in ER-OL is more accurate. Most of the St Lucie Unit 1 construction force was retained for St Lucie Unit 2 construction. Impacts to nearby communities are low.
		4.1.3.1	Of the total 2025 work force, only 304 are immigrant workers.	
4.1.6	<u>Construction Effects on Wildlife Habitats</u> Area between canals will be flooded for mosquito control.	4.1.3.3	<u>Effects on Terrestrial Vegetation and Wildlife</u> Three acres of mangrove swamp cleared to accommodate St Lucie Unit 2 headwall (Section 4.1.2 and Figure 4.1-2) were disturbed. No flooding or draining of this area for mosquito control.	Mosquito control is the responsibilities of the St Lucie County Mosquito Control District.

TABLE 291.7-1

ER-CP		ER-OL		COMMENTS
SECTION	HEADING AND SUMMARY	SECTION	HEADING AND SUMMARY	
4.1.7	<u>Effects of Dredging for Discharge Pipes on the Offshore Benthic Fauna</u> Offshore construction of St Lucie Unit 2 discharge pipeline will disturb 17,600 m ² and displace 16.4 x 10 ⁶ organisms, based on 100 percent mortality.	4.1.3.3	<u>Effects on Marine Biota</u> Offshore construction of St Lucie Unit 2 discharge pipeline will disturb a surface area of 56,690 m ² , and displace 8.9 x 10 ⁸ organisms (Table 4.1-3).	Although the area affected and benthic displacement are greater in ER-OL, the impact will be temporary and projected to one year after completion, based on observed substrate stabilization and recolonization subsequent to St Lucie Unit 1 discharge pipeline construction.
4.1.8	<u>Chemical Releases During Construction</u> Spent chemicals are routed to the settling basin or to neutralization basin if neutralization is required prior to discharge.			
		4.4	<u>Radioactivity</u> New section.	
		4.5	<u>Construction Impact Control Program</u> New section.	
5.1	<u>Effects of Heat Dissipation System</u>	5.1	<u>Effects of Operation of Heat Dissipation System</u>	

TABLE 291.7-1

ER-CP		ER-OL		COMMENTS
SECTION	HEADING AND SUMMARY	SECTION	HEADING AND SUMMARY	
5.1.1	<p><u>Effect of Thermal Discharge of Ocean Temperatures</u></p> <p>Reference is made to Section 3.4 for description of the "alternating" diffuser. The 12 foot diameter diffuser section will be 1060 feet long consisting of 48 ports. The ports, each 1.5 feet in diameter, will be mounted alternately on both sides of the diffuser.</p> <p>Based on 1150 cfs circulating water flow and a maximum temperature rise of 24°F, the St Lucie Unit 2 diffuser performances was analyzed for thermal impacts under conditions of Unit 2 discharge alone, and combined discharges for Units 1 and 2. It did not generate any "net offshore" momentum and exhibited "good" performance only under high ambient current situations.</p>	5.1.1	<p><u>Effluent Limitations and Water Quality Standards</u></p> <p>US EPA Effluent Limitations (40 CFR 423), and State of Florida Rules and Regulations Ch. 17-3 pertaining to water quality standards (s. 17-3.05, Thermal Surface Criteria) will govern the thermal effects from St Lucie Unit 2 discharge.</p>	<p>Table 5.1-1 (ER-OL) presents a qualitative comparison of the performance between the "alternating" and "staged" diffusers. The state-of-the-art "staged" diffuser provides a more efficient means of dispersing the thermal plume. With the present design, the plant discharge is carried to deeper waters where more diluent flow is available, and potential for recirculation and interference with Unit 1 plume will be reduced.</p>
		5.1.2	<p><u>Physical Effects</u></p> <p>Reference is made to Section 3.4 for description of "offshore angled or staged" diffuser. The 16 foot diameter diffuser section will be 1416 feet long, with 58 ports. The ports, each about 18 inches in diameter, are oriented 25° horizontally in an alternating manner. Plume computations were made for discharges from Unit 2 alone and combined discharges from Units 1 and 2 for a maximum temperature rise of 32°F. This optimized diffuser generates "net offshore" momentum and exhibits "good" performance under all ambient current conditions.</p>	

291.7-5

TABLE 291.7-1

ER-CP		ER-OL		COMMENTS
SECTION	HEADING AND SUMMARY	SECTION	HEADING AND SUMMARY	
5.1.2	<u>Effects of Thermal Discharge on Aquatic Life</u> Thermal plumes will have minimal effects on the aquatic communities.			
5.1.3	<u>Entrainment of Aquatic Organisms</u> Entrainment effects were calculated based on offshore densities, and an assumption of 100 percent mortality. Daily entrainment rates for phytoplankton and zooplankton are 13.5 kg/day and 9.14×10^3 kg/day, respectively. Impingement is not considered significant.	5.1.3	<u>Biological Effects of St Lucie Unit 2 Operation</u>	
		5.1.3.1	<u>Intake Effects</u> Worst case estimate of 1.8 percent (3.6 percent for both units) of nearshore planktonic community will be entrained through St Lucie Unit 2, based on comparison of pre-operational and operational monitoring programs conducted for St Lucie Unit 1. Based on average impingement rates observed during operation of St Lucie Unit 1 (1976-78 data), it is anticipated that impingement rates for St Lucie Unit 2 will be 82,000 (620 kg) finfish and 30,000 (197 kg) shellfish per year. These rates represent less than .04 percent and .005 percent of the commercial catches of finfish and shellfish, respectively, for either St Lucie or Martin Counties.	Estimates in ER-OL are more reliable because of St Lucie Unit 1 operational experience.
		5.1.3.2	<u>Discharge Effects</u> Because of the optimized "staged" diffuser design, the plumes will have no adverse	

TABLE 291.7-1

ER-CP		ER-OL		COMMENTS
SECTION	HEADING AND SUMMARY	SECTION	HEADING AND SUMMARY	
		5.1.3.2	(Cont'd)	
			effects on the benthic community. If planktonic productivity is stimulated by surface temperatures, a resulting increase in benthic productivity may occur.	
			Based on thermal tolerances of resident planktonic and nektonic species and the plume size and temperature, no adverse effects are expected from operation of St Lucie Unit 2.	
5.2 5.3	<u>Radiological Impact on Biota and Man</u> Reference is made to Section 3.5 and Amendments 7 and 8 for a description of the radwaste systems. Source terms and releases are based on GALE code and doses based on site and meteorological data.	5.2	<u>Radiological Impact from Routine Operation</u> Reference is made to Section 3.5 for a description of changes in radwaste systems. Releases are based on revised GALE code. Doses are based on updated site and meteorological data.	The major system change is the replacement of the Airborne Radioactivity Removal System (ER-CP), with a Low-volume Continuous Purge System (ER-OL). Reanalysis of releases and updated site data revealed no significant change that will affect doses.

TABLE 291.7-1

ER-CP		ER-OL		COMMENTS
SECTION	HEADING AND SUMMARY	SECTION	HEADING AND SUMMARY	
5.4	<u>Effects of Chemical and Biocide Discharges</u>	5.3	<u>Effects of Chemical and Biocide Discharges</u>	
5.4.1	<u>Chlorine</u> Reference is made to Section 3.6 for description of chemical and biocide discharges. Gaseous chlorine will be used for biocide control. The maximum free residue chlorine concentration was estimated to be less than 0.19 ppm at the discharge canal.	5.3.2	<u>Effects on Water Quality of Atlantic Ocean</u> Reference is made to Section 3.6 for description of chemical and biocide discharges and comparison with applicable federal effluent limitations (Table 5.3-1). Sodium hypochlorite (instead of gaseous chlorine) will be used for biocide control, resulting in maximum total residue chlorine concentration of 0.08 mg/l at point of discharge.	
5.5	<u>Effects of Sanitary Waste Discharge</u> Reference is made to Section 3.7 for description of the treatment system. Septic tank will be used to treat sanitary wastes. Treated effluent is disposed via a leaching field within the site, which meets all applicable site regulations.	5.4	<u>Effects of Sanitary Waste Discharge</u> Reference is made to Section 3.7 for description of the package-type extended aeration treatment facility. This treatment plant is capable of achieving 90 to 95 percent removal of both BOD ₅ and suspended solids from the sanitary wastes. Treated effluent meets EPA and state regulations. Treated effluent discharged into intake canal will be diluted 8.7×10^4 times by circulating water flow before discharging into Atlantic Ocean.	System design change considered the package-type treatment system more compatible for plant operation and site use.

TABLE 291.7-1

ER-CP		ER-OL		COMMENTS
SECTION	HEADING AND SUMMARY	SECTION	HEADING AND SUMMARY	
5.7	<u>Other Effects</u> Effects of gaseous wastes from periodic testing of emergency diesel generators and of racoon population control are considered insignificant.	5.6	<u>Other Effects</u>	
		5.6.1	<u>Land Use</u> Two-thirds of area within five miles of St Lucie Unit 2 is submerged. Potential for residential development is limited.	
		5.6.2	<u>Plant Operation and Maintenance Noise</u> New section. Maximum shift is two (2) dB above ambient within area of a five mile radius.	A shift less than five dB is not considered significant.
8.0	<u>Economic and Social Effects of Plant Construction and Operation</u>	8.0	<u>Benefits and Costs</u>	
8.1	<u>Value of Delivered Products</u> - Plant size utilized: 850 MW(e)-nameplate - Capacity factor: 80% Amounts to 5.978 billion kWh/year - Year of commercial operation: 1979 - Plant life and analysis period: 30 years - Discount rate: 10%	8.1.1	<u>Primary Benefits</u> - Plant Size utilized: 802 MW(e) - net - Capacity factor: 72% Amounts to 5.058 billion kWh/year - Year of Commercial operation: 1983 - Productive life and analysis period: 40 years - Discount rate: 10.04%	The format utilized to present data in the ER-CP for Chapters 8 and 11 varies significantly from the format outlined in NRC Reg. Guide 4.2.- Rev. 2 utilized for ER-OL.



TABLE 291.7-1

ER-CP		ER-OL		COMMENTS
SECTION	HEADING AND SUMMARY	SECTION	HEADING AND SUMMARY	
8.2	<u>Income</u> Total capital cost for developing St Lucie Unit 2 will be \$360 million (in 1980 dollars)	8.1.2	<u>Secondary Benefits</u> - Operation workers: 150 - Employment multiplier (for operational phase only): 1.72 - Indirect employment effect (new jobs): 258	Revenues cited are categorized by type and jurisdiction in Table 8.1-1 (ER-OL).
8.3	<u>Employment</u> - Operational workers: 25 - Employment multiplier (construction and operational phase): 0.65 - Indirect employment effect (new jobs): 16	8.2	<u>Costs</u>	
8.4	<u>Taxes</u> Not determined	8.2.1	<u>Internal Costs</u> Capital costs of St Lucie Unit 2: \$925 million (in 1983 dollars)	
11.0	<u>Summary Benefit - Cost Analysis</u> Table 11.1-1 shows distribution of electrical energy (expected annual net delivery in kilowatt hours) as follows:	11.0	<u>Summary Benefit -Cost Analysis</u> Reference is made to Sections 8.1 and 8.2. Table 8.1-1 shows distribution of electrical energy (expected annual net delivery in kilowatt hours) as follows:	Net delivered energy excluded 8 percent transmission loss.

TABLE 291.7-1

ER-CP		ER-OL		COMMENTS
SECTION	HEADING AND SUMMARY	SECTION	HEADING AND SUMMARY	
	Industrial (8.5%) - $.468 \times 10^9$		Industrial (7.0%) - $.3257 \times 10^9$	
	Commercial (29.9%) - 1.595×10^9		Commercial (36.5%) - 1.6986×10^9	
	Residential (50.7%) - 2.788×10^9		Residential (49.1%) - 2.2849×10^9	
	Other (11.8%) - $.649 \times 10^9$		Other (7.4%) - $.3444 \times 10^9$	
	Total Delivered 5.500×10^9		Total Delivered 4.6536×10^9	
	Revenues from delivered benefits:		Revenues from delivered benefits:	
	\$103,000,000 (in 1971 dollars).		\$234,865,287 (discounted 1983 dollars).	

291.7-11

Amendment No. 2, (6/81)

Question No.

- 291.8 Provide an estimate of the maximum probable yearly recreational harvest of finfish, shellfish and molluscs harvested from waters within a 50-mile radius of the station that potentially could be contaminated by radionuclides due to a maximum probable accident. The harvest estimates should be summarized by species and location of capture (water body segment) and provide an explanation of how the estimate was obtained..

Response

The estimated total number of fish caught by marine recreational fishermen in Atlantic Ocean waters of Florida during 1979 was about 40 million⁽¹⁾. Dominant species were sea catfish (5 million); grunts (4 million); herrings (3 million); pinfish (3 million); dolphins (3 million); snappers (2 million); bluefish (2 million); spotted seatrout (1 million); sea basses (1 million); blue runner (1 million); and sheepshead (1 million). Forty percent of the estimated catch occurred within three miles of shore (in the Atlantic Ocean), and 24 percent of the estimated catch occurred in estuaries and embayments. November and December accounted for the largest portion of the estimated recreational catch (40 percent).

Marine recreational catch data presented by the US Department of Commerce (1980) cannot be reduced sufficiently to permit estimation of catch within 50 miles of St Lucie Unit 2. However, most of the catch occurs in estuaries, lagoons, or in nearshore Atlantic Ocean waters, and availability of fishery facilities should be expected to bear a relationship to fishing activity and catch (assuming equal catch rates per stretch of coast). Based therefore on the percentage of fishing sites per county⁽²⁾, it is estimated that between ten and 20 percent of the Florida east coast catch may be taken within 50 miles of St Lucie Unit 2. Brevard County comprised eight percent of the fishing sites enumerated in⁽²⁾; Indian River County one percent; St Lucie County one percent; Martin County nine percent; and Palm Beach County 15 percent. Brevard and Palm Beach Counties are on the outskirts of the five county region, and only portions of these fisheries are within 50 miles of St Lucie Unit 2.

No ER-OL revisions are required.

References

1. U.S. Dept. of Commerce. 1980. Marine Recreational Fishery Statistics Survey, Atlantic and Gulf Coasts, 1979. Natl. Mar. Fish. Serv., Wash. D.C. Current Fish. Stat. No. 8063, Dec. 1980.
2. Deuel, D. 1981. National Marine Fisheries Serv.; Dept of Statistics, Wash., D.C. Pers. comm.

Question No.

- 291.9 Using data from the last 5 years, provide an estimate of the maximum probable yearly commercial harvest of finfish, shellfish and molluscs harvested from waters within a 50 mile radius of the station that potentially could be contaminated by radionuclides due to a maximum probable accident. The harvest estimates should be summarized by species and location of capture (waterbody segment) and provide a generalized explanation of how the estimate was obtained.

Response

Portions of five counties are included within a 50 mile radius of St Lucie Unit 2. The US Dept of Commerce annual landings statistics⁽¹⁻⁴⁾ are reduced to county landings only, thus a conservative estimate of fin and shellfish landings can be obtained from such statistics. Additional conservatism is built into the estimates because port of landing statistics do not necessarily reflect local fishery activity. For instance, large portions of lobster and rock shrimp catches occur in deep waters outside of Florida.

Table 291.9-1 provides catch data for the five county region from 1975 through 1980. Based on county landings, the average annual catch for these counties was estimated at approximately 18 million pounds of finfish and 3.5 million pounds of shellfish. Table 291.9-2 gives a breakdown of dominant species within county catches. It is shown that Spanish and king mackerel dominate the finfish catch, and hard blue crab, rock shrimp, and spiny lobster dominate the shellfish catch. Calico scallop comprises a large portion of the 1980 shellfish landings in Brevard County. This fishery exhibits wide year class fluctuations due to differential success of spat set⁽⁵⁾. The Brevard County landings account for 95 percent of the five county shellfish harvest and 40 percent of the Florida east coast harvest.

No ER-OL revisions are required.

References

1. National Marine Fisheries Service, 1977, Florida Landings, Annual Summary, 1975. Current Fisheries Statistics No. 6919.
2. National Marine Fisheries Service, 1978, Florida Landings, Annual Summary, 1976. Current Fisheries Statistics No. 7219.

3. National Marine Fisheries Service, 1980, Florida Landings, Annual Summary, 1977. Current Fisheries Statistics No. 7517.
4. Michael, S. and T. Culbertson, 1981. Personal communication. National Marine Fisheries Service, Miami, Florida.
5. Allen, D. 1981. Personal communication. National Marine Fisheries Service. Miami, Florida.

SL2-ER-OL

TABLE 291.9-1

COMMERCIAL FISHERIES LANDINGS, 1975-1980*

	COUNTY	BREVARD	INDIAN RIVER	ST LUCIE	MARTIN	PALM BEACH
<u>1975</u>						
Total Pounds Finfish		3,463,644	2,547,429	4,760,026	3,043,802	1,925,105
Total Pounds Shellfish		4,087,586	61,173	15,904	2,864	79,775
<u>1976</u>						
Total Pounds Finfish		3,153,547	2,667,307	7,177,920	4,935,439	3,089,123
Total Pounds Shellfish		2,612,218	17,159	10,456	1,950	39,548
<u>1977</u>						
Total Pounds Finfish		2,180,524	2,351,740	8,606,184	6,492,498	2,118,537
Total Pounds Shellfish		3,749,286	24,950	13,320	1,487	35,135
<u>1978</u>						
Total Pounds Finfish		2,256,017	1,491,532	6,271,737	4,203,935	1,541,736
Total Pounds Shellfish		3,398,933	150,255	10,553	2,752	22,523
<u>1979</u>						
Total Pounds Finfish		1,621,858	875,550	5,650,437	4,399,665	1,475,645
Total Pounds Shellfish		1,431,557	3,333	3,530	5,221	19,212
<u>1980</u>						
Total Pounds Finfish		2,073,856	1,478,244	7,583,345	7,247,389	2,287,479
Total Pounds Shellfish		4,608,084	195	261,595	4,000	76,446
<u>1975-1980 AVERAGE</u>						
Pounds Finfish		2,458,241	1,901,967	6,674,941	5,053,788	2,072,938
Pounds Shellfish		3,314,611	42,844	52,560	3,046	45,440
<u>Five County Averaged Annual Total of Finfish (lbs):</u> 18,161,875						
<u>Approximate Value:</u> \$8,717,700						
<u>Five County Averaged Annual Total of Shellfish (lbs):</u> 3,485,501						
<u>Approximate Value:</u> \$5,533,602						

*Based on references 1-4.

SL2-ER-0L

TABLE 291.9-2

DOMINANT FINFISH AND SHELLFISH (PERCENT RELATIVE WEIGHT) IN COMMERCIAL LANDINGS, 1975-1980*

COUNTY	BREVARD	INDIAN RIVER	ST LUCIE	MARTIN	PALM BEACH
<u>1975</u>	Black Mullet (20%) Hard Blue Crab (51%)	Menhaden (35%) Hard Blue Crab (95%)	Spanish and King Mackerel (77%) Rock Shrimp and Hard Blue Crab (75%)	Spanish Mackerel (41%) Spiny Lobster (91%)	Spanish and King Mackerel (83%) Spiny Lobster (99%)
<u>1976</u>	Black Mullet, Spanish and King Mackerel (53%) Hard Blue Crab (60%)	Menhaden and King Mackerel (62%) Hard Blue Crab (53%)	Spanish and King Mackerel (84%) Spiny Lobster (66%)	Spanish Mackerel (64%) Spiny Lobster (100%)	Spanish Mackerel (67%) Spiny Lobster (95%)
<u>1977</u>	Black Mullet (29%) Hard Blue Crab and Rock Shrimp (72%)	King and Spanish Mackerel (50%) Hard Blue Crab (93%)	Spanish and King Mackerel (83%) Hard Blue Crab (61%)	Spanish Mackerel (71%) Spiny Lobster (100%)	Spanish and King Mackerel (73%) Spiny Lobster (83%)
<u>1978</u>	Black Mullet Hard Blue Crab and Rock Shrimp	Spot Hard Blue Crab	Spanish and King Mackerel Hard Blue Crab and Spiny Lobster	Spanish Mackerel Spiny Lobster	Spanish and King Mackerel Spiny Lobster
<u>1979</u>	Black Mullet Hard Blue Crab	King Mackerel and Black Mullet Hard Clam	Spanish and King Mackerel Hard Blue Crab	Spanish Mackerel Hard Blue Crab	Spanish and King Mackerel Spiny Lobster
<u>1980</u>	Black Mullet Hard Blue Crab and Calico Scallops	No Dominant	Spanish Mackerel and Swordfish Calico Scallops	Spanish Mackerel Unidentified Species	King and Spanish Mackerel Spiny Lobster

*Where final landings data were not available, relative weight of dominant species could not be calculated.

291.9-4

Amendment No. 2, (6/81)

Question No.

291.10 Provide a short narrative of the fishery resources of the Big Mud Creek and the Indian River in the vicinity of Big Mud Creek.

Response

The fish community of the Indian River is productive and diverse, particularly in the southern region where Big Mud Creek is located. Over 300 fish species have been collected in the southern portion of the Indian River lagoon⁽¹⁾.

Table 291.10-1 is a list of species caught in the Indian River in 1974-1975⁽²⁾. Big Mud Creek ranked highest in numerical abundance of fish (533,737, or 50 percent), but lowest in numbers of species (60). Anchovy (Anchoa mitchilli) dominated the Big Mud Creek samples (88 percent), and this dominance is reflected in species diversity values given in Table 291.10-2. Brevoortia smithi formed about six percent of the catch and Mugil curema formed another three percent of the catch. Menhaden (Brevoortia smithi) and mullet (Mugil spp.) are the dominant species of commercial value, although the commercial fishery of the Florida east coast near St Lucie Unit 2 is dominated by markerel, which were not collected in Big Mud Creek (see Response to Question 291.9).

No ER-OL revisions are required.

References

1. Gilmore, R G. 1981. Harbor Branch Foundation, Inc., Ft Pierce, Fla. Pers. comm.
2. Jones, R S, R G Gilmore Jr., G R Kulezycki, W C Magley, and B Graunke. 1975. Studies of the fishes of the Indian River coastal zone. Harbor Branch Foundation, Inc., Ft. Pierce, Fla.

SL2-ER-OL

TABLE 291.10-1

COMPARISON OF NUMBER OF INDIVIDUALS FOR EACH SPECIES BETWEEN STATIONS. THE 49 SPECIES LISTED WERE CHOSEN FROM A RANK ORDER LIST OF ALL SPECIES, ALL STATIONS COMBINED. SPECIES THAT SCORED LESS THAN 50 INDIVIDUALS WERE GROUPED IN A SINGLE "REMAINING SPECIES" CATEGORY. (FROM REFERENCE 2).

Species	Sebastian	Wabasso	Link Port	Jim Island ¹	Big Mud	Jensen	Bessie Cove ²	Totals
<u>Anchoa mitchilli</u>	27,894	29,592	137,417	2,487	472,190	233,282	13,218	917,080
<u>Brevoortia smithi</u>	72	196	7	6	32,254	12	34	32,581
<u>Anchoa nasuta</u>	2	0	11,910	261	1,930	1,303	2,517	17,923
<u>Anchoa cubana</u>	66	0	0	2	0	8,200	7,942	16,210
<u>Anchoa hepsetus</u>	503	646	1,447	2,461	714	91	9,817	15,681
<u>Harengula pensacolata</u>	2,927	87	4,217	3,476	1,980	84	1,732	14,503
<u>Mugil curema</u>	146	962	41	32	12,968	118	34	14,301
<u>Diapterus olisthostomus</u>	54	2,858	791	1,318	2,821	856	1,212	9,910
<u>Lagodon rhomboides</u>	327	1,354	319	2,810	1,074	1,873	816	8,573
<u>Eucinostomus argenteus</u>	582	559	75	2,097	3,843	777	212	8,145
<u>Eucinostomus gula</u>	303	629	191	584	1,253	286	401	3,647
<u>Sardinella anchovia</u>	481	36	246	501	233	150	1,496	3,143
<u>Menidia beryllina</u>	146	2,106	11	1	68	210	0	2,542
<u>Bairdiella chrysura</u>	83	535	613	4	46	285	859	2,425
<u>Orthopristis chrysoptera</u>	106	575	82	158	45	124	130	1,220
<u>Opisthonema oglinum</u>	202	0	41	7	784	1	72	1,107
<u>Membras martinica</u>	69	602	61	0	98	121	4	955
<u>Anchoa lamprotaenia</u>	950	0	0	0	0	0	2	952
<u>Leiostomus xanthurus</u>	117	158	5	4	362	45	0	691
<u>Haemulon parrai</u>	16	0	11	139	121	7	211	505
<u>Lutjanus synagris</u>	8	9	10	276	0	0	72	375
<u>Sphyraena barracuda</u>	3	3	16	17	196	19	77	331
<u>Trachinotus falcatus</u>	68	7	140	90	0	3	4	312
<u>Strongylura notata</u>	17	68	29	72	62	29	23	300
<u>Oligoplites saurus</u>	5	17	10	17	166	22	8	245
<u>Syngnathus scovelli</u>	12	56	91	16	23	38	5	241
<u>Strongylura timucu</u>	6	9	13	61	39	50	45	223
<u>Elops saurus</u>	13	75	12	5	37	46	7	195
<u>Albula vulpes</u>	3	0	1	0	159	19	12	194
<u>Fundulus similis</u>	2	185	0	0	1	0	0	188
<u>Cynoscion nebulosus</u>	32	44	13	5	9	38	18	159
<u>Lutjanus analis</u>	5	2	1	123	1	5	16	153
<u>Lutjanus griseus</u>	5	32	12	11	35	36	4	135
<u>Monacanthus hispidus</u>	0	4	10	73	1	15	22	125
<u>Syngnathus louisianae</u>	3	11	15	28	8	19	34	118
<u>Gobiosoma robustum</u>	2	65	21	8	4	10	2	112
<u>Archosargus probatocephalus</u>	5	24	9	6	43	19	3	109
<u>Mugil sp.</u>	36	8	4	41	5	1	0	95
<u>Fundulus grandis</u>	0	89	0	0	0	0	0	89

291.10-2

Amendment No. 2, (6/81)

SL2-ER-OL

TABLE 291.10-1

Species	Sebastian	Wabasso	Link Port	Jim Island ¹	Big Mud	Jensen	Bessie Cove ²	Totals
<u>Mugil cephalus</u>	1	51	6	6	8	0	11	83
<u>Floridichthys carpio</u>	1	74	0	3	0	0	0	78
<u>Ocyurus chrysurus</u>	0	0	0	47	0	0	22	69
<u>Hyporhamphus unifasciatus</u>	37	10	8	3	0	5	1	64
<u>Microgobius gulosus</u>	1	56	0	7	0	0	0	64
<u>Sciaenops ocellata</u>	0	22	7	0	9	26	0	64
<u>Gobionellus smaragdus</u>	0	44	0	17	0	0	0	61
<u>Centropomus undecimalis</u>	0	14	13	1	15	5	9	57
<u>Sphyraena borealis</u>	0	0	2	8	0	1	42	54
<u>Gobionellus boleosoma</u>	0	6	0	45	0	0	0	51
Subtotal Individuals	35,311	41,880	157,931	17,333	533,599	248,231	39,650	1,073,935
Subtotal Species	41	41	39	41	34	38	37	
Remaining Individuals	30	159	44	201	138	97	1,655	2,325
Remaining Species	19	26	22	42	26	28	40	
Total Individuals	35,341	42,039	157,975	17,535	533,737	248,328	41,305	1,076,260
Total Species	60	67	61	83	60	66	77	138

1 - Two collections were missed for this station.

2 - One collection was missed for this station.

291.10-3

SL2-ER-OL

TABLE 291.10-2

SUMMARY OF STATION DATA FOR ONE YEAR OF SAMPLING
(From Reference 2)

	Area Sampled (m ²)	No. Species	No. Individuals	Total Weight (kg)	Mean Numbers		Mean Weight		Mean Species Richness (D)
					Diversity (H')	Evenness (J')	Diversity (H')	Evenness (J')	
Sebastian	13,932	60(47)	35,341(2,057)	61.95(14.55)	0.87(1.62)	0.29(0.63)	1.36(1.59)	0.48(0.65)	2.28(2.89)
Wabasso	13,932	67(59)	42,039(10,461)	79.09(47.23)	1.24(1.82)	0.38(0.59)	1.86(1.84)	0.57(0.60)	3.17(3.71)
Link Port	13,932	61(51)	157,975(2,637)	92.64(26.51)	0.79(1.51)	0.27(0.57)	1.21(1.47)	0.42(0.57)	2.13(2.75)
Jim Island	11,610	83(72)	17,535(8,255)	104.80(74.91)	1.56(1.66)	0.46(0.52)	1.74(1.61)	0.52(0.51)	3.78(3.50)
Big Mud	13,932	60(51)	533,737(10,671)	235.63(28.55)	0.46(1.51)	0.15(0.54)	1.11(1.69)	0.37(0.61)	1.96(2.82)
Jensen Beach	13,932	66(57)	248,328(5,086)	73.18(19.60)	0.85(1.52)	0.27(0.53)	1.28(1.57)	0.41(0.55)	2.59(3.18)
Bessie Cove	12,771	77(66)	41,305(4,430)	91.55(70.14)	1.32(1.78)	0.40(0.59)	1.62(1.30)	0.50(0.44)	3.34(3.67)
Totals for Indian River	94,041	138(125)	1,076,260(43,597)	738.84(281.49) 1,628.84 lbs. (620.57 lbs.)					

Note: Numbers in parentheses exclude the families Engraulidae, Clupeidae and Mugilidae.

291.10-4

Question No.

- 291.11 The discussion of the difficulties experienced maintaining flows introduces uncertainty as to what the actual cooling water flow will be with two units in service. With the new intake in service what will the flow be through each unit? Will this be maintained by throttling back pumps? Apparently higher flows could be employed. At what reduced flow and corresponding elevated temperature rise will intake pipeline cleaning procedures be initiated?

Response

The actual cooling water flow rate requirements will remain constant for St Lucie Units 1 and 2 assuming a design condenser ΔT of 24°F. Intake canal water level will be drawn down slowly to offset the increased pipe resistance in the ocean intake lines as a result of marine fouling. When the canal level has been drawn down to the lowest allowable limit, ocean intake pipe cleaning must be initiated to preclude a reduction in flow and a corresponding reduction in unit output.

No ER-OL revisions are required.

Question No.

291.12 Discuss recirculation of discharged water to the new intake pipeline.

Response

The separation distance between the existing twin intake pipelines and the plant discharge diffusers is approximately 2300 feet. The addition of the third pipeline (located north of the existing pipelines) will reduce the separation distance by 100 feet, or about 4.35 percent of the original separation distance. The following discussion relates to recirculation of discharged water to the new intake pipeline as well as the existing pipelines:

- 1) There would be no recirculation for either individual or two unit operation under both stagnant and northward current conditions.
- 2) Under a southward current condition, there would be some possibility of recirculating discharge water to all three intake pipelines up to 30 percent of the time on an annual basis.
- 3) For the worst case conditions the plant intake water temperature rise due to recirculation would be 0.2°F and 1.2°F for one unit and two unit operation, respectively. This is based on the assumption that the new intake pipeline will carry 1150 cfs and each of the two existing pipelines will carry 575 cfs. The addition of a new intake pipeline will not increase nor decrease flow volume used for plant operation. Therefore recirculation potential for three intake pipelines is expected to be similar to that for two intake pipelines. | 5
- 4) The temperature rises due to recirculation are relatively small as compared to the daily ambient temperature fluctuations of the ocean water, which can range from 2° to 5°F. | 5

Based on the above discussions it appears that the addition of a third intake pipeline will not significantly reduce the separation distance between the intake and discharge pipelines, nor will it increase the flow volume used for plant operation. Therefore, it is concluded that the recirculation potential for three intake pipelines will not be significantly higher than, if not the same as, that for two intake pipelines.

See revised ER-OL Subsection 5.1.2.3.3.

Question No.

291.13 Page 10 of the Circulating Water System Modification document provides some flow velocities in the pipelines. Indicate if these velocities are based on no pipe fouling or with fouling. Explain why the maximum flow velocity would be reduced to 2/3's of the twin pipeline flow velocity when the existing pipelines are 12 feet in diameter and the new pipeline is to be 16 feet in diameter.

| 5

Response

The maximum calculated flow velocity of 10.18 fps through the two existing 12 foot diameter intake pipelines corresponds to the initial design requirement: supply a total flow of 2300 cfs for two unit operation.

The maximum flow velocity of 6.8 fps through the proposed 16 foot diameter third intake pipeline was developed for a calculated flow distribution of 1360 cfs through the 16 foot pipe and a flow of 470 cfs through each of the 12 foot pipes. This flow distribution results from the following assumed friction factor: $f=0.02$ in the proposed pipe and $f=0.07$ in the existing pipes (the increased friction factor is a result of marine growth built up in the pipes since the last pipe cleaning performed in 1980).

| 5

No ER-OL revisions are required.

Question No.

291.14 Provide estimates of flow velocities at the entrance of each velocity cap, each vertical pipe section of the velocity cap, each intake pipeline, and the intake canal under one and two unit operation and clean and fouled conditions.

Response

Flow distribution through the three pipes varies with the change in the friction factors as a result of marine fouling.

For the scheduled start of two unit operation in June 1983 the friction factors are assumed to be $f=0.07$ for the 12 foot pipes which were last cleaned in 1980 and $f=0.02$ for the new 16 foot pipe (note: $f=0.015$ for a clean pipe, however, it takes less than two months for the friction factor to increase to $f=0.02$).

It is estimated that the pipes will be able to operate on a seven to eight year cleaning cycle with the flow velocities noted in Table 291.14-1. Please note that the velocities in the table are for two units operation. Velocities for one unit operation are half the values shown.

See revised ER-OL Subsection 3.4.2.1.

TABLE 291.14-1

CALCULATED HYDRAULIC CHARACTERISTICS FOR THREE INTAKE PIPELINE OPERATION

Year	Friction Factor "f"		Velocity Cap Entrance Velocity (FPS)		Vert. Pipe Sect. Flow Velocity (FPS)		Pipe Flow Velocity (FPS)		Canal Flow Velocity (FPS)
	12'Ø	16'Ø	12'Ø	16'Ø	12'Ø	16'Ø	12'Ø	16'Ø	
1983	0.07	0.02	0.368	1.00	1.18	6.77	4.16	6.77	1.0 ₊
1986	0.115	0.07	0.401	0.941	1.28	6.34	4.54	6.34	1.0 ₊
1988	0.145	0.10	0.411	0.927	1.31	6.24	4.62	6.24	1.0 ₊
1990	0.175	0.13	0.414	0.918	1.32	6.18	4.67	6.18	1.0 ₊

Ø: Inside diameter of intake pipe.

Note: The above calculations are based on two unit operation.

Question No.

291.15 Describe the procedures for removing a pipeline from service and cleaning it.

Response

I. For 16 foot diameter intake pipeline:

- A. Remove line from service by closing the 16 foot line sluice gate.
- B. Place stop logs into headwall
- C. Open sluice gate
- D. Insert cleaning machine into intake structure
- E. Cleaning machine is hydraulically forced through the ocean pipeline to effect cleaning.
- F. Cleaning machine is removed, sluice gate closed, and stop logs removed.
- G. Line is placed into service by opening the sluice gate.

5

II. For 12 foot diameter intake pipelines:

15

- A. During a period of zero flow through either 12 foot diameter line, the cleaning machine is inserted into the pipeline and a cover plate is then installed on the headwall.
- B. Cleaning machine is hydraulically forced through the ocean pipeline to effect cleaning.
- C. During a subsequent zero flow conditions, the cover plate and cleaning machine are removed and the line restored to service.

No ER-OL revisions are required.

Question No.

291.16 Indicate whether cleaning of any of the ocean intake pipelines will be attempted during two unit operation or whether cleaning be limited to outages.

Response

Normally, pipe cleaning will be scheduled during a unit outage. However, cleaning of the 16 foot intake pipe during two unit operation may be performed if warranted.

No ER-OL revisions are required.

Question No.

291.17 Indicate whether all three pipelines will be used at all times or whether any pipeline will be blocked off during periods of one unit operation or kept on standby for any reason.

Response

Except for periods of cleaning, all three intakes pipelines will be in service during one unit operation.

No ER-OL revisions are required.

Question No.

291.18 Verify that construction is still planned for February through December 1982.

Indicate if applicable the period of time construction activities will occur on a three shift per day basis.

Response

Mobilization has commenced and construction activity is presently scheduled for three shifts per day from February through December 1982.

See revised ER-OL Subsection 4.1.1.

Question No.

- 291.19 On page 13 of the Circulating Water System Modification document a discussion of decreased turtle nesting due to initial intake and discharge construction is presented. Provide the magnitude of the decrease in turtle nesting due to recent construction of the second discharge structure.

Response

As a test for 1981 construction effects of the second discharge pipeline, the number of nests occurring at the Plant Site (Area 4) were compared to the expected number predicted by a linear regression model.⁽¹⁾ These counts were within 14 percent of the estimate each year except 1975 and 1981, when the counts dropped to 50 and 65 percent, respectively, of the estimate.⁽²⁾ The apparent cause of these discrepancies was the construction of intake pipelines (1975) and discharge pipelines (1975 and 1981) in the beach and nearshore environment. Construction activity and lights on the construction pier at night, as well as localized beach erosion south of the structures, reduced nesting activity in this area. Nesting is expected to return to normal levels as was observed during years following nearshore construction in 1975.

No ER-OL revisions are required.

References

1. Applied Biology, Inc 1980. Florida Power & Light Company, St Lucie Plant, annual non-radiological environmental monitoring report 1979, AB-24. Applied Biology, Inc, Atlanta, Ga.
2. Applied Biology, Inc 1982. Florida Power & Light Company, St Lucie Plant, annual non-radiological environmental monitoring report 1981, AB-379. Applied Biology, Inc, Atlanta, Ga.

Question No.

291.20 Is there any intention of using chemical procedures or chemical coatings to control fouling in the new intake? If so, give adequate detail for impact assessment.

Response

FP&L has no intention of using chemicals to control fouling of the ocean intake pipelines.

No ER-OL revisions are required.

Question No.

291.21 Indicate the status of other Federal and State permit actions related to the new intake. Where actions are complete, provide copies of the permits or approvals along with copies of any conditions or qualifications. Provide copies of all environmental impact appraisals and other environmental review documents prepared in conjunction with the other permitting actions. Specifically, provide copies of the comments of the USFWS and the NMFS submitted to the Corps of Engineers on their permit.

Response

FP&L submitted a Dredge and Fill permit application to the Corps of Engineers on November 24, 1981. The Corps Permit #81D-1679 was signed by FP&L on December 31, 1981, with stipulations for modification to the special conditions. The Corps has agreed that mangroves do not have to be transplanted but instead FP&L will plant seedlings. Because the area to be used for mitigation will be used during construction as a lay-down area, the Corps has agreed that mangroves will be planted within one year of issuance of the Dredge and Fill Permit. The Corps expects to sign the permit momentarily. No official comments were received from National Marine Fisheries Service or the U.S. Fish and Wildlife Service. The Corps informed FP&L that both agencies verbally advised the Corps that they had no comments.

FP&L applied for a modification to the St. Lucie NPDES Permit #FL0002208 on December 31, 1981 to include the third intake pipe.

FP&L petitioned the Florida Department of Environmental Regulation to amend the St. Lucie Unit 2 Certification #PA-24-02 on November 30, 1981 to include the construction of the third intake pipe. At this time, the amendment is expected to be approved on January 26, 1982.

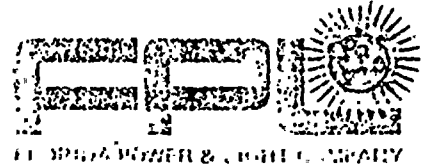
FP&L applied for an easement with the Florida Department of Natural Resources for the third intake pipe on November 30, 1981. The easement #3177-56, will be granted on January 13, 1982.

See revised Table 12.0-1.

Note: At the time of issuance of this amendment, the above mentioned permits have been secured from the agencies on the dates noted:

1. U.S. Army Corps of Engineers - Dredge and Fill permit No. 81D-1679 - January 29, 1982.
2. U.S. EPA - NPDES Permit No. FL0002208 including approval of the third intake pipeline - January 29, 1982.

3. Florida State Department of Natural Resources -
Easement No. 26211(3177-56) - February 1, 1982.
4. Florida State Department of Environmental Regulation
- Modification of Conditions of Certification -
January 27, 1982.



November 24, 1981

Mr. John Adams, Chief
Regulatory Section
U. S. Department of the Army
Corps of Engineers
P. O. Box 4970
Jacksonville, FL 32201

RE: APPLICATION FOR DREDGE AND FILL
ST. LUCIE POWER PLANT-ST. LUCIE COUNTY
THIRD INTAKE PIPELINE

Dear Mr. Adams:

Enclosed please find a Joint Application Department of the Army/Florida Department of Environmental Regulation for Activities in Waters of the State of Florida and attachments. The foregoing application and attachments are being submitted on behalf of Florida Power and Light in reference to its St. Lucie Power Plant Unit No. 2. These materials are being submitted in an effort to obtain a Department of Army Permit to perform works in or affecting navigable waters of the United States and to discharge dredged or fill material into waters of the United States. The foregoing activities are being conducted in accordance with the provisions of the Florida Electrical Power Plant Siting Act, 403.501 et seq., Florida Statutes, and therefore a modification of the power plant's certification is required for this proposed activity but said modification procedures obviate the need for a separate Florida Department of Environmental Regulation dredge and fill permit. We are also, this date, submitting a request to the Secretary of the Florida Department of Environmental Regulation for modification of the power plant certification, consistent with the enclosed.

Thank you for your assistance and cooperation in this matter.

Very truly yours,


W. J. Barrow, Jr.
Manager
Environmental Permitting & Programs

cc: Victoria Tschinkel, ~~THIS COPY FOR~~
Secretary of Florida Dept. of Environmental Regulation

WJBjr/os

enclosures

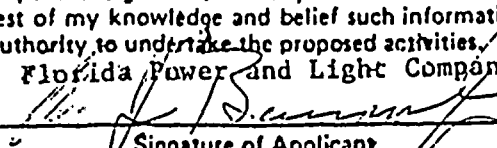
JOINT APPLICATION
DEPARTMENT OF THE ARMY/FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
FOR
ACTIVITIES IN WATERS OF THE STATE OF FLORIDA

Refer to Instruction Pamphlet for explanation of numbered items and attachments required.

1. Application number (To be assigned)	2. Date <div style="text-align: center;">24 Nov. 1981</div> <div style="text-align: center;">Day Mo. Yr.</div>	3. For official use only
4. Name, address and zip code of applicant W. J. Barrow, Jr., Manager Environmental Permitting and Programs Florida Power & Light Company P.O. Box 529100 Miami, FL 33152		
Telephone Number <u>305-684-8500</u>		
5. Name, address, zip code and title of applicant's authorized agent for permit application coordination Mrs. Elsa A. Bishop Associate Environmental Coordinator Environmental Permitting and Programs Florida Power & Light Company P. O. Box 529100 Miami, FL 33152 Telephone Number <u>305-684-8500</u>		
6. Describe the proposed activity, its purpose and intended use, including a description of the type of structures, if any, to be erected on fills, or pipe or float-supported platforms, and the type, composition and quantity of materials to be discharged or dumped and means of conveyance. <p>An ocean intake pipeline and channel extension to convey cooling water from the Atlantic Ocean into the intake canal is proposed. The 1515 ft long pipeline is 16 ft inside diameter extends 1195 ft offshore and is buried beneath the dunes and ocean bottom. The pipe terminates into a velocity cap, a precast reinforced concrete structure, supported on tremie concrete, placed within a sheetpiling enclosure below the ocean bottom. Dredged soils will be sands, silts and clay. Backfill will be dredged sands.</p> <p>The channel extension projects about 100 ft into the east slope of the existing intake canal.</p> <div style="display: flex; justify-content: space-around; font-size: small;"> Dredged/Excavated Filled/Deposited </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> Volume of Material: * <u> </u> CY <u> </u> CY <u> </u> CY <u> </u> CY </div> <div style="display: flex; justify-content: space-between; font-size: x-small; margin-top: 2px;"> *See Supplement Sheet 1 Waterward of O.H.W. or M.H.W. Landward of O.H.W. or M.H.W. Waterward of O.H.W. or M.H.W. Landward of O.H.W. or M.H.W. </div>		
7. Proposed use Private [] Public [] Commercial <input checked="" type="checkbox"/> Other [] (Explain in remarks)		
8. Name and address including zip code of adjoining property owners whose property also adjoins the waterway. North Boundary: Barnett Winston, 720 Gilmore St., Jacksonville, Florida 32204 South Boundary: John R Mayer & Elizabeth M Johnston P O Box 617, Jensen Beach Florida		
9. Location where proposed activity exists or will occur Street address <u>N/A</u> Longitude <u>N 80°14'</u> Latitude <u>W 27°21'</u> (If known) Sec. <u>16</u> Twp. <u>T 36 S</u> Rge. <u>R 41E</u> <u>Florida</u> <u>St Lucie</u> <u>Et Pierce</u> State County In City or Town Near City or Town		
10. Name of waterway at location of the activity <u>Atlantic Ocean</u>		

SAJ FORM 983

21 Jul 77

11.	Date activity is proposed to commence	Feb. 1982
	Date activity is expected to be completed	Feb. 1983
12.	Is any portion of the activity for which authorization is sought now complete? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
	If answer is "Yes" give reasons in the remarks section. Month and year the activity was completed _____	
	_____ . Indicate the existing work on the drawings.	
13.	List all approvals or certifications required by other Federal interstate, state or local agencies for any structures, construction, discharges, deposits or other activities described in this application, including whether the project is a Development of Regional impact.	
	Issuing Agency	Type of Approval Identification No. Date of Application Date of Approval
	US NRC	Construction Permit Docket 50-389 - May 2, 1977
	State of Florida	Site Suitability Certificate PA-74-02 - June 10, 1975
	Fla DNR	Easement No
14.	Has any agency denied approval for the activity described herein or for any activity directly related to the activity described herein? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> (If "Yes" explain in remarks)	
15.	Remarks (see Instruction Pamphlet for additional information required for certain activities)	
	See supplemental sheets entitled. "Item 15 Remarks"	
16.	<p>Application is hereby made for a permit or permits to authorize the activities described herein. I agree to provide any additional information/data that may be necessary to provide reasonable assurance or evidence to show that the proposed project will comply with the applicable State Water Quality Standards or other environmental protection standards both during construction and after the project is completed. I also agree to provide entry to the project site for inspectors from the environmental protection agencies for the purpose of making preliminary analyses of the site and monitoring permitted works, if permit is granted. I certify that I am familiar with the information contained in this application, and that to the best of my knowledge and belief such information is true, complete, and accurate. I further certify that I possess the authority to undertake the proposed activities.</p> <p style="text-align: center;">Florida Power and Light Company</p> <p style="text-align: center;">  Signature of Applicant </p> <p style="text-align: right;">November 24, 1981 Date</p> <p>W. J. Barrow, Jr., Manager, Environmental Permitting and Programs</p> <p>18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up by any trick, scheme, or device a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statement or entry, shall be fined not more than \$10,000 or imprisoned not more than five years, or both.</p> <p>The application must be signed by the person who desires to undertake the proposed activity; however, the application may be signed by a duly authorized agent if accompanied by a statement by that person designating the agent and agreeing to furnish upon request, supplemental information in support of the application.</p>	
	FEE: Attach Checks/Money Orders on front Payable to Department of Environmental Regulation \$200 Standard form projects \$20 Short forms and Chapter 403 projects only	

SL2-ER-OL
FLORIDA POWER & LIGHT COMPANY
ST LUCIE PLANT

JOINT APPLICATION
DEPARTMENT OF THE ARMY/FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
FOR
ACTIVITIES IN WATERS OF THE STATE OF FLORIDA

ITEM 6 - Volume of Material

The table below has been prepared to delineate the volumes of dredge and fill material estimated for this project. The project has been divided into two parts: pipeline construction and channel extension.

<u>ITEM</u>	<u>VOLUME OF MATERIAL</u>			
	<u>DREDGED/EXCAVATED</u>		<u>FILLED/DEPOSITED</u>	
	<u>Waterward of MHW</u>	<u>Landward of MHW</u>	<u>Waterward of MHW</u>	<u>Landward of MHW</u>
Pipeline Construction	37,700 cy	11,800 cy	25,100 cy	8,400 cy
Channel Extension		31,400 cy		3,900 cy

cy - cubic yard

SUPPLEMENTAL SHEET 1

SL2-ER-OL
FLORIDA POWER & LIGHT COMPANY
ST LUCIE PLANT

JOINT APPLICATION
DEPARTMENT OF THE ARMY/FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
FOR
ACTIVITIES IN WATERS OF THE STATE OF FLORIDA

ITEM 15 - Remarks:

The proposed pipeline and channel extension is part of the plant cooling water system. This system consists of subaqueous ocean intake and discharge pipelines extending into the ocean, canals on land connecting the ocean pipelines to the plant, and equipment and conduits in the plant area. Major portions of this system were constructed with the first unit (St. Lucie 1) and have been in operation for about 5 years. The proposed intake pipeline is for both units (St. Lucie 1 & 2). Construction of St. Lucie 2 is authorized by a Construction Permit dated May 2, 1977 issued by the Nuclear Regulatory Commission (NRC). Alternatives to the pipeline, such as cooling towers and cooling ponds were evaluated in the Environmental Report submitted to and reviewed by the NRC in the Final Environmental Statement, Docket 50-389 dated May 1974. The State of Florida Site Suitability Certificate was issued on June 10, 1975. The plan of development for the site is found in the Environmental Report.

The site for the St. Lucie Nuclear Power Plant consists of approximately 1132 acres on Hutchinson Island in St. Lucie County about half way between the cities of Fort Pierce and Stuart on the East Coast of Florida. The St. Lucie plant is sited near the center of a long, narrow island. To the east is the Atlantic Ocean. To the west, the island is separated from the mainland by the Indian River.

The site itself is generally flat. Much of it consists of swamp and, outside the mosquito control areas, the land is covered with a dense vegetation characteristic of Florida coastal mangrove swamps. At the ocean shore the land rises slightly in a dune or ridge to approximately 15 feet above mean low water. Of the 1132 acres owned by Florida Power and Light Company, approximately 380 acres is occupied or modified by the plant (Units 1 & 2) and the plant facilities.

The effects of the construction of the pipeline and the water conveyed from the Atlantic Ocean into the plant were evaluated in the same documents outlined above. These documents state that the waters of the state will not be degraded by the proposed activity. Specific provisions designed to minimize the potentially adverse environmental impact caused by construction are: a) construction of a temporary beach dune when cutting through the natural dunes, b) use of sheet piling and/or silt screens around excavation work to limit turbidity to less than 50 Jackson Units, and c) the disposal of spoils in approved onshore disposal areas.

Construction methods to be used for this project are anticipated to be as follows:

Material will be dredged from the Atlantic Ocean from within a sheetpile trench by a crane.

The pipe trench will be excavated from in situ soils. Material removed from within the sheetpile will be used to backfill other portions of the pipeline, or will be stockpiled temporarily on the ocean adjacent to the trench, or will be disposed of in approved onshore spoil areas. The ground profile along the pipeline will be restored to its original contour after construction. Construction equipment and materials will be brought to and removed from the site via truck transport or via barge. Barges may be off loaded at an existing barge slip located at the site on an appendage of the Indian River, or they may be moved directly to the construction site (the Atlantic Ocean).

The channel extension on land, behind the dune line, will involve clearing less than 1/2 acre of mangrove swamp. The concrete headwall structure will require dewatering and excavation within a cofferdam. After completing the structure, the onland portion of the pipeline will be constructed followed by the canal and dike construction modification.

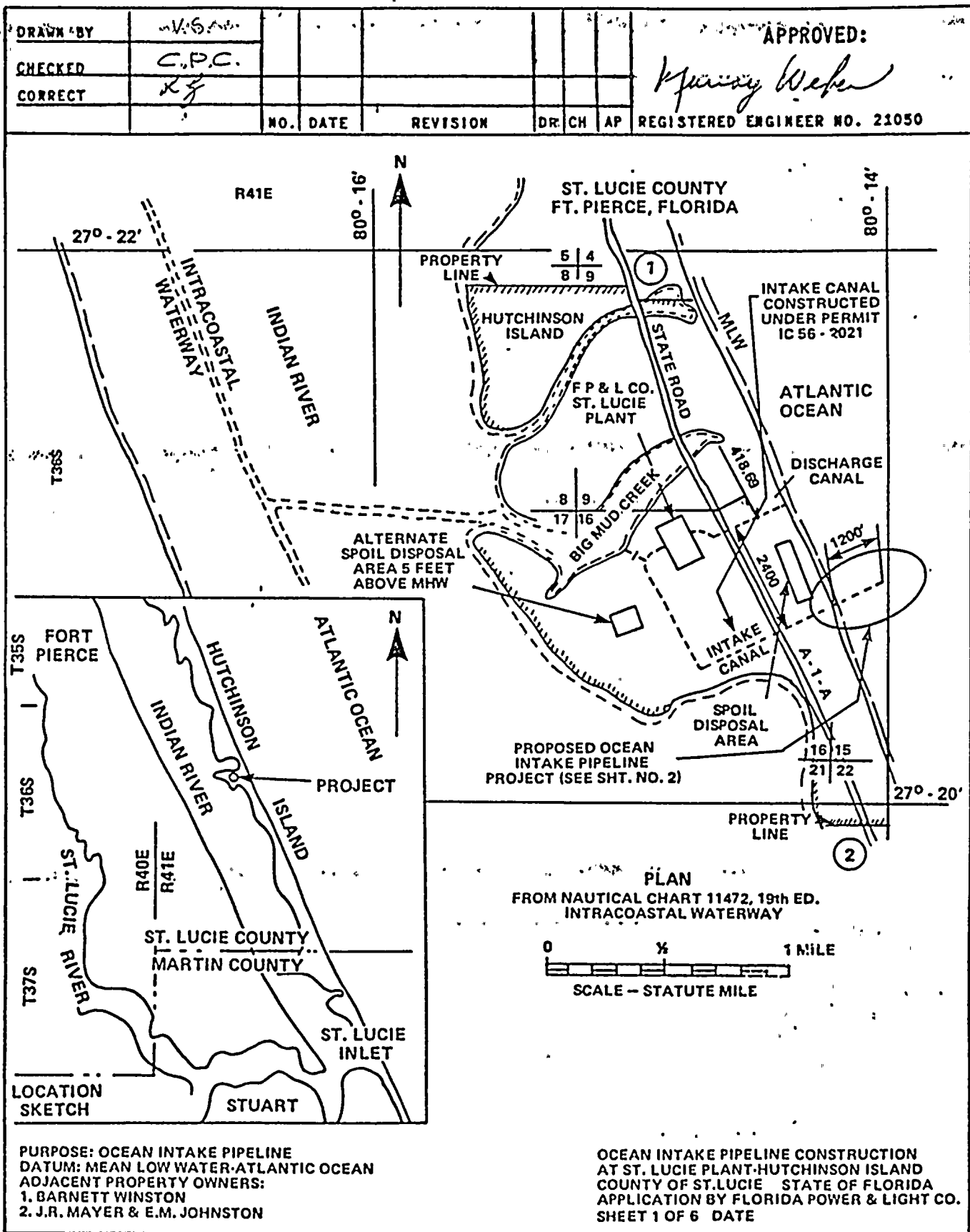
Water from the dewatering operation will be discharged into the intake canal.

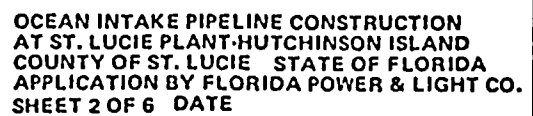
Dredged material disposed of onland will be contained by dikes or other means as necessary such that any runoff will not contaminate the waters of the State. Dredge water will be decanted and released to either the intake or discharge canal. Rainfall runoff will not affect any part of this construction except where there are bare soil slopes during construction. Such slopes include the canal dike extension and spoil piles. Runoff from such slopes will not adversely affect the waters of the State.

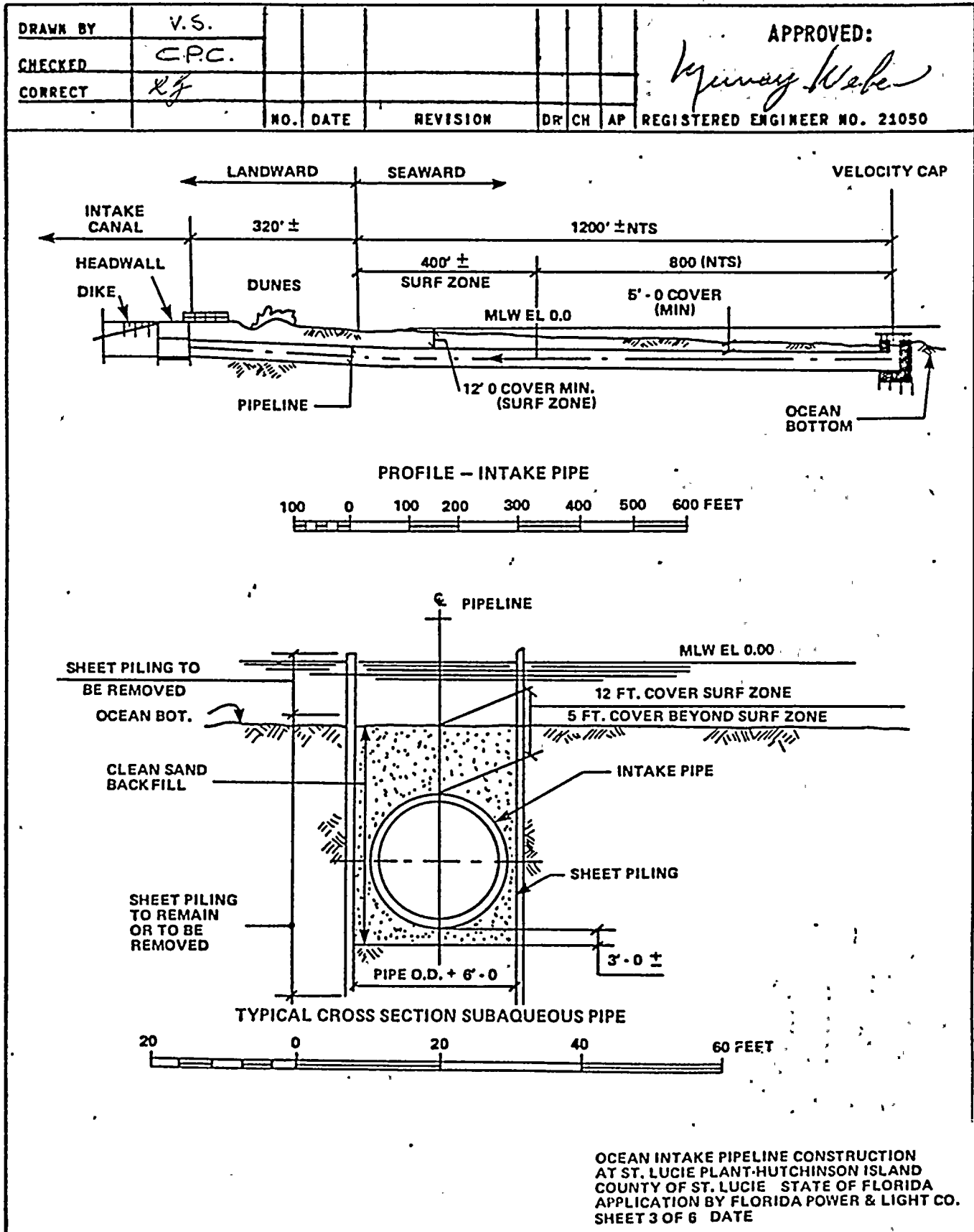
The pipeline will be constructed with concrete pipe.

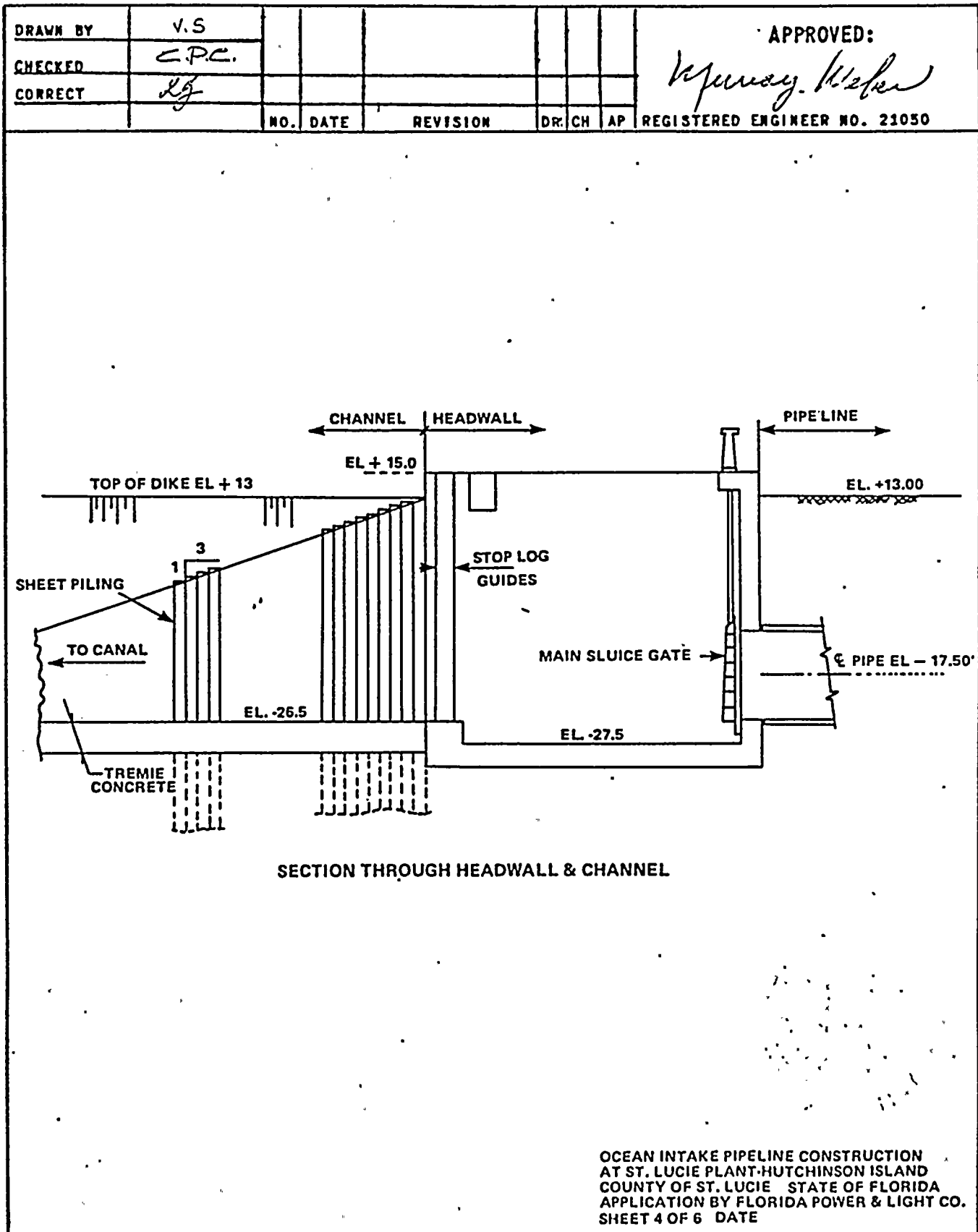
The proposed intake pipeline is sixteen feet inside diameter, four feet larger than the existing two twelve foot inside diameter pipelines previously installed in the ocean at this site. This increase in size is due to the effects of marine fouling experienced with the operation of the twelve foot diameter pipes. The marine fouling effects experienced are a heavy build-up of marine organism on the pipe wall. This build-up results in an increase in pipe friction and pressure drop, decrease in canal water level and a reduction in the flow of water through the system. To limit these adverse effects, the pipelines have been periodically "cleaned," a not inexpensive operation.

The sixteen foot diameter pipeline will greatly reduce the effects of marine growth. This reduction is due to the fact that pressure drop through the pipeline is proportional to the square of the flow velocity. For the twelve foot diameter pipeline, with a design flow velocity of 10 feet per second (fps), the pressure drop was proportional to 100. For the sixteen foot diameter pipeline, with a maximum design flow velocity of approximately 6.8 fps, the pressure drop is proportional to 46. Therefore, the sixteen foot pipe results in a 54% reduction in pressure drop. This reduction is important as it will reduce the frequency of pipe cleanings necessary.



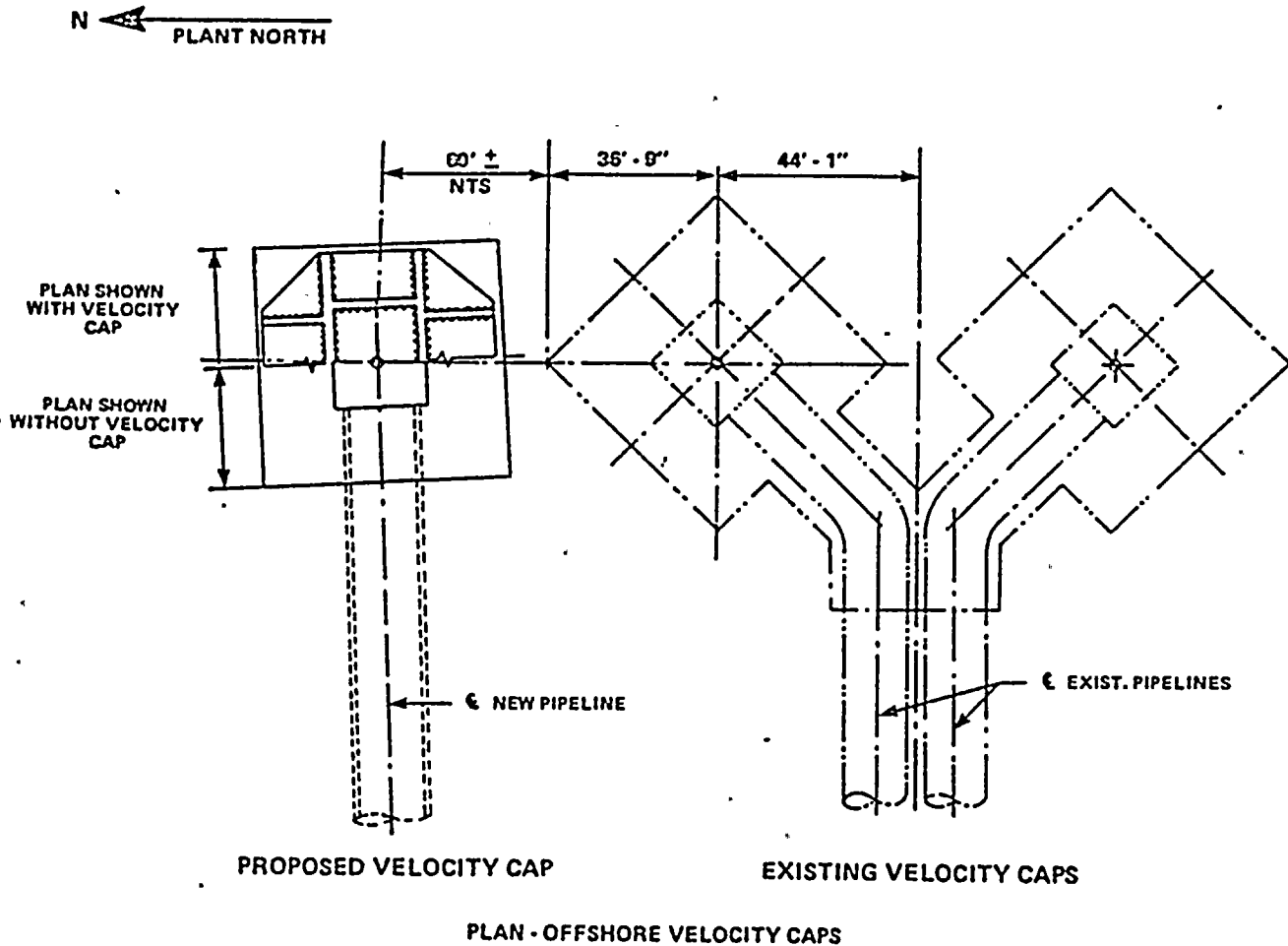






Amendment No. 5, (6/82)

DRAWN BY	V.S.							APPROVED: <i>Murray Weber</i> REGISTERED ENGINEER NO. 21050
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CORRECT	XZ							
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**OCEAN INTAKE PIPELINE CONSTRUCTION
AT ST. LUCIE PLANT-HUTCHINSON ISLAND
COUNTY OF ST. LUCIE STATE OF FLORIDA
APPLICATION BY FLORIDA POWER & LIGHT CO.
SHEET 6 OF 6 DATE**

FLORIDA POWER AND LIGHT COMPANY

ST LUCIE PLANT - UNITS 1 & 2

CIRCULATING WATER SYSTEM MODIFICATION

November, 1981

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1.0

NEED FOR CIRCULATING WATER SYSTEM MODIFICATION

Full flow operation of the Circulating Water System (CWS) for St Lucie Unit 1 was attempted in January of 1976. At that time, the ocean portion of the system consisted of two 12 foot diameter intake pipelines and one 12 foot discharge pipeline. Separate intake and discharge canals on land conveyed the ocean cooling water to and from the plant. During initial operation, very high water levels occurred in the discharge canal, causing some flow over an emergency spillway. Because of this, the system was shutdown. Subsequent testing of CW pumps performance in early February indicated that they were pumping about 15 percent above the design flow. However, throttling the pumps with the discharge valves to the design flow still resulted in higher than expected water level in the discharge canal and hydraulic headlosses in excess of those expected in both intake and discharge pipelines. These conditions were determined to be the result of higher than expected ocean tides, and the formation of marine growth on the pipe wall, as described below.

A diver's inspection of the pipelines revealed the formation of marine growth on the pipe wall (several inches thick on the intake pipelines, about one inch thick on the discharge pipeline) along the entire length of these pipelines. Tests performed to determine the hydraulic characteristics of each pipeline indicated that the hydraulic headlosses in the ocean pipelines were high, and that the pipeline friction factor (Darcy-Wiesbach 'f') was determined to be 0.030 for the intake pipeline and 0.024 for the discharge pipeline, as compared with a clean pipe

friction factor of 0.015 or less. These higher friction factors were caused by marine growth on the pipe wall and added approximately three ft and two ft of hydraulic headloss to the intake and discharge pipelines, respectively, representing 50 percent and 30 percent increase in total headlosses for these pipelines.

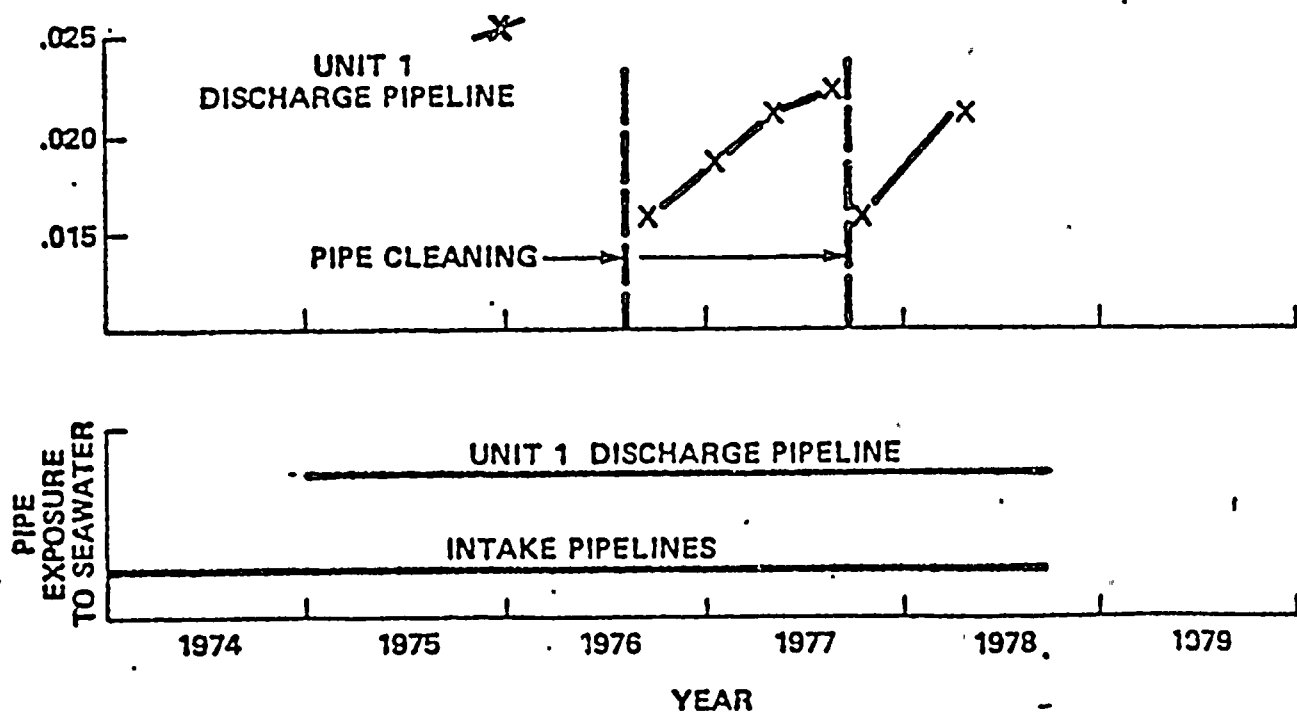
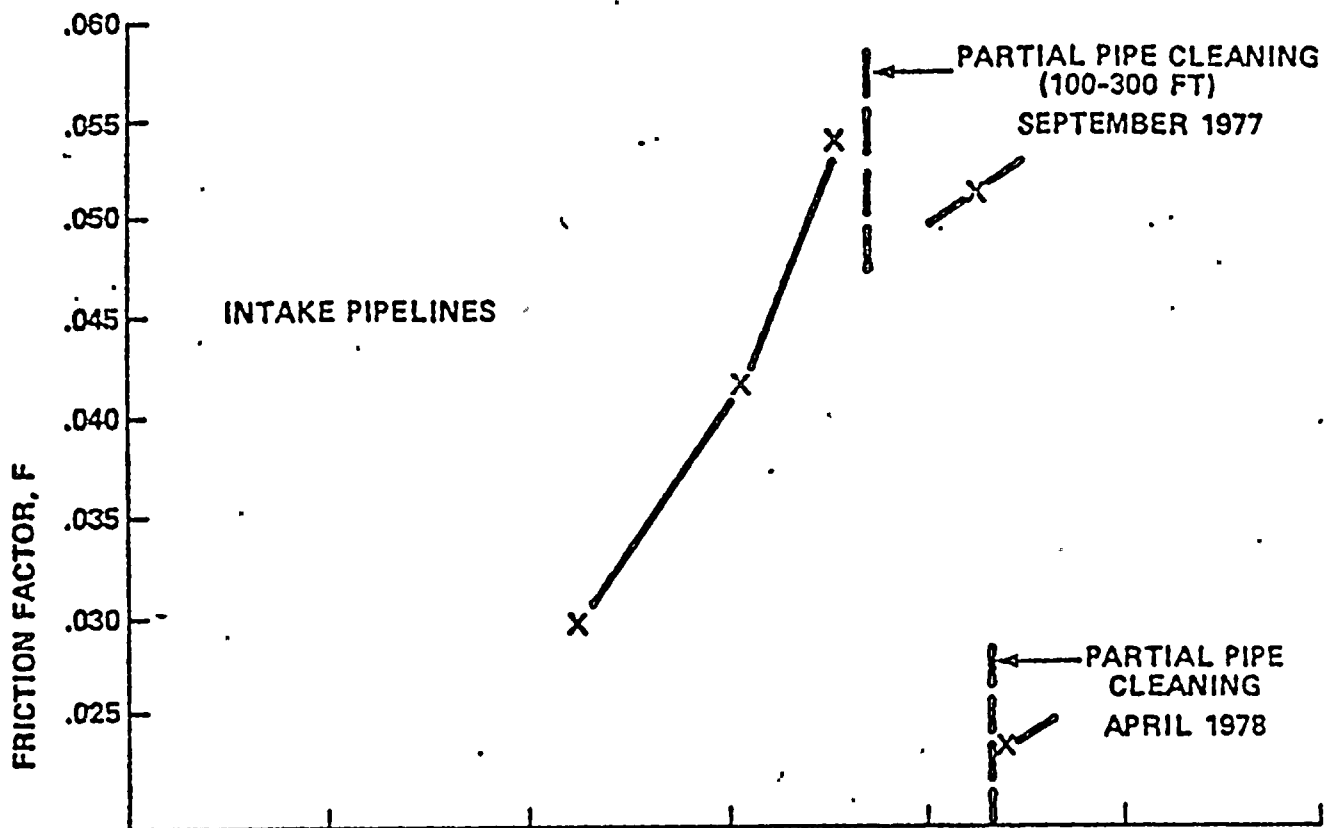
To demonstrate that the marine growth seriously affected the hydraulic friction factor, the discharge pipeline was cleaned in September of 1976 to restore the friction factor to 0.016. A reduction of about two feet of headloss was realized. Additionally, periodic monitoring of the hydraulic performance of the ocean pipelines was initiated to determine changes in the friction factor. The results of this monitoring are shown in Figure 1.0-1.

From the monitoring program, it was concluded that marine growth on the pipe wall would require treatment either by periodic cleaning of the pipelines, or by some type of control or by physical modification of the system.

Since the two intake pipelines were designed to supply water for St Lucie Units 1 and 2, no operating problem was experienced for St Lucie Unit 1 on the intake side. However, when St Lucie Unit 2 becomes operational in 1983 the combined effects of headlosses, as indicated in tests simulating two unit operation, will adversely affect plant operations in that excessive headlosses through the intake pipelines could reduce the intake canal water level such that minimum pump submergence requirements could

not be met. Similarly, excessive headlosses in the ocean discharge pipeline would result in high water levels in the discharge canal and possible spillway overflow to the mangroves north of the canal. Finally, the combined headloss increases would reduce the volume of cooling water pumped through the plant such that plant temperature rise would exceed the original 24 F maximum and plant efficiency would be reduced.

In 1978, the discharge canal dikes and the overflow spillway were raised to accommodate higher water levels in the discharge canal. Additionally, a periodic pipe cleaning routine was initiated for the 12 foot diameter ocean discharge pipeline. Finally, the St Lucie Unit 2 ocean discharge pipeline, which has been constructed, was increased in diameter to allow for marine growth accumulations. These actions alleviated the problem on the discharge side. For the intake side, a third intake pipeline is proposed. This new pipeline will be constructed north of the existing twin intake pipelines. Environmental impacts associated with the construction and operation of the third intake pipeline are addressed herein.



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT

HYDRAULIC PERFORMANCE
MONITORING FOR INTAKE
& DISCHARGE PIPELINES
Figure 1.0-1

Amendment No. 5, (6/82)

2.0

EXISTING CIRCULATING WATER SYSTEM

The circulating water system for St Lucie Plant has been described in detail in Section 3.4 of the St Lucie Unit 2 Environmental Report - Operating License.

3.0 ECOLOGY

3.1 TERRESTRIAL

Terrestrial vegetation and wildlife in the Plant site area has been described in detail in Section 2.2-1 of the St Lucie Unit 2 Environmental Report - Operating Licensing. The following description relates to the area where the proposed third intake pipeline is located.

Beach and dune vegetation near the existing intake pipelines are characterized by dense stands of saw palmetto (Serenoa repens) or sea grape (Coccoloba uvifera) and sandy open areas with sea oats (Uniola paniculata), battis (Battis maritima) and other species. Plant species observed in this area along two sampling transects are noted in Tables 3-1 and 3-2 along with estimates of cover/abundance. Important species are sea oats, which stabilize the foredune against wind and storm erosion, and other species which are of tropical affinity and consequently of interest to botanists and naturalists. The latter include sea grape, Spanish bayonet (Yucca aloifolia), Myrsine guianensis, lantana (Lantana involucrata)⁽¹⁾ and neckless pod (Sophora tomentosa)⁽²⁾

Land immediately north of the existing intake canal comprises of mangrove swamp, and an area used for storage of heavy equipment during construction. The swamp is dominated by red mangrove (Rhizophora mangle). It includes scattered individuals of white mangrove (Laguncularia racemosa) black mangrove (Avicennia germinans) and

buttonwood (Conocarpus erectus). Hydrologically, this swamp is isolated from marine and estuarine communities by State Route 1A, the intake and discharge canals, and a service road parallel to the beach.

3.2 AQUATIC

Atlantic Ocean marine communities offshore Hutchinson Island which would be exposed to construction and operation of the circulating water system are described in Section 2.2.2 of the St Lucie Unit 2 Environmental Report - Operating License.

CHAPTER 3: REFERENCES

1. Long, R W and O Lakela, 1976. A Flora of Tropical Florida, Banyan Books, Miami, Florida.
2. Small, J K, 1933. Manual of the Southeastern Flora, Hafner Publishing Company, New York.

TABLE 3-1

COVER/ABUNDANCE ESTIMATES FOR DUNE FLORA: AREA OF INTAKE PIPELINES

SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
<i>Uniola paniculata</i> (sea oats)	7	5	7	7	7	5	3																							
<i>Coccoloba uvifera</i> (sea grape)					1	3	3		3	2	3	5	4	1		1	2		4						2					
<i>Helianthus debilis</i> var <i>debilis</i> (sunflower)					3	5	4		2		5	4	6	4	4	4	7	5	3											
<i>Cenchrus incertus</i> (burgrass)										6	3	5	3			5	3	4	3	4	1									
<i>Croton punctatus</i>								1																						
<i>Yucca aloifolia</i> (Spanish bayonet)								5	5																					
<i>Battis maritima</i> (bnattis)									2		5	5	2	2	2															
<i>Vitex trifolia</i>																				4	7	3	5	3						
<i>Cassuarina</i> sp (Australian pine)																								1	7					
Bare Sand	3	5	3	3	3	5	5	7	6	6	4	5	3	3	7	6	5	3	3	6	4	7	7	7	3	7	7	7	7	7

Note: Stations located contiguously along transect perpendicular to coastline. Stations 1-5 occur on east side of foredune; transect terminated on west side of foredune at FP&L fence line (road). Each station is one meter (3.3 feet) square. Observations recorded January 30, 1979. Voucher specimens identified at University of Miami. Nomenclature follows Long and Lakela⁽¹⁾. Cover abundance scale⁽³⁾: 1 = solitary, cover less than 6 percent; 2 = few, cover less than 6 percent; 3 = numerous, cover less than 6 percent; 4 = 6-25 percent cover; 5 = 26-50 percent cover; 6 = 51-75 percent cover; 7 = 76-100 percent cover.

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291.21-26

Amendment No. 5, (6/82)

TABLE 3-2

COVER/ABUNDANCE ESTIMATES FOR DUNE FLORA: AREA IMMEDIATELY NORTH OF INTAKE PIPELINES

SPECIES	STATIONS:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
<i>Uniola paniculata</i> (sea oats)		6	7																													
<i>Croton punctatus</i>		2	3																													
<i>Helianthus debilis</i> var <i>debilis</i> (seaflower)		1																											3	7	4	
<i>Cenchrus incertus</i> (burgrass)		1																														
<i>Coccoloba uvifera</i> (sea grape)				7	7	7																						5	5			
<i>Yucca aloifolia</i> (Spanish bayonet)						2																										
<i>Serenoa repens</i> (saw palmetto)							7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	5	7	4	6					
<i>Myrsine guianensis</i>																					1	5	3	1	7	7	6					
<i>Sophora tomentosa</i> (neckless pod)			4	1																							1	1			4	1
<i>Lantana involucrata</i> (lantana)																											7	5				
<i>Panicum rhizomatum</i>					1																											
1																																
Bare Sand		4	3	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	5	4	5	7

Note: See note for Table 3-1. Stations 1-3 occur on east side of foredune.

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Amendment No. 5, (6/82)

4.0

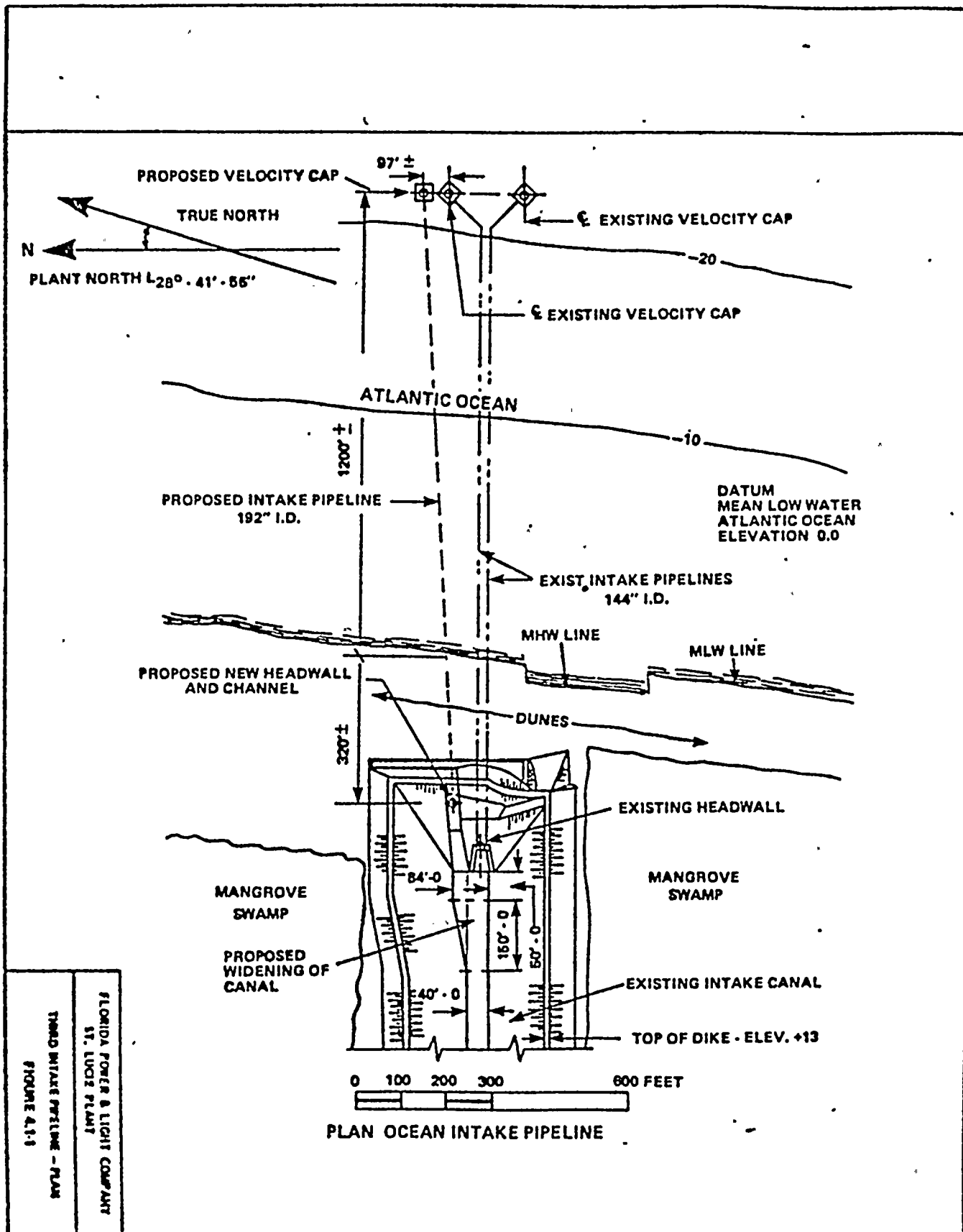
THIRD INTAKE PIPELINE

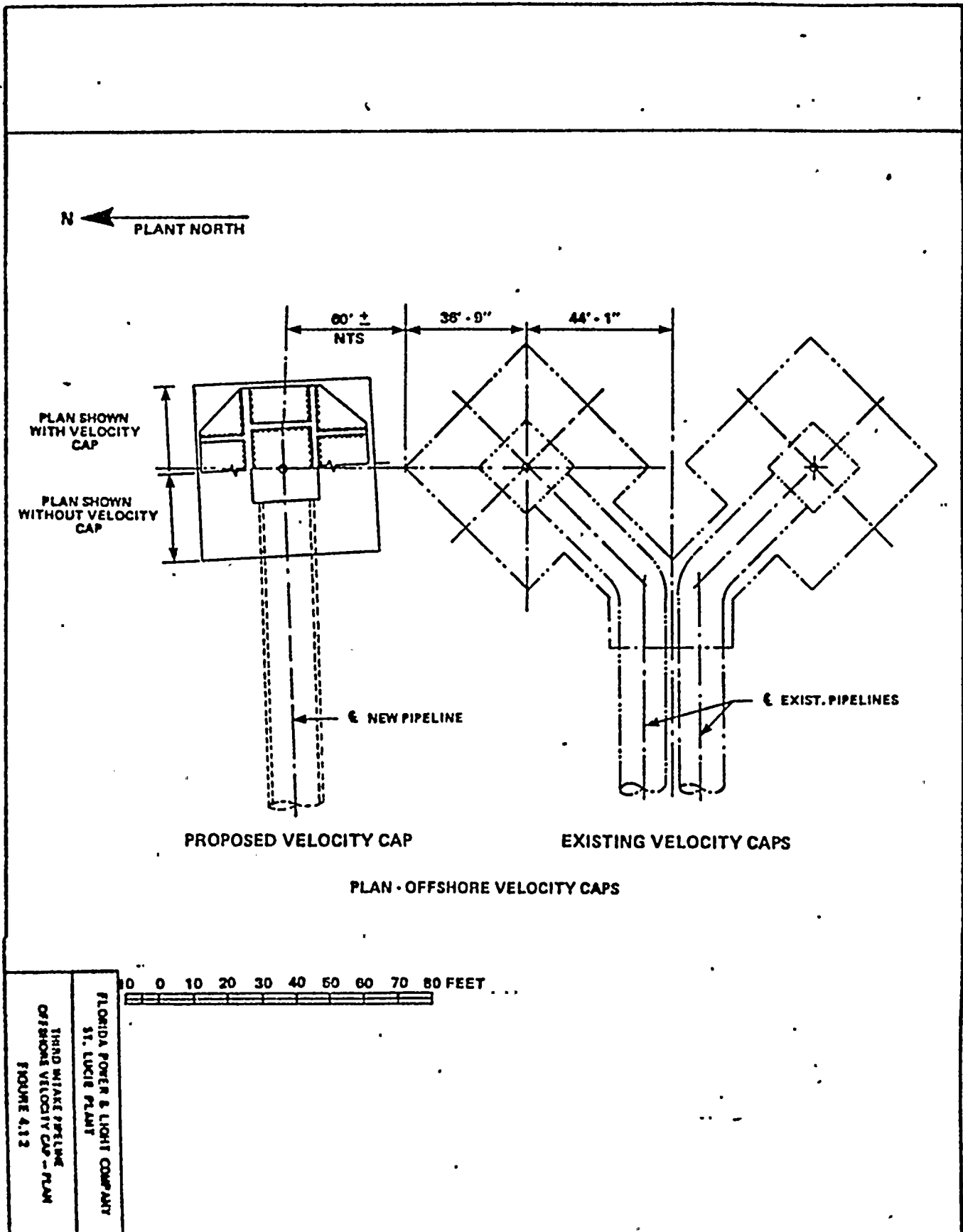
The addition of a third intake pipeline (TIP) would reduce the hydraulic losses in the ocean intake pipelines because headlosses are a function of the velocity of flow squared (V^2). For example, by adding a third 16 foot diameter pipeline, the maximum flow velocity would be reduced to two-thirds of the twin pipeline flow velocity (from approximately 10 fps, to approximately 6.8 fps); the headlosses would correspondingly be reduced by 54 percent.

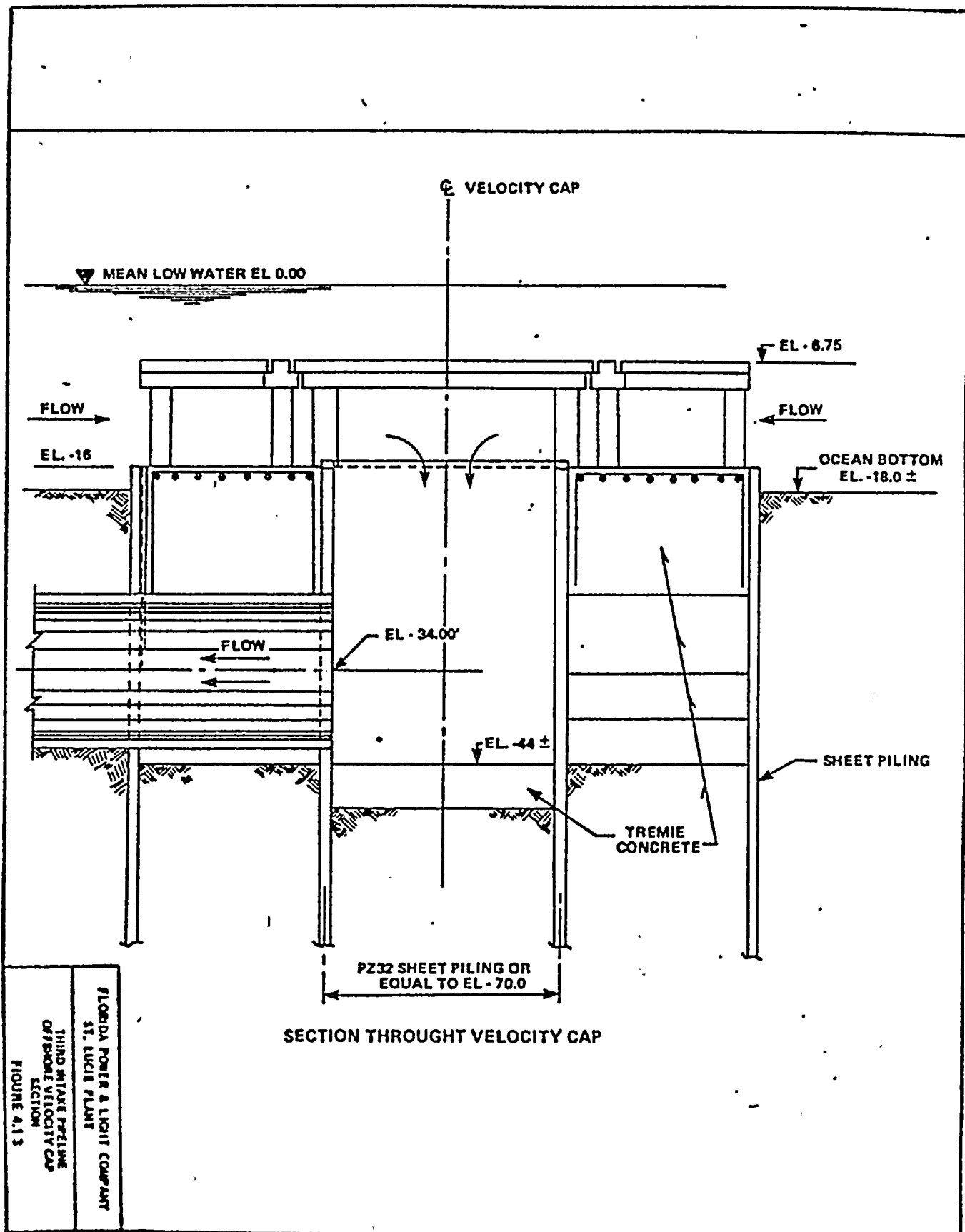
During the several years that the intake pipeline headlosses were monitored, and before the pipelines were cleaned, marine fouling continued to grow and the pipe wall friction factor increased. An upper limit for growth and friction factor were not established. Accordingly, it has been assumed that periodic pipe cleaning will be necessary even with a TIP in service; however, the frequency of such cleanings can be greatly reduced. Cleaning of the TIP can be scheduled to coincide with refueling outage of one unit, without interrupting operation of the other unit. Therefore, by adding a TIP, operational reliability and flexibility of the Plant CWS systems would be greatly improved.

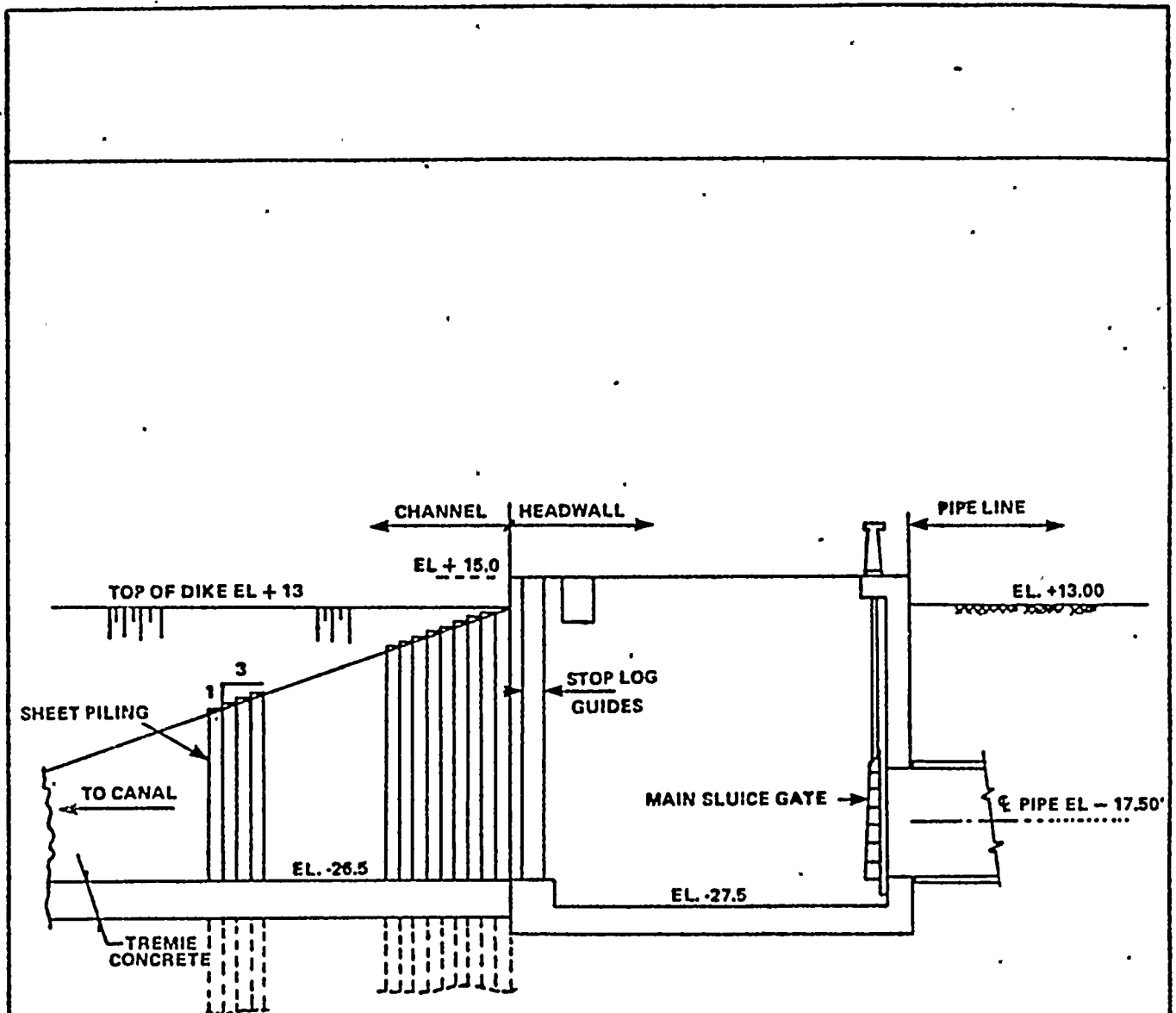
Construction of the 16 foot diameter pipeline would be within a sheetpiled trench and would be similar in all respects to the construction methods used for both the twin intake pipeline construction in 1973/74 and the Unit 2 discharge pipeline construction in 1980/81. Construction methodology for the latter is described in Section 4.1 of the St Lucie Unit 2 Environmental Report - Operating License.

As shown in Figures 4.1-1 through 4.1-4, the pipeline would begin at an offshore velocity cap structure located approximately 1200 feet from the Mean Low Water line. The velocity cap structure would be of similar size and design to the existing structures. The pipeline would be buried for its entire length, both offshore and onshore. The pipeline would enter the east end of the intake canal at a new headwall structure. The headwall structure would be of similar design to the one built for St Lucie Unit 2 discharge structure. A short sheetpile channel would be constructed from the headwall to the existing canal.









SECTION THROUGH HEADWALL & CHANNEL

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT
THIRD INTAKE PRELIMINARY
HEADWALL STRUCTURE - SECTION
FIGURE 4.14

5.0 CONSTRUCTION EFFECTS

5.1 ECOLOGICAL EFFECTS

Construction of the TIP will probably begin in February 1982 and will be completed by December 1982, before the operation of St Lucie Unit 2.

Ecological effects are temporary and impacts are primarily restricted to marine systems.

5.1.1 Terrestrial

Construction of the TIP will follow the same practices for constructing the discharge pipelines which were addressed in Sections 4.1.3.2 and 4.1.3.3 of the St Lucie Unit 2 Environmental Report - Operating License. Terrestrial impacts include (i) excavation of a strip of dune vegetation and sand less than 100 feet wide, and (ii) preemption of less than one half an acre of mangrove swamp immediately west of the storage area and north of the intake canal for an access road and canal widening (see Figure 4.1-1).

The dune area affected is characterized by dense stands of saw palmetto and more open areas providing habitat for plant species noted in Tables 3-1 and 3-2. Dune flora is important for its role in soil stabilization, and for the assemblage of relatively uncommon plants of tropical affinity. After contours have been restored to pre-construction

conditions, the disturbed areas will be replanted with native dune-stabilizing species. No longterm effects on dune flora diversity or abundance are anticipated. Removal of less than one half an acre of the mangrove swamp represents about one percent of the mangrove between the intake and discharge canals.

5.1.2 Aquatic

Construction of a TIP during any part of the marine turtle nesting season (1 May to 1 September) will probably cause local, short-term impacts on marine turtles. In 1975, pipeline construction at the St. Lucie site apparently reduced the suitability for nesting of the beach near the Plant. Analysis of nesting data showed that nesting density near the Plant decreased to about 50 percent of the expected number of nests.^(1, 2) However, turtles that failed to nest in the Plant vicinity probably nested elsewhere on the island as evidenced by the higher than expected nest densities in areas to the north and south of the plant. The effects of construction should be limited to the nesting season during which construction occurs. After construction ended in 1975, nest numbers were near expected values.

Additional impacts associated with construction of the TIP may include the crushing and excavation of nests by construction equipment on the beach and nest losses resulting from beach erosion. A nest surveillance and relocation program will be instituted on those areas of beach potentially affected by construction activity, as described in Section 4.1.3.2 of the St Lucie Unit 2 Environmental Report - Operating License.

The pipeline sheetpiled trench will disrupt the littoral flow of sand that normally stabilizes beaches and, with time, could result in some changes in beach profiles near the construction site. During storms, the process is accelerated and nests in the affected area could be lost to erosion, flooding or additional accumulations of sand.

In the marine environment, impacts due to construction of a TIP would be identical in nature to those discussed in Section 4.1.3.3 of the St Lucie Unit 2 Environmental Report - Operating License. The sheetpile trench excavated for the TIP would be 364 m (1200 ft) long and 7.6 m (25 ft) wide. The total surface area disturbed would be 2782 m² (0.7 acre), raising the total amount of disruption from 55640 m² (14 acres for the St Lucie Unit 2 discharge pipeline alone) to 58420 m² (14.7 acres). Thus, the temporary loss in numbers and/or biomass of benthic organisms would be five percent greater than that presented in St Lucie Unit 2 Environmental Report - Operating License. Past history at the St Lucie site indicate that substrate stabilization and recolonization should occur rapidly following pipeline construction.

CHAPTER 5: REFERENCES

1. Applied Biology Incorporated ABI. 1978. Ecological monitoring at the Florida Power & Light Co. St. Lucie Plant, annual report 1977. 2 vol. AB-101. Prepared for Florida Power & Light Co., Miami, Fla.
2. Applied Biology Incorporated. 1980. Non-radiological environmental monitoring report 1979. vol. AB-244. Prepared for Florida Power & Light Co., Miami, Fla.

6.0 OPERATION EFFECTS

6.1 ECOLOGICAL EFFECTS

Operational impacts of the TIP include entrainment and impingement, as described below.

6.1.1 Entrainment

Section 5.1.3.1.1 of the St Lucie Unit 2 Environmental Report - Operating License described impact of entraining planktonic organisms into the circulating water system. Use of three intake pipelines, rather than two, to convey the required 2320 cfs cooling water will not increase plankton entrainment. The types and concentration of planktonic organisms will also be similar among intake pipelines due to the fact that the TIP would withdraw water from the same source volume as that presently used.

Three intake pipelines, will have intake velocities lower than the 1.0 fps evaluated for the existing twin pipelines (Section 3.4.2.1 of the St Lucie Unit 2 Environmental Report - Operating License). Thus, to the extent that entrainment is a species-specific function of intake velocity (ie, ability to resist or avoid intake currents), actual losses of organisms for two unit operation may be less than that estimated in Section 5.1.3.1.1 of the St Lucie Unit 2 Environmental Report - Operating License. An entrainment rate of 3.6 percent of the near-field community was presented as a worst case for two unit operation in the St Lucie Unit 2 Environmental Report-Operating License.

6.1.2 Impingement

Impingement effects of two unit operation at St Lucie were discussed in detail in Section 5.1.3.1.2 of the St Lucie Unit 2 Environmental Report-Operating License. Conservative impingement rates for fish and shellfish were estimated to be 150,000 and 60,000 individuals/yr, respectively. These estimates assumed a linear increase in impingement with respect to capacity or velocity, and year-round operation of both units. The actual rate is likely to be lower, particularly for important species such as Spanish mackerel and bluefish which appear capable of avoiding entrainment into the pipelines. Impingement rates for two pipeline operation with average intake velocities of 1.0 fps should exceed those for three pipeline operation.

Intake operation will affect mostly subadult turtles because they may frequent nearshore waters more than adults. Adult turtles are found inshore only during the nesting season. Studies of turtle populations in Mosquito Lagoon, at the north end of the Indian River, showed that subadults were selectively inhabiting these inshore waters.

It is not known if turtles are attracted to the plant intake area or if they encounter the intakes by chance. However, turtles do seem attracted to underwater objects that appear to provide cover. Behavioral studies of immature loggerhead and green turtles showed that turtles seek out covered areas in which to rest. The existing two velocity caps and exposed portions of the intake probably appear to turtles as suitable resting and foraging spots in an area otherwise devoid of bottom

profile. Turtles may enter the intake pipes in response to the visual cue of the dark area under the velocity caps, or accidentally, while searching for food or swimming in the area when the water is turbid.

The addition of a third intake structure may increase the entrapment rate of marine turtles. The percentage of turtles coming in contact with the plant intake that actually enter the pipelines is not known, but a TIP will increase the probability of a turtle encountering a structure.

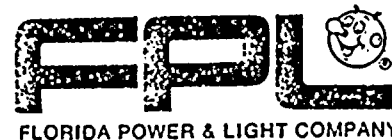
6.2 OTHER EFFECTS

6.2.1 Aesthetics

Since the TIP is buried under the ocean and the beach dunes, operation of the TIP will offer no visual impacts.

6.2.2 Noise Effects

Operation of the TIP as well as the existing twin intake pipelines would not produce any noise.



November 25, 1981

Ms. Victoria Tschinkel, Secretary
Florida Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, FL 32301

RE: St. Lucie Power Plant Unit No. 2
Modification of Conditions of Certification
No. PA-74-02

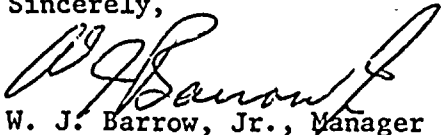
Dear Secretary Tschinkel:

We are submitting this letter to request that the Florida Department of Environmental Regulation modify the conditions of the above-referenced certification for the St. Lucie Power Plant Unit No. 2 pursuant to § 403.516(1), Florida Statutes, and § 10 of the General Conditions of Certification. As grounds for this requested modification, Florida Power & Light Company relies upon the material and information contained in the enclosed Joint Application Department of the Army/Florida Department of Environmental Regulation for Activities in Waters of the State of Florida and attachments. We have provided the pertinent information regarding our proposal on the aforementioned application and attachments for convenience, since these same forms are being hand-delivered this date to the Department of Army/Corps of Engineers, Jacksonville District. A copy of the cover letter sent to the Corps has also been attached.

We request that you review the enclosures describing Florida Power and Light's proposed modification, and that you amend and modify the conditions of certification accordingly.

Respectfully submitted this 30th day of November 1981.

Sincerely,

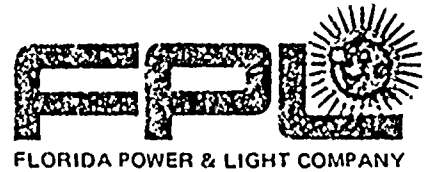

W. J. Barrow, Jr., Manager
Environmental Permitting and Programs

WJBjr/pc

- Enclosures: 1) Joint Application (2 pages)
2) Joint Application Supplement Sheet #1 (1 page)
3) Joint Application Supplement Sheet #2 (2 pages)
4) Joint Application Drawings (6 pages)
5) Cover letter to Corps of Engineers (1 page)
6) Circulating Water System Modification (18 pages)

cc: Hamilton S. Owen

Copies of the foregoing letter and enclosures have been furnished to all of the individuals and entities listed on the attached service list.



November 30, 1981

TO WHOM IT MAY CONCERN:

Attached for your information is an application to the Department of Environmental Regulation for Modification of Conditions of Certification No. PA-74-02 at Florida Power & Light Company's St. Lucie Power Plant Unit No. 2. This notification is for the construction of a 16' third intake pipe which is explained in detail by the attached documents.

Respectfully submitted this 30th day of November, 1981.

Sincerely,

A handwritten signature in dark ink, appearing to read 'W. J. Barrow, Jr.', is written over the typed name.

W. J. Barrow, Jr.
Manager
Environmental Permitting & Programs

WJBjr/os

attachments

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Community Affairs
2571 Executive Center Circle East
Tallahassee, Florida 32301

Conservation Alliance of St. Lucie
County
c/o Mrs. Margorie Silver Alder
304 St. Andrews Lane
Fort Pierce, Florida 33450

Martin County Conservation
Alliance
c/o Martin Harold Hodder, Esq.
1131 Northeast 86th Street
Miami, Florida 33138

League of Women Voters of
St. Lucie County
c/o Mrs. Judith James
Route 3, Box 423
Fort Pierce, Florida 33450

Mr. Estes Whitfield
Senior Governmental Analyst
Office of Planning and Budgeting
Office of the Governor
The Capitol
Tallahassee, Florida 32301

Citizens United Against Radioactive
Environment
c/o Harold H. Alder
304 St. Andrews Lane
Fort Pierce, Florida 33450

Steve Walker, Esq.
South Florida Water Management
District
Post Office Box V
West Palm Beach, Florida 33402

Sam Shannon, Esq.
Treasure Coast Regional Planning
Council
Post Office Box 396
Stuart, Florida 33495

The Honorable Bob Graham
Governor
The Capitol
Tallahassee, Florida 32304

The Honorable George Firestone
Secretary of State
The Capitol
Tallahassee, Florida 32301

The Honorable Jim Smith
Attorney General
The Capitol
Tallahassee, Florida 32304

The Honorable Gerald Lewis
Comptroller
The Capitol
Tallahassee, Florida 32301

The Honorable Bill Gunter
Treasurer
The Capitol
Tallahassee, Florida 32304

The Honorable Ralph D. Turlington
Commissioner of Education
The Capitol
Tallahassee, Florida 32301

The Honorable Doyle E. Conner
Commissioner of Agriculture
The Capitol
Tallahassee, Florida 32301



November 30, 1981

Dr. Elton J. Gissendanner
Executive Director
Florida Department of Natural Resources
3900 Commonwealth Blvd.
Tallahassee, FL 32303

RE: APPLICATION FOR EASEMENT
ST. LUCIE POWER PLANT - ST. LUCIE COUNTY
SUBAQUEOUS INTAKE PIPELINES

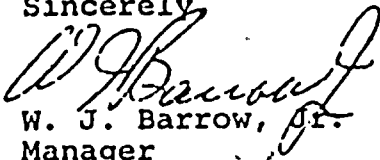
Dear Dr. Gissendanner:

Enclosed please find an Easement Application for two existing and one proposed intake pipeline extending approximately 1195 feet offshore from Hutchinson Island into the Atlantic Ocean. The two existing intake lines were permitted by the Board of Trustees (TIIF) on March 22, 1972 (Permit No. 253.123(2) (b)-1101). The foregoing application attachments are being submitted on behalf of Florida Power and Light Co. in reference to its St. Lucie Power Plant. These materials are being submitted in an effort to obtain an easement across sovereignty lands of the State of Florida for public utility purposes, pursuant to Chapter 16Q-17.09 F.A.C. (Sovereignty Submerged Lands).

We request that you review the enclosures describing the Florida Power and Light Company's proposed easement, and that you place this application before the Board of Trustees of the Internal Improvement Trust Fund at the earliest possible date. We have provided the pertinent information regarding our proposal on the aforementioned application and attachments for your convenience.

Respectfully submitted this 30th day of November, 1981.

Sincerely



W. J. Barrow, Jr.
Manager

Environmental Permitting & Programs

WJBjr/os

Attachments: Easement Application
Map of Survey - Project No. 225
Permit Appraisal - Biological Report
Circulating Water System Modification

cc: Victoria Tschinkel - w/o attachments
Hamilton Oven - w/o attachments

EASEMENT APPLICATION

Easement No. _____ Date _____

Please type or print. Fill in the blanks for all applicable information. If information requested is not applicable, so indicate by placing N/A in the blank.

APPLICANT INFORMATION:Name Florida Power & Light CompanyAddress P. O. Box 529100Miami, FL Zip Code 33152Telephone Number: (305) 552-3564Name of Agent W. J. Barrow, Jr.Manager, Environmental Permitting & ProgramsAddress of Agent 2250 Palm Beach Lakes Blvd.West Palm Beach, FL Zip Code 33409Telephone Number: (305) 684-8500

Proposed easement will be used for:

Public Utility ☒ (XX) Public Road Right-of-Way ☐ ()
 Private Utility ☐ () Private Road Right-of-Way ☐ ()
 Other ☐ () Explain: Electric Generating Facility (Power Plant)
Ocean Intake Pipeline for plant cooling water.

LOCATION:Section 16 Township 36 South Range 41 EastCounty St. Lucie City Ft. PierceWater body affected by activity: Atlantic OceanProject is in an aquatic preserve? Yes ☐ () No ☒ (X)If "yes", give preserve number: N/A

List names and addresses of the riparian land owners of property on each side of the project site.

North Boundary: Krantz, Christ. & Mary Lou
Geo. & Mary Ann
200 Ocean Tr. Apt. 1210
Jupiter, FL 33458

South Boundary: Sand Dollar Villas Dev. Co.
P. O. Drawer 2315
Stuart, FL 33494

Describe the proposed activities in detail.

An ocean intake pipeline and channel extension to convey cooling water from the Atlantic Ocean into the intake canal is proposed. The 1515 foot pipeline has an inside diameter of 16 feet and extends 1195 feet offshore and is to be buried beneath the dunes and ocean bottom. The pipe terminates with a velocity cap of precast reinforced concrete, supported on tremie concrete placed within a sheetpiling enclosure below the ocean bottom. Dredged materials include sands, silts and clay. Backfill material will be dredged sands.

The channel extension projects about 100 feet into the east slope of the existing intake canal.

* See supplemental sheet 1

List all approvals or certification required for this activity:

<u>Issuing Agency</u>	<u>Type of Approval</u>	<u>Identification Number</u>	<u>Date of Application</u>	<u>Date of Approval</u>
US NRC	Construction Permit	Docket 50-389	-	May 2, 1977
State of Florida	Site Suitability Certificate	PA-74-02	-	June 10, 1975
U. S. COE	Dredge & Fill Permit	81D-1679	11/23/81	Pending

REMARKS: Any comment that you feel should be made in regards to this application.

See Supplemental Sheet 2.

ALL LISTS OF REQUIRED INFORMATION SHOULD BE ATTACHED TO THIS APPLICATION WHEN THE APPLICATION IS SUBMITTED.

Date: December 30, 1981 Signature of Applicant: _____

W. J. Barrow, Jr.
Manager
Environmental Permitting & Programs

MAP OF SURVEY FOR FLORIDA POWER AND LIGHT COMPANY, INC. ST. LUCIE UNIT #1 AND UNIT #2 SUBAQUEOUS INTAKE PIPE EASEMENT ST. LUCIE COUNTY, FLORIDA

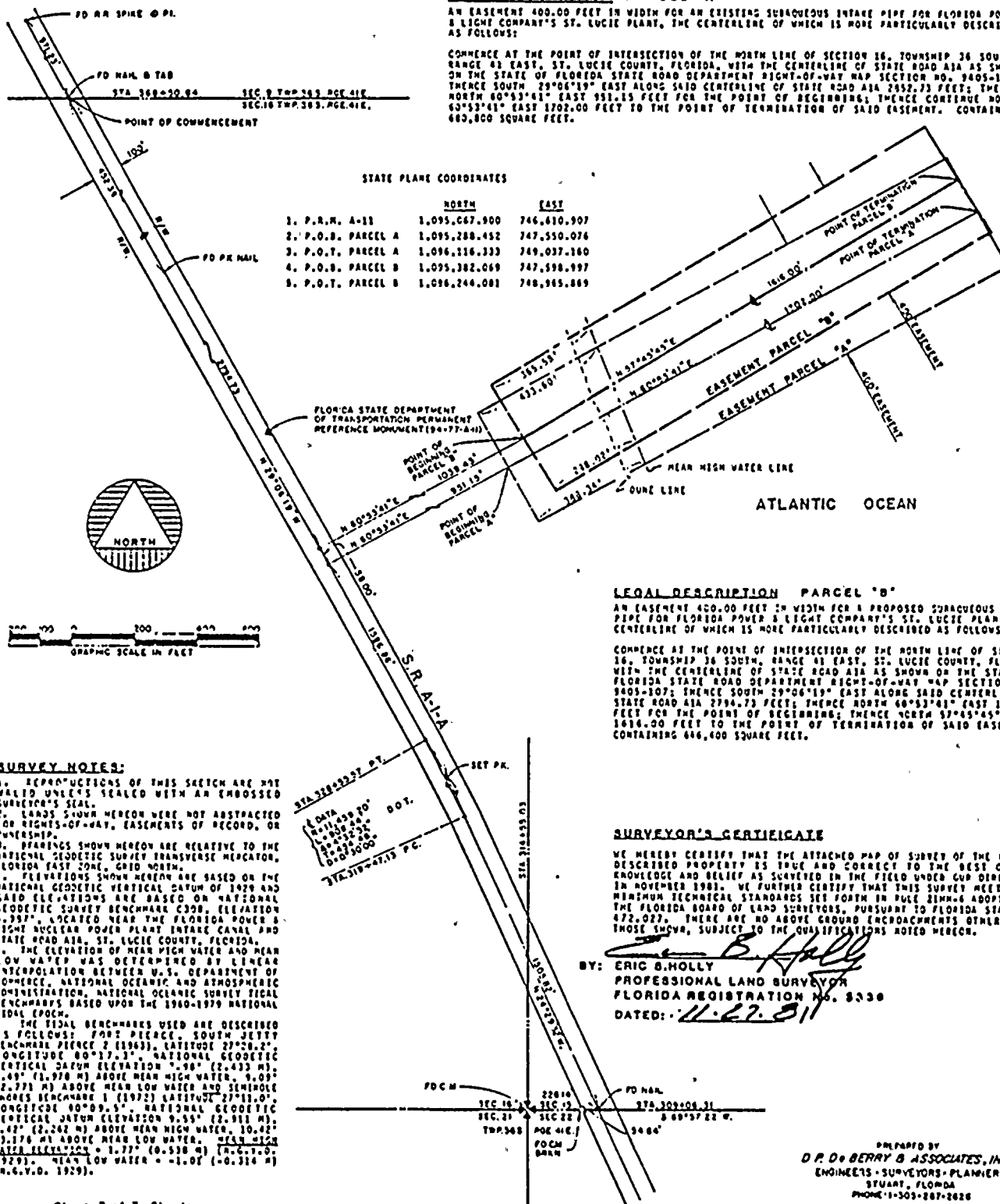
LEGAL DESCRIPTION "PARCEL A"

AN EASEMENT 400.00 FEET IN WIDTH FOR AN EXISTING SUBAQUEOUS INTAKE PIPE FOR FLORIDA POWER & LIGHT COMPANY'S ST. LUCIE PLANT, THE CENTERLINE OF WHICH IS MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCE AT THE POINT OF INTERSECTION OF THE NORTH LINE OF SECTION 16, TOWNSHIP 36 SOUTH, RANGE 41 EAST, ST. LUCIE COUNTY, FLORIDA, WITH THE CENTERLINE OF STATE ROAD A1A AS SHOWN ON THE STATE OF FLORIDA STATE ROAD DEPARTMENT RIGHT-OF-WAY MAP SECTION NO. 9405-107; THENCE SOUTH 29°06'19" EAST ALONG SAID CENTERLINE OF STATE ROAD A1A 2952.73 FEET; THENCE NORTH 60°53'41" EAST 931.15 FEET FOR THE POINT OF BEGINNING; THENCE CONTINUE NORTH 60°53'41" EAST 1702.00 FEET TO THE POINT OF TERMINATION OF SAID EASEMENT, CONTAINING 680,800 SQUARE FEET.

STATE PLANE COORDINATES

	NORTH	EAST
1. P.R.M. A-11	1,095,667.900	746,410.907
2. P.O.B. PARCEL A	1,095,288.452	747,550.076
3. P.O.T. PARCEL A	1,096,116.333	749,037.160
4. P.O.B. PARCEL B	1,095,382.069	747,598.997
5. P.O.T. PARCEL B	1,096,244.081	748,965.889

**SURVEY NOTES:**

1. REPRODUCTIONS OF THIS SKETCH ARE NOT VALID UNLESS SEALED WITH AN EMBOSSED SURVEYOR'S SEAL.
2. LANDS SHOWN HEREON WERE NOT ABSTRACTED FOR RIGHTS-OF-WAY, EASEMENTS OF RECORD, OR OWNERSHIP.
3. BEARINGS SHOWN HEREON ARE RELATIVE TO THE NATIONAL GEODETIC SURVEY TRANSVERSE MERCATOR, FLORIDA EAST ZONE, GRID NORTH.
4. ELEVATIONS SHOWN HEREON ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 AND SAID ELEVATIONS ARE BASED ON NATIONAL GEODETIC SURVEY BENCHMARK C398, ELEVATION 4.357', LOCATED NEAR THE FLORIDA POWER & LIGHT NUCLEAR POWER PLANT INTAKE CANAL AND STATE ROAD A1A, ST. LUCIE COUNTY, FLORIDA.
5. THE ELEVATION OF MEAN HIGH WATER AND MEAN LOW WATER WAS DETERMINED BY LINEAR INTERPOLATION BETWEEN U.S. DEPARTMENT OF COMMERCE, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, NATIONAL OCEANIC SURVEY TIDAL BENCHMARKS BASED UPON THE 1980-1979 NATIONAL TIDAL EPOCH.
6. THE TIDAL BENCHMARKS USED ARE DESCRIBED AS FOLLOWS: 7407 PIERCE, SOUTH LEE BENCHMARK PIERCE 2 (1963), LATITUDE 27°26.2', LONGITUDE 80°17.3', NATIONAL GEODETIC VERTICAL DATUM ELEVATION 7.98' (2.433 M), 6.49' (1.978 M) ABOVE MEAN HIGH WATER, 9.09' (2.771 M) ABOVE MEAN LOW WATER AND SCHMIDT SHORE BENCHMARK 1 (1972) LATITUDE 27°18.0', LONGITUDE 80°09.5', NATIONAL GEODETIC VERTICAL DATUM ELEVATION 9.55' (2.911 M), 7.42' (2.262 M) ABOVE MEAN HIGH WATER, 10.42' (3.176 M) ABOVE MEAN LOW WATER, MEAN HIGH WATER ELEVATION 1.77' (0.538 M) (N.C.T.D. 1929), MEAN LOW WATER -1.01' (-0.314 M) (N.C.T.D. 1929).

LEGAL DESCRIPTION "PARCEL B"

AN EASEMENT 400.00 FEET IN WIDTH FOR A PROPOSED SUBAQUEOUS INTAKE PIPE FOR FLORIDA POWER & LIGHT COMPANY'S ST. LUCIE PLANT, THE CENTERLINE OF WHICH IS MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCE AT THE POINT OF INTERSECTION OF THE NORTH LINE OF SECTION 16, TOWNSHIP 36 SOUTH, RANGE 41 EAST, ST. LUCIE COUNTY, FLORIDA, WITH THE CENTERLINE OF STATE ROAD A1A AS SHOWN ON THE STATE OF FLORIDA STATE ROAD DEPARTMENT RIGHT-OF-WAY MAP SECTION NO. 9405-107; THENCE SOUTH 29°06'19" EAST ALONG SAID CENTERLINE OF STATE ROAD A1A 2794.73 FEET; THENCE NORTH 60°53'41" EAST 1039.43 FEET FOR THE POINT OF BEGINNING; THENCE NORTH 60°53'41" EAST 1616.00 FEET TO THE POINT OF TERMINATION OF SAID EASEMENT, CONTAINING 646,400 SQUARE FEET.

SURVEYOR'S CERTIFICATE

WE HEREBY CERTIFY THAT THE ATTACHED MAP OF SURVEY OF THE HEREON DESCRIBED PROPERTY IS TRUE AND CORRECT TO THE BEST OF OUR KNOWLEDGE AND BELIEF AS SURVEYED IN THE FIELD UNDER OUR SUPERVISION IN NOVEMBER 1981. WE FURTHER CERTIFY THAT THIS SURVEY MEETS THE MINIMUM TECHNICAL STANDARDS SET FORTH IN RULE 21MM-6 ADOPTED BY THE FLORIDA BOARD OF LAND SURVEYORS, PURSUANT TO FLORIDA STATUTES 472.027. THERE ARE NO ABOVE GROUND ENCROACHMENTS OTHER THAN THOSE SHOWN, SUBJECT TO THE QUALIFICATIONS NOTED HEREON.

BY: *Eric B. Holly*
ERIC B. HOLLY
PROFESSIONAL LAND SURVEYOR
FLORIDA REGISTRATION NO. 8338
DATED: 11-27-81

Question No.

291.22

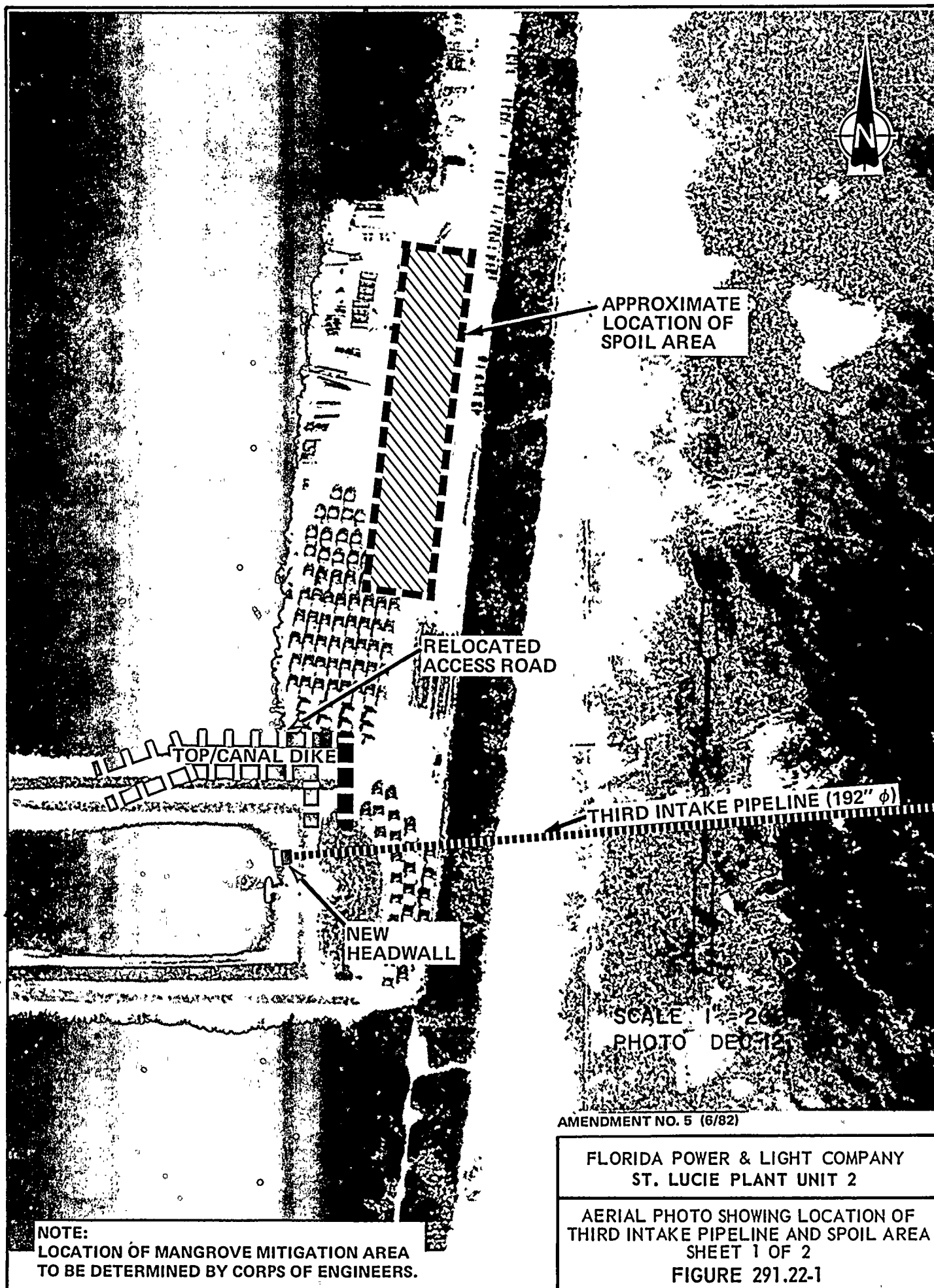
On an aerial photo such as provided on site visit (scale 1"=200', taken 12/12/80) show the exact location for the third intake pipeline including detail for the on-land portion. Also show the details of the mitigation area to be provided as compensation for the destruction of mangrove swamp.

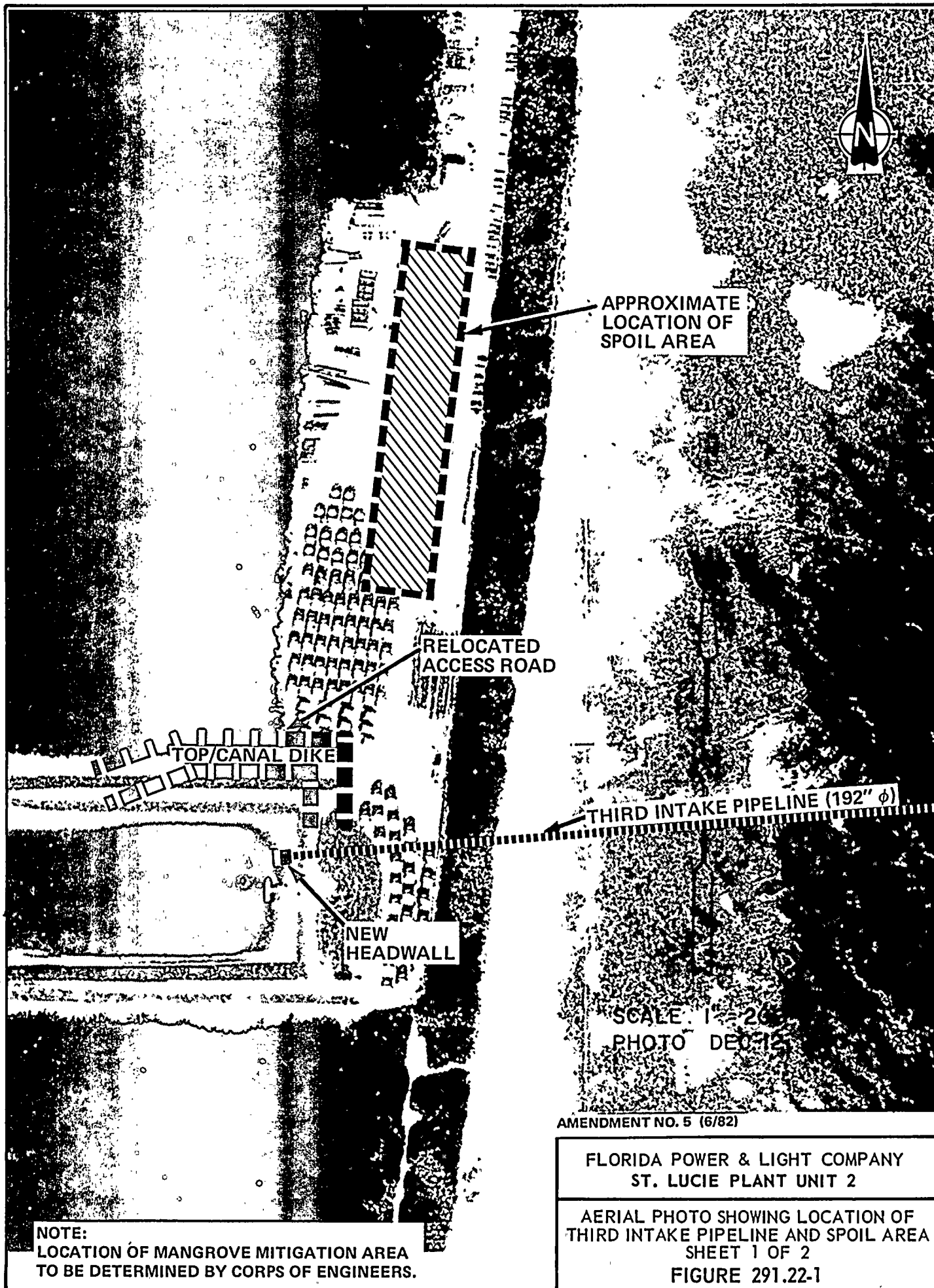
On the same photo, if appropriate, or on other photo identify boundaries of areas to be used for the disposition of dredge spoils resulting from the construction of the third intake pipeline, headwall, and widening of the intake canal.

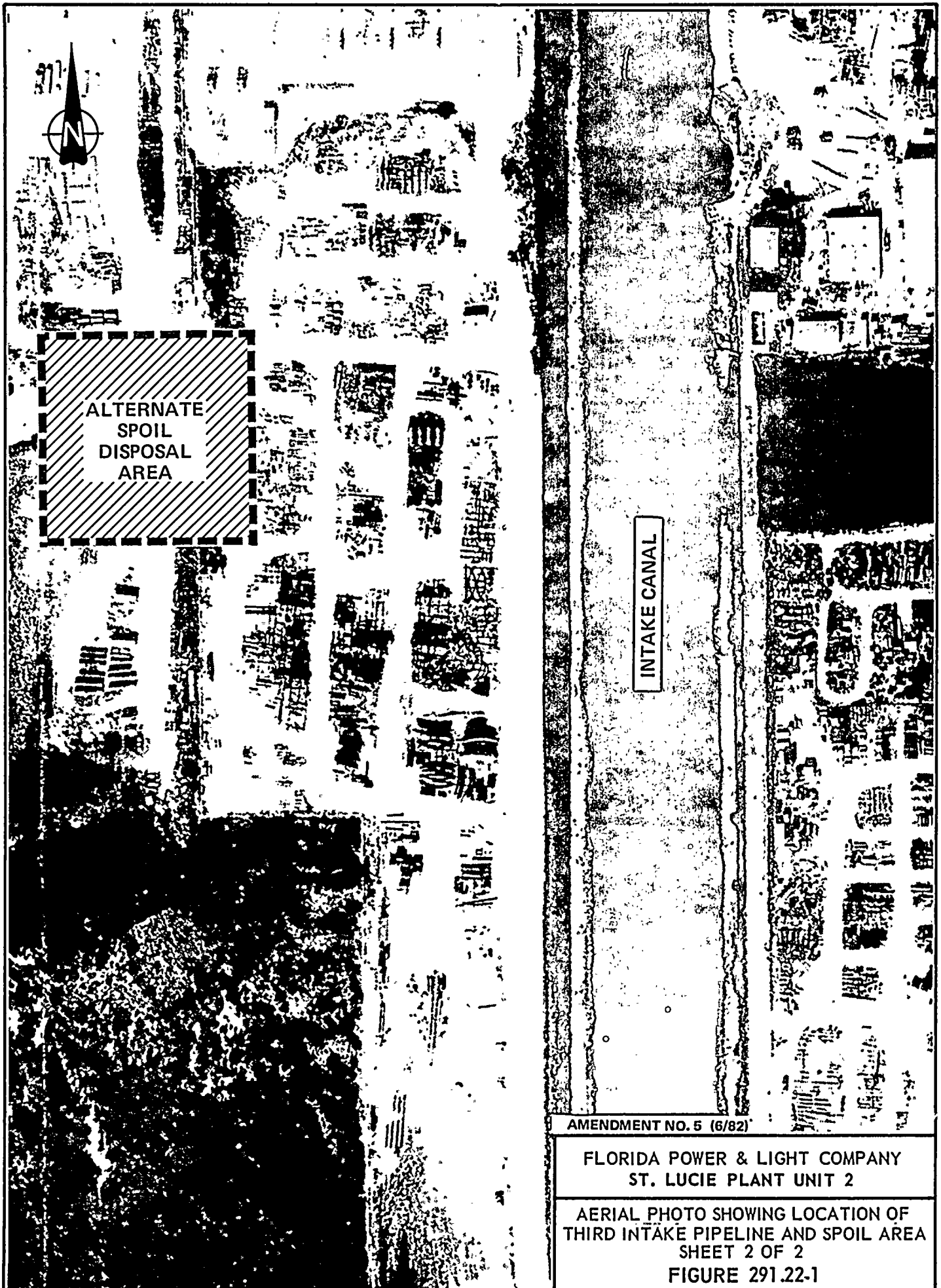
Response

See attached marked-up aerial photo.

No ER-OL revisions are required.







ALTERNATE
SPOIL
DISPOSAL
AREA

INTAKE CANAL

AMENDMENT NO. 5 (6/82)

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 2

AERIAL PHOTO SHOWING LOCATION OF
THIRD INTAKE PIPELINE AND SPOIL AREA
SHEET 2 OF 2

FIGURE 291.22-1

Question No.

291.23

Provide the following information:

- a) The month the mangrove swamp mitigation action is to take place.
- b) The kind of equipment used to perform the mitigation action (e.g., backhoe, dragline).
- c) The names of the specific native species to be planted.

Response

- a) The mangrove swamp mitigation will be completed by February 1, 1983.
- b) Equipment to be used will be a backhoe to bring the lay down area elevation down to wetland elevation. Mangrove seedlings will be planted by either using a mechanical auger or by hand.
- c) Mangroves (Rhizophora mangle) will be planted per the Crops permit special conditions.

See revised ER-OL Subsection 4.1.3.2.

Question No.

291.24 Conduct a survey of the mangrove swamp to determine whether any leather ferns are in area to be destroyed.

Response

A survey of the construction area has been conducted and no leather ferns were found.

No ER-OL revisions are required.

Question No.

291.25 Provide a narrative of any present or future efforts that have been or will be taken to prevent marine turtle entrapment at the offshore intake structure.

Response

Efforts to understand and reduce turtle entrapment at St Lucie Plant dated back to May 1976, when Unit 1 began operation. Monitoring of entrapped sea turtles began in 1976 (intermittent plant operation) when 33 loggerheads were handled. Monitoring of entrapped sea turtles continued in 1977 and 84 turtles (mostly loggerheads) were handled. After the 1977 entrapment data were reviewed for the annual non-radiological reports, the FP&L Environmental Department realized that turtle entrapment would be a continuing phenomenon and began a series of evaluations on potential methods to reduce it.

On April 5, 1978, a recommendation was made to the Power Plant Engineering Department that they investigate the feasibility of covering the underwater intake opening with a network of bars. Based on carapace width of 140 turtles (four species: green, n=4; hawksbill n=1; leatherback n=3; loggerhead n=132, maximum dimensions recommended were: square opening of 31.5 cm (12.5 in.) on a side or a diagonal measurement of 44.5 cm. These dimensions would exclude approximately 95 percent of the turtles. On July 24, 1978 this preliminary design was completed and reviewed by FP&L. The design called for a cage-like structure with a network of bars on 30.5 cm centers to be hinged to the top of the velocity cap. The package included a description of the project, data sheets, material lists, and estimated costs. No further work was authorized on this design because of expected marine fouling and subsequent reduction of flow, costs, and because other methods to modify turtle behavior were under consideration.

An experiment to reduce turtle entrapment occurred in June, 1978, when one of the two intake pipes was plugged and Unit 1 operated off the other pipe, which had just been cleaned of fouling organisms. This action increased the horizontal approach velocity around the plane of the velocity cap to 30.5 cm/sec and doubled the water velocity in the pipeline (e.g., the design criteria when both units are in operation). The hypothesis being tested was that the lower approach velocity of 15.3 cm/sec was insufficient for turtles to detect and by operating at the design criteria, the turtles could sense this velocity and avoid being entrapped. Turtle catch per effort during one pipe mode of operation (June 1-24) was compared to catch data during two-pipe operation and it was concluded that there was no difference between the two modes of operation.

On June 8, 1978, FP&L contracted with Applied Biology Inc., of Atlanta, Georgia, to conduct a 28 month laboratory investigation on methods to minimize sea turtle entrapment at the St. Lucie Plant. Area of investigation included how light and mechanical devices would modify turtle behavior.

In August, 1980, a final report on this project concluded that under laboratory conditions, turtles readily sought out and utilized dark box habitats during resting periods in both night and day situations⁽¹⁾. Lights (100 watts) in the box habitats were a useful deterrent at night but were ineffective during the day when ambient solar light negated their results.

The study also concluded that a bubble screen was effective in excluding turtles from the box habitats during daylight hours. The effects were more positive during bright light conditions probably due to increased visibility as the bubbles reflected the sunlight. At night the bubble screen was ineffective.

Under laboratory conditions, the combined installation of lights and a bubble screen in or around the velocity cap was felt to be promising methods to reduce turtle entrapment. Further testing of prototype designs were felt warranted, but a number of unknowns needed to be evaluated such as effects on other biotic communities and logistics of installing these devices in an ocean environment.

Based on the results of the above study, an evaluation was made on methods to determine if there was a day or night pattern of turtle entrapment. To monitor time of turtle entrapment, sonar and underwater closed-circuit television were considered for the velocity cap and an optical beam was considered for the headwall. However, because of practical and logistic problems associated with the installation of this equipment and other research work on electrical field about to begin, no further work using these monitoring methods was authorized.

On June 1, 1981, FP&L contracted with Environmental and Chemical Science (ECS) of Atlanta, Georgia, to perform a study on how electrical fields (AC and DC) could modify turtle behavior. The final report⁽²⁾ was issued in December, 1981, and is being evaluated by FP&L at the present time. The conclusions of the study are as follows:

1. Marine turtles avoided both AC and pulsed DC electric fields of sufficient intensity.
2. Exposure to low voltage electric fields did not harm the turtles. Turtles did not exhibit learned behavior after repeated exposures to such fields.

3. For a given peak voltage, sine wave AC fields were more effective than pulsed DC in repelling turtles. While there was some variability in the response of turtles to different DC pulse rates, pulse width and waveforms, no well-defined set of parameters appear to be superior.
4. There was considerable variation in the responses exhibited by individual turtles to electric fields. Size was important because the larger turtles are more sensitive. Species variations may exist as there were some indications that green turtles are more sensitive than loggerheads.
5. The field intensity experienced by the head of the turtle may be the most important electrical parameter determining behavior.
6. Under some conditions, turtles entered strong electrical fields and lost motor coordination. At the field intensity studied, the turtles recovered immediately when released from the field with no apparent damage and, again, no apparent learning.

The scope of work for the ECS contract was expanded on November 30, 1981, to allow a preliminary analysis on using sound to modify turtle behavior. This evaluation is underway at this time.

Future Efforts

Until the electrical field and sound work is further evaluated on engineering, cost, practicality and safety criteria, the direction of future work is uncertain. Undoubtedly, further laboratory testing using scale models of the intake structure would be appropriate. Depending on a number of variables, lights, bubble curtains, electrical fields, and sound devices may all have potential for modifying turtle behavior and reducing turtle entrapment at St. Lucie Plant.

No ER-OL revisions are required.

References

1. Applied Biology, Inc. 1980. Turtle entrainment deterrent study, AB-290, Atlanta, Ga.
2. Environmental and Chemical Sciences, Inc. 1981. Avoidance responses by sea turtles exposed to electric fields, Atlanta, Ga.

Question No.

291.26 Provide details on any refinements considered for the current procedures used to capture turtles in the intake canal.

Response

In April 1978, it was recognized that if the turtles entrapped in the intake canal could be restricted to a small area by the headwall, then the efficiency of their removal could be improved. Based on this reasoning, a request was made to the Power Plant Engineering Department to install a 12 inch square mesh barrier net (strand diameter 3/8") the entire width of the canal at the Ala bridge. This net was installed in the summer of 1978 and is still in place.

On May 3, 1977, Applied Biology, Inc., under contract with FP&L, prepared formal procedures on net placement, turtle removal, tagging, data recording, and turtle release. These procedures were updated in May 1979 and June 1981 and incorporated the following steps to reduce mortalities (not limited to greens):

1. The utmost care is taken in handling the animals to prevent injury and trauma.
2. Sick or injured turtles are treated and occasionally held for observation prior to release. Treatment includes injections of antibiotics and vitamins by a local veterinarian if warranted.
3. Resuscitation techniques are used if the animal appears recently dead (a green was revived by mouth-to-mouth resuscitation in 1981).
4. Sport fishing in the canal has been prohibited (turtles have been found with hooks and monofilament line entangled or attached; however, this did not necessarily happen while they were in the canal).
5. Gill netting for fish monitoring has been deleted at a station by the headwall.
6. Plant personnel have home phone numbers of Applied Biology, Inc., personnel so they can be notified of sea turtle occurrences at irregular hours.
7. Plant and Applied Biology personnel are checking the tangle nets more frequently.

The following are methods which will be evaluated and/or employed to further reduce mortalities (emphasis on greens or other small turtles):

1. Use special nets which are lighter in weight, fish near the surface, and have finer mesh than presently used.
2. Modification in size, weighting or positioning of the presently used nets.
3. Discontinue use of one of the two currently used turtle nets during January through March when the majority of greens occur.
4. Check the nets more frequently during January through March.
5. Experiment with net positions and its effectiveness as a function of turtle behavior. For example, if the greens stay near the headwall the lighter nets could fish there, while the heavier nets could be placed farther up the canal for the loggerheads.

Through practical experience as other ideas occur on methods to reduce turtle netting mortality, they will be tested and, if effective, they will be incorporated into the procedures.

No ER-OL revisions are required.

Question No.

- 291.27 Provide information on what percent of the Caribbean populations of green and loggerhead sea turtles nest in the area of the power plant. Also provide an estimate of the number of nesting turtles (both green and loggerhead) on Florida's east coast. Fully document and reference your response.

Response

Data on green and loggerhead nestings on Hutchinson Island (i.e., the vicinity of the power plant) are based on six survey years: 1971, 1973, 1975, 1977, 1979, and 1981 conducted by the Florida Department of Natural Resources and Applied Biology, Inc., under contract with FP&L. Further details of these studies are reported in the annual non-radiological monitoring reports for St. Lucie Plant including the 1982 report, which is in draft stages.

Green turtles over the six-year period had a range of 5 - 37 nests per year (actual count, but excluding the northern 10 percent of the island during the first five survey years) with a mean of 19 per year.⁽¹⁻²⁾ R Witham of DNR reported 62 nests in 1978⁽¹⁾ (a non-survey year for FP&L). Loggerhead turtles had a range of 3000 - 4800 nests per year with a mean of approximately 4000 (these figures are whole island estimates based on extrapolations from transects)⁽¹⁻²⁾. Figure H-11 illustrates that the greens predominately nest south of the St. Lucie Power Plant⁽¹⁾ (Area 4). However, in 1981 when 10 green nests were verified on Hutchinson Island, there was one nest recorded in Area 4⁽²⁾. Figure H-3⁽¹⁾ illustrates the nesting pattern of loggerheads in Area 4 (e.g., the Plant Site). In 1981, 65 nests were recorded in Area 4,⁽²⁾ compared to 124 nests observed in 1979 when no beach and nearshore construction occurred.

Pritchard estimates the U.S. loggerhead population consists of about 15,714 adult females⁽⁴⁾. An estimated 19,895 nests are dug in Florida each year by adult females estimated at 14,210.

Pritchard also estimates the current population of the Florida green as no more than 50 mature females, however, other data suggests this estimate is low. For example, Huff et al. surveyed selected Florida beaches on the east coast⁽³⁾ (a total of 222.1 km), and listed actual green nest counts at 281, as shown in Table 291.27-1. Counts for loggerhead nests during the same survey were 9448. Comparison from 1979 and 1980 revealed two short-term trends: loggerhead nesting decreased in 1980 and green turtle nesting increased in 1980.

No ER-OL revisions are required.

References

1. Applied Biology, Inc., 1980. Florida Power & Light Company, St. Lucie Plant, annual non-radiological environmental monitoring report 1979, AB-244. Applied Biology, Inc., Atlanta, Ga.
2. Applied Biology, Inc., 1982. Florida Power & Light Company, St. Lucie Plant, annual non-radiological environmental monitoring report 1981, AB-379. Applied Biology, Inc., Atlanta, Ga.
3. Huff, J Alan, P Ross Witham, Carol J Gray, and Lou Fallon, 1980. Summary of marine turtle activity in Florida in 1980. Florida Department of Natural Resources, Marine Research Laboratory, St. Petersburg, Fl.
4. Pritchard, P C H (ed.), 1978. Rare and endangered biota of Florida, Vol. 3, Amphibians and Reptiles. University Presses of Florida, Gainesville, Fl.

TABLE 291.27-1

1980 NEST SURVEY-ATLANTIC COAST OF FLORIDA ACTUAL COUNTS

<u>Location</u>	<u>County</u>	<u>Caretta caretta</u>	<u>Chelonia mydas</u>
1. Key Biscayne	Dade	22	10
2. Miami Beach	Dade	10	0
3. Deerfield Beach	Broward	555	21
4. Boca Raton	Palm Beach	127	2
5. Highland Beach	Palm Beach	511	34
6. Lantana	Palm Beach	10	0
7. Lost Tree Village Beach	Palm Beach	189	16
8. Juno Pier	Palm Beach	384	2
9. Jupiter Island	Martin	1,104	23
10. Hutchinson Island	St. Lucie	528	14
11. Fort Pierce Beach	St. Lucie	1	0
12. Fort Pierce Inlet	St. Lucie	16	0
13. Sebastian Inlet	Brevard & Indian R.	335	0
14. Indialantic	Brevard	35	0
15. Port Canaveral S. to Sebastian Inlet	Brevard	3,933	122
16. Canaveral National Seashore & Kennedy Space Center	Brevard	1,261	33
17. North of Brevard County Line	Volusia	392	4
18. Fort Matanzas	St. Johns	3	0
19. Little Talbot Island	Duval	<u>32</u>	<u>0</u>
TOTAL		9,448	281

Source: Reference 3.

Question No.

310.1 The projections of age distribution for the year 2000 (Sections 2.1.2.1.6 and 2.1.2.2.8) are based on 1970 U.S. data. However, it is the case that:

- The data were about eight years old when used
- The U.S. population is "aging" as the postwar babies mature.
- Florida has an older population than the U.S.
- Florida's population grew by 28 percent between 1970 and 1977 (2.1.2.2.5)
- 90 percent of Florida's growth is attributable to net migration (2.1.2.2.5)
- more relevant bases of age distribution exist such as U.S. Bureau of Census, Current Population Reports, Series P-25, No. 796, "Illustrative Projections of State Populations by Age, Race, and Sex: 1975 to 2000," U.S. Government Printing Office, Washington, DC 1979.

Present revised Tables 2.1-2 and 2.1-4 using a more appropriate age distribution base.

Response

Tables 2.1-2 and 2.1-4 are revised estimates of the age distribution of the projected population for the year 2000 between zero and ten miles and ten and fifty miles of St Lucie Unit 2. The new age distribution estimates were based on the projections for the State of Florida presented in the U.S. Department of Commerce, Bureau of the Census publication entitled Illustrative Projections of State Population by Age, Race, and Sex 1975 to 2000. The new factors used to estimate the age distribution in the year 2000 are as follows:

<u>Age Group</u>	<u>% of Total Population Year 2000</u>
0-11	14.4
12-18	9.4
19 and over	76.2

See revised ER-OL Tables 2.1-2 and 2.1-4

Question No.

310.2 In Table 2.1-3 footnote "+" refers to a place having a 1970 population of 5,772. However, there is no place listed with the "+" nor with the 1970 population of 5,772. What town does the "+" refer to?

Response

Table 2.1-3 has been revised (see attached table). The symbol "+" refers to the Town of Gifford which had a 1970 population of 5,772 and an estimated 1976 population of 7,781.

See revised ER-OL Table 2.1-3.

Question No.

310.3 Include the estimates of beach usage in Table 2.1-6, Transient Population: Attendance at Attractions and Events, while acknowledging "the lack of comprehensive data" concerning beaches. (2.1.2.3)

Response

Table 2.1-6 has been revised to include the beach usage estimates discussed in Section 2.1.2.3 of the text. See attached text and table.

See revised ER-OL Table 2.1-6 and Subsection 2.1.2.3.



Question No.

310.4 The Tourists and Seasonal Visitors Section (2.1.2.3.1) contains no time element to indicate whether the estimates are for yearly, daily, etc. attendance rates. One may surmise that the data are daily based on Table 2.1-5. That information should be presented in the analysis as well as the table.

Response

Section 2.1.2.3.1 has been revised to indicate that the estimates for tourists and seasonal visitors are peak daily estimates. See attached text for revision.

See revised ER-OL Subsection 2.1.2.3.1.

Question No.

310.5 Peak daily class attendance estimates at colleges (2.1.2.3.4 and 6.1.4.2.3) appear to be about 13 percent of enrollment based on Table 2.1-7. Even if one assumes an equal distribution of daily attendance, the peak days would be 16 and 20 percent of enrollment assuming 6 day and 5 day school weeks, respectively. How was the peak attendance calculated?

Response

Table 2.1-7 and Subsections 2.1.2.3.4 and 6.1.4.2.3 have been revised to show the peak daily class attendance at colleges to be 20 percent of total enrollment. This is based on the assumption that there is an equal distribution of the total enrollment attending class over a five day week.

See revised ER-OL Table 2.1-7 and Subsections 2.1.2.3.4 and 6.1.4.2.3.

Question No.

- 310.6 The Hutchinson Island Residential Units Section (2.1.3.5.1) reports construction of a 203 unit apartment and 32 unit townhouse complex called Sand Dollar Villas to be completed in 1980. Sand Dollar Villas is 1.4 miles from the plant site.

The 1983 resident population forecasts (Figure 2.1-6, sheet 3 of 8) indicate 36 residents between 1 and 2 miles from the site in sectors SE and SSE. The 1983 peak daily and seasonal transient population (Figure 2.1-10, sheet 3 of 8) for the same sectors is 0. Reconcile the inconsistencies between the reported construction and the population forecasts for both resident and transient population within two miles of the plant.

Response

In 1981, Sand Dollar Villas contained 203 completed residential units. Discussions with the developer indicated that an additional 162 units would be completed by 1983, and another 144 units by 1986(1). Based on 1980 preliminary census figures for St Lucie County, it was estimated that the household size on Hutchinson Island is approximately 0.44 persons per dwelling unit. This factor was used to derive the following resident population figures for Sand Dollar Villas. Transient population in Sand Dollar Villas will be composed of two components: 1) people who occupy their condominiums during the tourist season (winter); and, 2), visitors to friends and relatives. Together, these two components are expected to increase the population in Sand Dollar Villas by a factor of 3.6 times the resident population. The following table shows both resident and transient population for Sand Dollar Villas. Sand Dollar Villas is located in annular sectors SSE 1-2 and SE 1-2.

<u>Year</u>	<u>Annular Sector</u>	<u>Resident Population</u>	<u>Transient Population</u>
1981	SSE 1-2	45	162
	SE 1-2	45	162
1983	SSE 1-2	45	162
	SE 1-2	116	418
1986	SSE 1-2	108	389
	SE 1-2	116	418

See revised subsection 2.1.2.1.1 of the ER-OL and revised Figure 2.1-10.

Reference

- (1) Personal Communication, Sand Dollar Villas Sales Office, Stuart, Florida, May, 1981.

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Question No.

310.7 The ER-CP for St Lucie Unit No. 2 states that "studies conducted to date indicate that the land available for development on Hutchinson Island will be almost totally utilized by the end of this decade (by 1980)..." p. 2.2-4 Rev. 6-5/9/75.

Future residential development on Hutchinson Island "which falls within the five mile radius is expected to experience considerable development" (ER-OL 2.1.3.6 part b). The same section discusses the limited fresh water supply being a constraint to growth on the island. Are there plans to expand the supply of potable water to the island? If so, when and how would residential development of this island be affected?

Response

There are plans to expand the water supply on Hutchinson Island. The Fort Pierce Utilities Authority (FPUA) plans to construct a 16 inch water main to a point approximately 3.5 miles south of St Lucie Unit 2(1). This water main is being installed to serve Island Dunes, a 572 unit high rise development which is scheduled for completion by 1988. The first building of Island Dunes will be completed in December, 1982(2). The FPUA water main serving Island Dunes is in addition to the 12-inch FPUA main already serving Hutchinson Island between St Lucie Unit 2 and the southern boundary of St Lucie County.

Other plans to expand the water supply on Hutchinson Island involve the construction of deep wells to the Floridan Aquifer. These wells employ a desalinization process called "reverse osmosis". They are being constructed by developers not served by public water supplies. On Hutchinson Island, all planned developments, except for Island Dunes and those projects within the City of Fort Pierce, will be providing their own potable water with the reverse osmosis process. This desalinization process is being encouraged by the South Florida Water Management District (SFWMD), and at present there do not appear to be any constraints, other than cost, to providing potable water in this manner(3). Furthermore, the SFWMD indicates that the reverse osmosis desalinization process "may soon become competitive with conventional treatment plants in terms of cost and reliability"(4).

The above plans to expand the potable water supply on Hutchinson Island appear to be encouraging new development there. Current plans for new development on the Island are extensive. The response to Question 310.8 tabulates the new developments which have been constructed recently or are planned within 5 miles of St Lucie 2. A total of 763 residential units were constructed in this area between 1978 and 1981; plans exist to build another 1,628 units by 1988. Development elsewhere on Hutchinson Island, in Fort Pierce Beach and south of the five mile radius, is also occurring at a rapid pace.

No ER-OL revisions are required.

References

- (1) Personal communication, Fort Pierce Utilities Authority, Fort Pierce, Florida, May 12, 1981.
- (2) Personal communication, Island Dunes sales office, Hutchinson Island, Florida, May 11, 1981.
- (3) Personal communication, South Florida Water Management District, West Palm Beach, Florida, May 15, 1981.
- (4) South Florida Water Management District, Summary Status Report, Upper East Coast, Water Use and Supply Development Plan, West Palm Beach, Florida, October, 1980.

Question No.

310.8 The FES-CP presents an estimated 1980 population for 0-5 miles of 1620 and from 5-10 miles of 61,000 (Figure 2.6). The ER-OL has estimates for 1980 of 12,291 and 70,594 for the 0-5 and 5-10 mile rings respectively. (Figure 2.1-6) While the 5-10 mile population estimates are only 15 percent off between the FES-CP and the ER-OL, the 0-5 mile estimates are over 650 percent different.

- a. Are there any additional developments (besides Sand Dollar Villas and Oceana) under construction or being planned on Hutchinson Island? If so, give location, number of units, estimated date of completion, and revise resident and transient population estimates within five miles of the plant to be consistent with the available information.
- b. Revise Table 2.1-12, Land Uses and Land Cover within Five Miles of St. Lucie Unit 2, to reflect these new developments.

Response

- a. There are several new developments which have been constructed, are under construction or being planned within a five mile radius of St Lucie Unit 2. See revised subsection 2.1.2.1.5 of the ER-OL.

The resident and transient populations estimates within five miles of the plant have been revised to reflect the increased growth rate resulting from development activities on Hutchinson Island and the mainland within five miles of the plant. The revised resident and transient populations are given in Tables 2.1-1 and 2.1-5 of the ER-OL.

- b) Table 2.1-12, Land Uses and Land Cover within Five Miles of St Lucie Unit 2, has been changed to reflect the new residential development which has occurred between 1978 and 1981. See revised Table 2.1-12 of the ER-OL.

Question No.

310.9 Tables 2.1-8 and 2.1-9 have references to the methodology in Sections 2.1.3.8.2 and 2.1.3.8 respectively. The tables contain data on transient populations using highways, air and rail. The sections referenced describe water use. Provide the correct references.

Response

Tables 2.1-8 and 2.1-9 have been corrected to cite the correct reference, Section 6.1.4.2.3.

See revised Tables 2.1-8 and 2.1-9.

Question No.

- 310.10 Explain why the 8 percent growth rate was used in projecting transient visitors for the years 1978 to 1985 and the 2.1 percent rate for 1985 to 2030; especially since the 8 percent figure is based on 1977-1978 data and the 2.1 percent rate is based on 1970-1978 data. (6.1.4.2.3)

Response

The Florida Division of Tourism had already developed tourist projection figures for the period 1977-1985. An analysis of these figures shows that an eight percent growth rate was used to make these short term projections. However, if the eight percent growth rate is used to project tourist visitors into the year of 2030, it results in an extraordinarily large number of tourists. Therefore, it was determined that the growth rates between 1970-1978 (based on the available Division of Tourism statistics) would be a more realistic growth rate for the tourist projections from 1985 to 2030.

No ER-OL revisions are required.



Question No.

- 310.11 Provide an estimate of the average annual number of workers required for the operation of St Lucie Unit No. 2. State whether the workers are employees of FPL or contractors. Also provide an estimate of the average annual operating workers' payroll for the unit.

Response

The average annual number of workers required for the operation of St Lucie Unit 2 (over and above those required for St Lucie Unit 1) is as follows:

FP&L employees	150
Guard Force (contracted)	0*
Backfit (permanently contracted)	134
Backfit (temporarily contracted)	400-500**

* No additional guard force personnel are utilized for the two unit site than the present one unit site.

** Contracted during refueling periods only; once every 18 months.

The average annual operating workers payroll is as follows:

FP&L employees	\$3.78 million
Backfit (permanent)	4.05 million
Backfit (temporary)	6 million

No ER-OL revisions are required.



Question No.

- 310.12 Local purchases of goods and services for a nuclear power plant operation may frequently have a significant impact on the local economy. (For these purposes local may be defined as either the host county or the host county and one or more contiguous counties.)

Please provide information on local purchases of goods and services expected to be made by the plant during a typical year of operation. To the extent possible, identify specific types and dollar amounts of these purchases. If it appears that there will be no significant local purchases, explain why.

Response

In order to minimize the cost of goods and services utilized in the operation of the numerous power plants that are owned and operated by FP&L, a Stores Department is maintained by the company to preclude the need for numerous local purchases. This department makes bulk centralized purchases that are used at each plant site in order to economize on large quantity purchases. The local area is defined as St Lucie and Martin Counties.

Based on the information available from the operation of St Lucie Unit 1 on a yearly basis, we expect that local purchases for the operation of St Lucie Unit 2 will be roughly equivalent. The table below summarizes these purchases.

Chemicals	\$128,000
Stationary	40,000
Lube oil	5,000
Miscellaneous	<u>577,000</u>
Total	\$750,000

No ER-OL revisions are required.

Question No.

- 310.13 Construct a table containing dollar estimates of taxes attributable to St Lucie Unit No. 2, for the first five full years of operation. Provide the dollar estimates by type of tax, and by taxing jurisdiction. What percent of the jurisdictions' total tax revenues are represented by the taxes attributable to St Lucie No. 2 plant?

Response

When St Lucie Unit 2 is placed in service, Florida Power & Light Company will be paying both real and personal property taxes on the unit. Based upon projected taxable value and millage rates, and the current Florida laws, the estimated tax yield from St Lucie Unit 2 for the first year in service will be 5.5 million dollars.

The plant will be depreciated (straight-line) at a rate of approximately four percent per year for property tax purposes. New additions to the plant will be added to the tax base as they are completed. The additions, unless substantial, tend to offset depreciation to the extent that the 5.5 million annual projection should be forecast through 1988.

The actual amount of taxes paid will be based on the millage rated as authorized by the County Commission, School Board Members, etc. during the years the unit is energized for commercial use, and the evaluation established following project completion. For these reasons, the actual taxes received by the county may be either less or greater than the amount indicated above.

The authorized 1981 tax revenues for St Lucie County are:

collected	\$25,385,000
to be collected	<u>2,500,000</u>
total	\$27,885,000

Based on these values, the taxes collected attributable to the St Lucie Unit 2 plant amount to 19.7 percent of the taxes collected by St Lucie County.

NO ER-OL revisions are required.

Question No.

310.14 The first paragraph in Section 2.1.2.1.5 confuses growth rates or compound interest and simple interest. It mentions of an "increase of 123.6 percent over the 52 year period, an average annual rate of growth of 2.4 percent". Actually, the annual growth rate of a 123.6 percent increase over 52 years is 1.56 percent.

Correct this and other population growth rates which were calculated by simple rather than compound interest.

Response

The text and supporting tables have been revised so that population growth rates are calculated by compound interest formula.

See revised ER-OL Tables 2.1-6, 2.1-8, 2.1-9, and 2.1-10 and Subsections 2.1.2.1.5, 2.1.2.2.5, 2.1.2.2.6, 2.1.2.2.7, 2.1.2.3.4 and 6.1.4.2.

Question No.

470.1 Reconfirm the 1978 land use data in Table 2.1-11.

Response

To reconfirm the land use data presented in Table 2.1-11, a helicopter survey and ground survey was conducted in May 1981, encompassing the five mile area around St Lucie Unit 2. The results are presented in revised ER-OL Table 2.1-11 and revised subsection 2.1.3.4.



Question No.

470.2 Provide updated information concerning the total meat (Kg/yr), milk (liters/yr), and agricultural (Kg/yr) production within an 80 km (50 mile) radius, if available.

Response

Updated meat, milk and agricultural production data within 80 km of the plant site are presented in revised ER-OL Tables 2.1-13, 2.1-14, 2.1-16, 2.1-17, 2.1-20 and 2.1-21 as well as in revised Subsection 2.1.3.7.

Question No.

470.3 State the fraction of daily intake of cows derived from pasture during grazing season.

Reponse

According to Dr Barney Harris of the University of Florida Dairy Science Department, the following fractions of daily pasture intake apply to milk and beef cattle in the vicinity of the plant:

<u>Animal</u>	<u>Percent Feed from Pasture</u>	<u>Remainder</u>
dairy cows	15-20%	commercial feed
beef cattle	90-100%	commercial feed

Typically dairy animals are confined to relatively small pastures whereas beef animals are allowed to roam over large areas for grazing.

No ER-OL revisions are required.

Question No.

470.4 Provide information on the annual sport fish (Kg/yr) and updated information on commercial fish and shellfish (Kg/yr) caught and consumed annually.

Response

Updated information on annual sport and commercial fish and shellfish caught is presented in the responses to Questions 291.8 and 291.9 of Amendment No. 2 (6/81) of the St Lucie Unit 2 Environmental Report - Operating License. Information on consumption is presented in Section 2.1.3.7.6 of the St Lucie Unit 2 Environmental Report - Operating License.

No ER-OL revisions are required.

Question No.

470.5 Provide an estimate of the number of recreational saltwater users for the year 2000.

Response

ER-OL Table 2.1-26 provides an estimate of the number of recreational salt water users for the year 2000. Table 2.1-26 will be revised subsequent to responses to NRC Questions 310.6 through 310.8.

Question No.

470.6 Tables 2.1-21, 2.1-22, and 2.1-23 do not contain information concerning vegetable production as stated in Assumption 2 of Table 5.2-22; clarify the information used in this analysis.

Response

ER-OL Tables 2.1-17, 2.1-18 and 2.1-19 contain vegetable production data, and have been revised per NRC Question 470.2. Table 5.2-22 has been revised to identify the appropriate tables.

