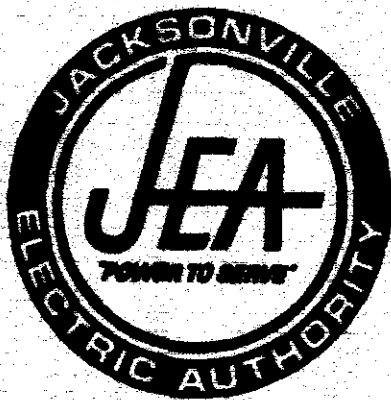
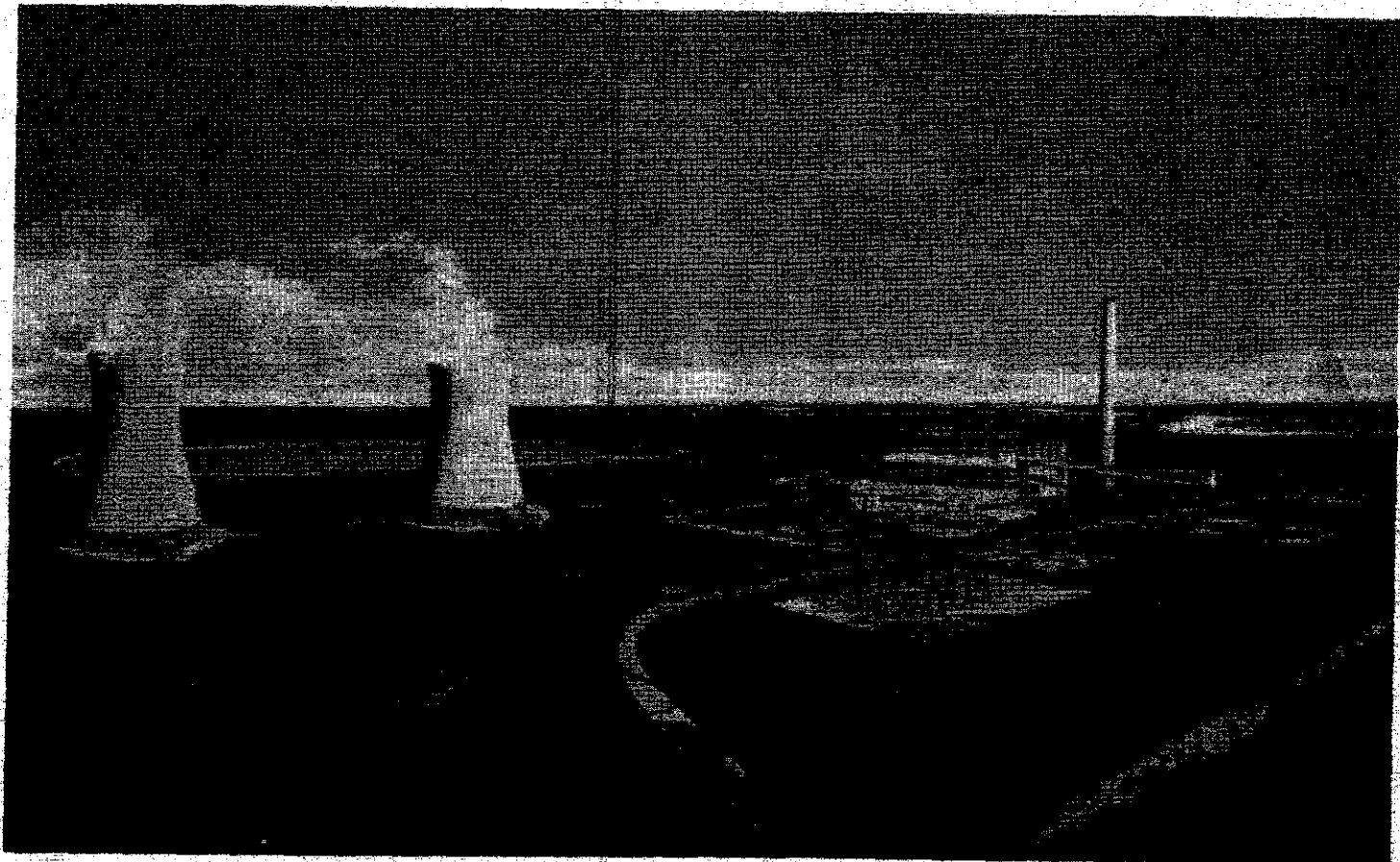




SITE CERTIFICATION APPLICATION ENVIRONMENTAL INFORMATION DOCUMENT

**FOR
JACKSONVILLE ELECTRIC AUTHORITY
ST. JOHNS RIVER POWER PARK
UNITS 1 & 2
1985-1987
VOLUME 1**



envirosphere company
A Division of EBASCO SERVICES INCORPORATED
145 TECHNOLOGY PARK/ATLANTA
NORCROSS, GEORGIA 30092

SITE CERTIFICATION APPLICATION
ENVIRONMENTAL INFORMATION DOCUMENT

FOR

JACKSONVILLE ELECTRIC AUTHORITY

ST. JOHNS RIVER POWER PARK

UNITS 1 & 2

1985-1987

Copy Number: 2 of 35
Prepared For: EDER
Revision Number: 0
Date: FEBRUARY, 1981

Coordinates

The Universal Transverse Mercator (UTM) coordinates are:

3366300 North
446900 East

Proposed Nameplate Generating Capacity

St. Johns River Power Park Unit 1 will have a nameplate generating capacity of 612 megawatts (MW), and is scheduled for commercial operation in December, 1985. St. Johns River Power Park Unit 2 will have a nameplate generating capacity of 612 MW, and is scheduled for commercial operation in May, 1987.

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PREFACE

Since the date this Site Certification Application was originally submitted on February 15, 1981, the St. Johns River Power Park project has received two significant state agency approvals. On June 26, 1981, after a two-day public hearing, the Florida Public Service Commission (FPSC) unanimously certified the need for SJRPP project with in-service dates of 1985 and 1987 for Units 1 and 2, respectively. (A copy of the FPSC order is included as an exhibit to this introduction.) Also, on September 1, 1981, the Florida Governor and Cabinet unanimously entered a Final Land Use Order determining that the SJRPP site is properly zoned and is consistent with all existing land use plans. (A copy of that order is also included as an exhibit to this introduction.)

In reaching its decision to certify the need for SJRPP, the FPSC recognized the utilities' dual need for additional capacity and for economic oil displacement. In the final order, the FPSC stated:

In our evaluation of the need for SJRPP Units 1 and 2 and related facilities, we have considered the principal areas of the electrical need for additional capacity to insure an adequate supply of bulk electrical power and energy to electric consumers and the economic need of providing this bulk power and energy at the lowest possible cost. In addition, the socioeconomic need of reducing the consumption of imported oil in the State of Florida has been considered. Each of these aspects of need for SJRPP 1 and 2 was evaluated with respect to the electrical consumers of JEA, FPL, and peninsular Florida as a whole. (Emphasis added)

As a result of its evaluation, and assuming that the utilities' achieve the FPSC's conservation goals, the FPSC found that JEA and FPL will need the additional generating capacity of SJRPP for reliability purposes by 1991 and 1989, respectively. Because the utilities proposed in-service dates of 1985 and 1987, the FPSC also considered whether advancing the in-service dates of the SJRPP units was the best alternative available for meeting the utilities' immediate needs for oil displacement. The FPSC concluded:

Having considered the record in this matter, we find that a need exists for the construction of St. Johns River Power Park Units 1 and 2 in the time frame proposed by the applicants, in that construction of the units appears to be the best available alternative to the continued use of expensive oil-fired generation, based upon the most reasonable projections of future fuel cost and our appraisal of possible alternatives. (Emphasis added)

This conclusion that SJRPP is the best available alternative is supported by the FPSC's finding that total savings to Peninsular Florida consumers of electricity for the period 1986-2000 would be \$8 billion (nominal dollars) under a set of fuel price assumptions deemed unfavorable to the construction of SJRPP. The FPSC further found that under "expected" fuel price assumptions, total consumer savings for the same period would be \$10 billion (nominal dollars).

Chapters 1 and 8 of this application have been updated to reflect the FPSC findings and the evidence on which the FPSC's need determination was made, including information concerning the impact of contracts entered into by JEA and FPL in February, 1981, for the purchase of firm power from the Southern Company system.

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: JEA/FPL's Application of need for	)	DOCKET NO. 810045-EU
St. John's River Power Park Units 1 and 2	)	ORDER NO. 10108
and related facilities.	)	ISSUED: 6-26-81

The following Commissioners participated in the disposition of this matter:

JOSEPH P. CRESSE, Chairman
GERALD L. GUNTER
KATIE NICHOLS

Pursuant to Notice, the Florida Public Service Commission held public hearings on the foregoing in Tallahassee, Florida on May 22 and 23, 1981. Having considered the entire record herein, the Commission now enters its final Order.

APPEARANCES: Gary P. Sams, Esq., Richard P. Melson, Esq., Hopping, Boyd, Green & Sams, Suite 420, Lewis State Bank Building, Tallahassee, Florida 32301, for Jacksonville Electric Authority and Florida Power and Light Company.

W.O. Birchfield, Esq., Martin, Ade, Birchfield and Johnson, 3000 Independent Square, Jacksonville, Florida 32201, for Jacksonville Chamber of Commerce.

George W. Kent, Jr., Esq., 2105 Park Avenue, Suite 21, Orange Park, Florida 32073, for Clean Air Coalition, Beekshire Drive Community Club and Sea Oats Garden Circle.

Joseph A. McGlothlin, Esq., Michael B. Towney, Esq., and Arthur R. Shell, Jr., Esq., 101 East Gaines Street, Tallahassee, Florida 32301, for the Florida Public Service Commission.

Virginia Daire Reber, Esq., Pamela Johnson, Esq., and Bill Bilenky, Esq., 101 East Gaines Street, Tallahassee, Florida 32301, for the Florida Public Service Commissioners.

ORDER

BY THE COMMISSION:

On February 28, 1981, the Jacksonville Electric Authority (JEA) and Florida Power and Light Company (FPL) filed a joint application with this Commission for the certification of need for St. Johns River Power Park (SJRP) Units 1 and 2. The application encompasses two coal-fired generating units and related facilities, with proposed in-service dates of December, 1985, and May, 1987. The application was made pursuant to the provisions of the Florida Power Plant Siting Act, Chapter 403, Florida Statutes. As required by Section 403.507 (1)(6), Florida Statutes, the Commission's preliminary report on the

need for SJRPP Units 1 and 2 was issued and filed with the Florida Department of Environmental Regulation (FDER) on April 27, 1981. This Order reflects our final determination of the issue of the need for the proposed units.

We construe the "need for power" issue to encompass several aspects of need. In our evaluation of the need for SJRPP Units 1 and 2 and related facilities, we have considered the principal areas of the electrical need for additional capacity to insure an adequate supply of bulk electrical power and energy to electric consumers and the economic need of providing this bulk power and energy at the lowest possible cost. In addition, the socio-economic need of reducing the consumption of imported oil in the State of Florida has been considered. Each of these aspects of need for SJRPP 1 and 2 was evaluated with respect to the electrical consumers of JEA, FPL, and peninsular Florida as a whole.

The Florida Energy Efficiency and Conservation Act also impacts upon the instant application. It states in pertinent part:

The commission shall adopt appropriate goals for increasing the efficiency of energy consumption, specifically including goals designed to increase the conservation of expensive resources, such as petroleum fuels, and to reduce the growth rates of electric consumption and especially weather sensitive peak demand.

Conservation goals pursuant thereto have been established for electrical utilities in Florida. Achievement of these goals would result in a 2.9% average annual compound rate of Peninsular energy growth during the period of 1980 through 1989. The rate of Peninsular summer and winter firm peak load growth for this period would be limited to 2.7% and 2.8%, respectively. Additionally, by 1990 the consumption of oil would be reduced to a level 25% less than that estimated to be consumed in 1980 pursuant to the "State of Florida, 1980 Ten Year Plan".

Should the Commission's FEECA goals governing the growth of seasonal kilowatt demand be achieved, and we are of the opinion that they can reasonably be achieved, additional generating capacity for the purpose of insuring adequate supplies of power and energy to peninsular Florida electric consumers does not appear to be required until 1991. Similarly, JEA and FPL do not appear to require additional generating capacity for reliability purposes until 1991 and 1989 respectively, should they achieve their respective FEECA seasonal kilowatt demand goals. Thus, the salient issue is the determination of the need for SJRPP Units 1 and 2 with in-service dates of December, 1985, and May, 1987, respectively is whether the construction of these units in the time frames proposed represents the lowest cost alternative available to the continued use of expensive oil-fired generation in Peninsular Florida, and in the areas served by JEA and FPL.

On May 22 and 23, 1981, public hearings were conducted in Tallahassee, at which time the Commission undertook a thorough investigation and analysis of the issues pertinent to a final decision of the need for SJRPP Units 1 and 2 to displace oil fired generation in peninsular Florida. The potential alternatives to the continued use of oil to insure an economical supply of bulk electrical power and energy to JEA, FPL, and Peninsular customers which were evaluated included: construction of SJRPP; construction of additional 500 kv transmission lines to Georgia and within Florida, or acceleration of currently planned lines for the purpose of importing increased amounts of "coal-by-wire" power and energy; conversion of existing oil-fired units to coal; coal-oil mix (COM) or coal-water mix; purchases from Georgia Power's Vogtle nuclear units; additional conservation in excess of the FEECA goals; and continued use of imported oil. The economic feasibility of each alternative was assessed, as well as the

impact of each upon the reduction of the consumption of imported oil in the State of Florida.

The proposal to construct SJRPP Units 1 and 2 and each of the alternatives which were evaluated will be discussed below.

PURCHASED POWER, CONSTRUCTION OF ADDITIONAL 500 KV TRANSMISSION LINES TO GEORGIA AND WITHIN FLORIDA AND/OR THE ACCELERATION OF CURRENTLY PLANNED LINES.

FPL has completed negotiations with the Southern Company to increase its purchases of economic coal-generated power from the present level of 100 mw to 300 mw in August of 1980, continuing through 1986. The purchases are subject to availability, other commitments of higher priority, and are thus interruptible if the power is needed by Southern. These economic power purchases are therefore considered to be a non-firm power source and are not included in the determination of FPL system reserves. However, firm coal purchases have been contracted for with Southern as follows:

<u>YEAR</u>	<u>CAPACITY (MW)</u>
1983-1986	350
1987	650
1988-1992	1000

Purchased power, as an alternative, from Seminole Electric Cooperative and Georgia Power Company was evaluated on the basis of economic optimization. Seminole offered to sell JEA the following amounts of power from its new coal-fired Unit 1:

200 mw in 1983 and 1984
400 mw in 1985 through 1990
300 mw in 1991 and 1992
100 mw in 1993 and 1994

Georgia Power offered and JEA could physically take approximately 650 mw when two 500 kv lines presently under construction are in service, but before 500 kv lines planned by FPL to run south from the Jacksonville area are completed in 1985 and 1987, respectively. After the two lines are completed then JEA could take up to 800 mw.

Georgia Power's rate per kilowatt hour is lower than Seminole's early on, but higher in the later years. Other factors which enhance the purchase from Georgia Power were: the availability of larger amounts of power; the purchase can begin immediately, while the Seminole purchase must wait until 1983; a high assurance of continuous supply with GPC; and the fast delivery of GPC's power blends easily into the GPC plan for 500 kv ties between Georgia and Florida. Also, additional high voltage lines would be needed for JEA to receive power from Seminole in significant amounts. As purchases from either Seminole or GPC are generically equivalent, purchase from one would eliminate a purchase from the other without altering the time frame of SJRPP's construction. The above firm purchases are incorporated in the calculation of FPL's generating system reserve.

JEA's "coal-by-wire" contract with Southern provides for the following power purchases:

	<u>Schedule E</u> <u>(Non-Firm)</u> <u>(MW)</u>	<u>Unit Power Purchases</u> <u>(Firm)</u> <u>(MW)</u>	<u>Total</u> <u>(MW)</u>
2/1980 - 5/1980	50	0	50
6/1980 - 7/1982	100	0	100
8/1982 - 12/1982	300	0	300
1983 - 1986	300	300	600
1987	0	500	500
1988 - 1992	0	400	400

In order to accommodate the firm and non-firm purchases, FPL must expand its high voltage (500 kv) transmission system. Two 500 kv lines are being constructed from Hatch (in Georgia) to Duval (an FPL transmission substation) with scheduled in-service dates of August, 1982, and January, 1983, respectively. They are being built jointly with JEA. Upon completion of the first Duval-Hatch 500 kv line, FPL will increase its purchase from Southern to 300 mw (350 mw firm; 300 mw scheduled) when the second line is completed in January 1983. Additional 500 kv transmission capacity is planned south of Duval to fully utilize the coal power available to FPL.

Plans call for one 500 kv line from Martin to Poinsett in 1984; one 500 kv line from Duval to Poinsett in 1985 which will complete a 500 kv route from the Georgia state line to Miami. A second 500 kv route will be completed in 1987 with the completion of the second Duval-Poinsett and the Poinsett-Midway 500 kv lines. Following completion of these lines FPL will increase its purchases from Southern to 1,000 mw in January, 1988.

Power from the proposed SJRPP units is more economical than "unit power" purchases from Southern because of Southern's high cost of capital, profit margin, transmission line losses, and the fact that purchased capacity is always delivered from Southern's newest units having the highest fixed charges. In addition, the availability and potential cost of purchased power after 1992 is uncertain, as Southern refuses to commit to firm sales after that date and because any purchases after 1992 would probably continue to be from Southern's highest cost coal units.

CONVERSION OF EXISTING OIL-FIRED UNITS TO COAL OR OTHER FUELS.

Conversion of JEA's existing units to use a fuel other than oil, the purchase of coal-derived energy from other utilities and purchase of a share in a generating plant constructed by other utilities were considered as possible alternatives to actual construction of SJRPP Units 1 and 2. However, a number of problems must be identified with reference to these alternatives. The continued availability of natural gas as a boiler fuel in substantial quantities at a reasonable price was found to be too uncertain. Large scale conversion of an existing unit to coal would involve construction of a new coal unloading, storage and handling facility, an ash handling and disposal system, substantial expansion of the flue gas handling and cleanup system and extensive reconstruction of the boiler room. In addition, the added investment would be applied to old units having a life expectancy much shorter than that of a new unit. Perhaps most importantly, the effect of such a conversion would be to decrease, rather than increase, the generating capacity.

In their presentation, the applicants conducted an economic analysis of annual costs to determine the feasibility of conversion of the three existing oil-fired JEA Northside units. Total capital costs including interest during construction to convert the units were estimated to be as follows:

Northside Units 1, 2, and 3	\$1,353.4 million
Northside Unit 3 only	\$ 617.2 million

The maximum output of the units was estimated to be reduced accordingly:

	Maximum Net Output (mw)	After Conver- sion to Coal
Northside Unit 1	262.5	149
Northside Unit 2	262.4	149
Northside Unit 3	499.4	283
TOTAL	1,024.2	581

The applicants estimated that the full-load heat rates would be increased by approximately 11% by the conversion. Evaluation of the

conversion of Northside's three units or Unit 3 alone, with deferral of SJRPP, indicated that such a conversion would result in a substantial increase in JEA's cost of power production.

This conclusion is reinforced by the result of certain analyses performed by FPL regarding the possible conversion of 800 mw and 400 mw class units to coal on their system. Using the PROMOD model FPL conducted promotion costing computer simulation runs based upon the assumption that conversion would result in a 10% derating of the 400 mw units and a 20% derating of the 800 mw units. The results of the PROMOD analyses indicate that (1) conversion would accelerate FPL need for additional capacity and (2) construction of SJRPP Units 1 and 2 would still be needed to economically displace generation by oil.

Conversion of oil-fired units to use of a coal oil-mixture would represent only a 50% solution to the oil displacement problem. It is not a proven concept and was not evaluated in depth. The uncertainties involved in adapting the JEA boilers to burn such a mixture also contributed to its elimination as a presently viable option.

PURCHASE FROM GEORGIA POWER'S VOGTLE NUCLEAR UNITS

The final alternative to the construction of SJRPP 1 and 2 considered was the possibility of purchasing part ownership of Georgia Power Company's Plant Vogtle which involves two nuclear units in the 1,150 mw class totaling 150 mw. However, its estimated cost of production for 550 mw, comparable to SJRPP, including interest during construction would total \$1522 billion compared to \$983 million for SJRPP. This much higher initial capital cost would lead to higher total capital and energy costs in the early years of operation, thereby lessening the attractiveness of Plant Vogtle as an alternative to SJRPP.

CONSTRUCTION OF SJRPP UNITS 1 and 2

The units which the applicants propose to construct are two coal-fired generators of the 550 mw class. The applicants demonstrated that certain economies of scale are associated with the joint ownership of such large units which enhance the economic viability of the proposal. In addition, the joint venture will make maximum utilization of JEA's ability to raise capital at relatively low costs, thereby lowering the fixed costs associated with the unit. The ability to adapt the boilers to the use of oil or gas has been engineered into the design of the units, so that conversion, if it proves necessary, will be less expensive than for a unit designed to burn one fuel exclusively.

To assess the economic viability of the proposal, it is necessary to make certain assumptions concerning the future relationships between the costs of coal and oil during the life of the proposed units. Various scenarios were presented and assessed during this proceeding. Each scenario included assumptions as to the units' heat rate and capacity factors over time; the cost of capital which would be associated with the construction of the units; and, perhaps most critically, the relationship between the costs of oil and coal during the life of the project. One set of assumptions concerning future escalation rates of fuel which we regard as reasonable and useful for purposes of the analysis are those formulated by Data Resources, Inc. Under this set of assumptions, the Commission staff computed the "expected case" savings in fuel costs for FPL associated with the construction of SJRPP 1 and 2 to reach \$29,604,000 in 1986; \$125,717,000 in 1990; and \$654,262,000 in the year 2000. The corresponding fuel savings which would be realized by JEA under these assumptions would amount to \$95,985,000 in 1986; \$235,055,000 in 1990; and \$804,027,000 in the year 2000. In total, Peninsular Florida would realize an estimated \$10 billion (nominal dollars) in savings under this "expected case" scenario.

We also examined a "worst case" scenario utilizing a higher estimated cost of capital and estimates of fuel escalation rates compiled by Chase Econometrics, which project a smaller differential between the costs of coal and oil and are thus less favorable to the application in terms of economic justification. Under these "worst case" assumptions, JEA's projected fuel savings would be \$94,298,000 in 1986; \$254,693,000 in 1990; and \$558,887 in the year 2000. FPL's savings would be \$22,236,000 in 1986; \$134,190,000 in 1990; and \$429,889,000 in the year 2000. Total peninsular savings for the period 1986-200 under this "worst case" scenario would be \$8 billion (nominal dollars).

Having considered the record in this matter, we find that a need exists for the construction of St. Johns River Power Park Units 1 and 2 in the time frame proposed by the applicants, in that construction of the units appears to be the best available alternative to the continued use of expensive oil-fired generation, based upon the most reasonable projections of future fuel cost and our appraisal of possible alternatives. While we have therefore determined that we should certify the need for the units, we note in passing that the cost effectiveness of one aspect of the overall proposal--the building of coal transloading facilities on Blount Island--was questioned during the hearing in this matter. Our concern over this aspect does not serve to overcome the economic benefits which we believe are properly associated with the overall project; however, we reserve jurisdiction to review the prudence of the Blount Island facilities in the context of ratesetting proceedings. Accordingly, it is

ORDERED by the Florida Public Service Commission that all findings of fact contained herein are hereby approved. It is further

ORDERED that the application of Jacksonville Electric Authority and Florida Power and Light Company for certification of the need for St. Johns River Power Park Units 1 and 2 be and the same is hereby granted. It is further

ORDERED that this Order, together with the attached report, which we adopt and incorporate by reference, be submitted to the Department of Environmental Regulation.

By ORDER of the Florida Public Service Commission, this 26th day of June 1981.

(S E A L)

JAM:ARS


STEVE TRIBBLE
COMMISSION CLERK

State of Florida

Commissioners:
JOSEPH P. CRESSE, CHAIRMAN
GERALD L. (JERRY) GUNTER
SUSAN WAGNER LEISNER
JOHN R. MARKS, III
KATIE NICHOLS



JOSEPH D. JENKINS
Director
Electric and Gas Department
(904) 485-8501

Public Service Commission

June 26, 1981

Mr. Hamilton S. Oven, Jr.
Power Plant Siting
Department of Environmental Regulation
2562 Executive Center Circle, East
Montgomery Building
Tallahassee, Florida 32301

Dear Mr. Oven:

Transmitted herewith are five (5) copies of the Florida Public Service Commission's evaluation of the Jacksonville Electric Authority and Florida Power and Light Company's application for certification of need for the coal fired St. Johns River Power Park Units No. 1 and 2. This represents our final report and is prepared pursuant to Chapter 403.507 F.S. Should you have any questions regarding this report, please do not hesitate to contact us.

Sincerely yours,

A handwritten signature in cursive script, reading "Larry Broderick".

Assistant Director, Electric and Gas Department

A handwritten signature in cursive script, reading "D. C. [unclear]".
Executive Director

B/S/s

FLETCHER BUILDING

• 101 EAST GAINES STREET •

TALLAHASSEE 32301

"An Affirmative Action/Equal Opportunity Employer"

M E M O R A N D U M

May 28, 1981

TO : STEVE TRIBBLE, COMMISSION CLERK
FROM: ELECTRIC & GAS DEPARTMENT (TRAPP, FOXX) *RLT TO F JDJ*
RE : PETITION OF JACKSONVILLE ELECTRIC AUTHORITY AND FLORIDA
POWER & LIGHT COMPANY TO DETERMINE THE NEED FOR ST. JOHNS
RIVER POWER PARK UNITS NO. 1 AND 2 AND RELATED FACILITIES.

Issues

- I. The salient issue in this case is which of the following alternatives will minimize the future cost of electricity to the customers of the Jacksonville Electric Authority (JEA) and Florida Power & Light Company (FPL):
 1. Construction of St. Johns River Power Park Units 1 and 2 (SJRPP 1 and 2).
 2. Construction of additional 500 KV transmission lines to Georgia and within Florida and/or the acceleration of currently planned lines to purchase an additional 1000 MW of firm coal-by-wire (CBW) from 1984 through 1989, 500 MW in 1990, or purchase of 470 MW of Georgia Power's Vogtle Nuclear Units 1 and 2 (1150 MW each) with scheduled in-service dates of 5/85 and 11/87.
 3. Conversion of existing oil fired units to coal, coal-oil-mix (COM), or coal-water-mix.

4. Construction of additional 500 KV transmission lines to Georgia and within Florida to purchase coal fired energy on a non-firm (economy) basis, possibly on a split-the-savings basis.
 5. Additional conservation in excess of the FEECA goals.
 6. Continue to burn imported oil.
- II. Whether the Blount Island coal transloading facilities associated with SJRPP 1 and 2 are needed.
- III. Whether the fuel procurement methodology utilized by JEA/FPL is structured in a manner conducive to the efficient and economical supply of coal to SJRPP 1 and 2.

Recommendations:

- I. The Electric & Gas Department suggests that the Commission certify the need for the proposed jointly-owned JEA/FPL St. Johns River Power Park Units 1 and 2 and associated transmission facilities.
 - II. The Electric & Gas Department suggests that the Commission reserve the right to review in future rate proceedings the prudence of expenditures related to the construction and operation of SJRPP 1 and 2 and, in particular, those expenditures related to the proposed Blount Island coal transloading facilities associated with SJRPP 1 and 2.
-

MEMORANDUM - STEVE TRIBBLE
MAY 28, 1981
PAGE 3

III. The Electric & Gas Department is of the opinion that the methodology employed by JEA/FPL to identify available cost reserves, establish a group of qualified suppliers, select a preferred group of suppliers and initiate the coal contracting process appears to be one of the most comprehensive and sophisticated approaches to coal procurement employed by a Florida utility to date.

Discussion

I. Pursuant to the record in this case, the construction of SJRPP 1 and 2 appears to be the most economical alternative available at this time for the purpose of reducing the consumption of oil in Peninsular Florida, JEA, and FPL. This opinion is conditioned upon the materialization of current projections of coal and oil prices and is based on the information available at this time regarding the estimated cost and uncertainty associated with potential alternatives to the construction of SJRPP 1 and 2. Late-filed exhibit 25 (a copy of which is attached) illustrates the projected savings to electric customers in Peninsular Florida, JEA, and FPL should SJRPP 1 and 2 be constructed as an alternative to the continued use of oil fired generation. Estimated Peninsular savings associated with the construction of SJRPP 1 and 2 range from approximately \$8 billion (nominal dollars) under the "worst case" scenario, to \$10 billion (nominal dollars) under the "expected case" scenario for the period of 1986 through 2000.

MEMORANDUM - STEVE TRIBBLE
MAY 28, 1981
PAGE 4

- II. Based on the record in this case, it appears that the construction and operation of the Blount Island coal transloading facilities, as currently proposed, is not cost-justified. Regardless of this, however, it appears that the economics relative to the construction of SJRPP 1 and 2 project, as a whole, is cost-justified, and warrants certification.

RLT:lkf

CC: Chairman Cresse
Commissioner Gunter
Commissioner Leisner
Commissioner Marks
Commissioner Nichols
Mr. David Swafford
Mr. William Talbott

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May 27, 1981

Joseph A. McGlothlin, Esquire
Staff Counsel
Public Service Commission
101 E. Gaines Street
Tallahassee, Florida 32301

Re: St. Johns River Power Park Units #1 and #2
Docket No. 810045-EU

Dear Joe:

Enclosed is late-filed Exhibit 25 (consisting of 10 sheets) and late-filed Exhibit 25A (consisting of 1 sheet labeled Sheet 5A).

These typed exhibits should be substituted for the handwritten version of late-filed Exhibit 25 which was submitted just prior to the close of the hearing in this docket on May 23. The typed exhibit includes a few minor corrections to the handwritten exhibit previously filed.

Concurrently herewith, we are filing the original and 16 copies of these exhibits with the Commission's clerk, and are furnishing a copy by hand to Joe Jenkins.

Also, by copy of this letter we are furnishing these exhibits to each Intervenor, or its counsel.

If you have any questions concerning these exhibits, please give me a call.

Very truly yours,

Richard D. Melson

Richard D. Melson

RDM/eb
Enclosures

cc: Joe Jenkins
All Intervenors

PROJECTED SURPP SAVINGS - COMPOSITE - "WORST CASE" SCENARIO

Year	FUEL			CAPITAL + O&M			SAVINGS		BLMONT IS. & TRANS.		SAVINGS	
	Cost of Oil \$/Bbl	Cost of Coal \$/Tonn	Fuel Savings \$/kwh	Investment Revenue 000 \$	Annual Expense 000 \$	Total Annual Costs 000 \$	Total Savings 000 \$	Total Annual Cost 000 \$	Total Annual Cost \$/kwh	Total Savings 000 \$	Total Annual Cost \$/kwh	Total Net Savings 000 \$
1981	27.90	4.68	38.76	1.64	197,634	197,634	197,634	197,634	197,634	197,634	197,634	197,634
1982	29.55	4.96	42.53	1.79	326,306	326,306	326,306	326,306	326,306	326,306	326,306	326,306
1983	34.00	5.70	46.64	1.96	532,196	532,196	532,196	532,196	532,196	532,196	532,196	532,196
1984	38.00	6.37	50.79	2.14	629,327	629,327	629,327	629,327	629,327	629,327	629,327	629,327
1985	44.00	7.38	55.37	2.33	724,434	724,434	724,434	724,434	724,434	724,434	724,434	724,434
1986	50.00	8.39	60.04	2.53	851,942	851,942	851,942	851,942	851,942	851,942	851,942	851,942
1987	55.00	9.23	66.02	2.78	977,379	977,379	977,379	977,379	977,379	977,379	977,379	977,379
1988	65.00	10.90	71.45	3.01	1,097,722	1,097,722	1,097,722	1,097,722	1,097,722	1,097,722	1,097,722	1,097,722
1989	73.00	12.58	77.32	3.25	1,175,013	1,175,013	1,175,013	1,175,013	1,175,013	1,175,013	1,175,013	1,175,013
1990	85.00	14.26	83.73	3.52	1,255,282	1,255,282	1,255,282	1,255,282	1,255,282	1,255,282	1,255,282	1,255,282
1991	90.00	15.10	90.35	3.80	1,332,852	1,332,852	1,332,852	1,332,852	1,332,852	1,332,852	1,332,852	1,332,852
1992	100.00	16.77	97.63	4.11	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389
1993	105.00	17.61	105.53	4.44	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389
1994	115.00	19.29	114.08	4.80	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389
1995	120.00	20.13	123.28	5.19	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389
1996	130.00	21.81	133.27	5.61	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389
1997	140.00	23.48	144.07	6.06	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389
1998	150.00	25.16	155.72	6.55	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389
1999	160.00	26.84	168.32	7.08	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389
2000	165.00	27.68	189.94	7.66	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389	1,359,389

Total 8,038,882

6. Composite totals differ from sum of JEA and FPL totals due to rounding.

5. Cost of Capital - JEA - 10.5%

FPL - Debt - 16%
Preferred - 14%
Equity - 17%

6. Ownership - JEA 80%

FPL 20%

7. Blount Island Cost - JEA 201.6 (includes transmission)

FPL 28.8

Total 230.4 million

JEA
PROJECTED SJRPP SAVINGS - "WORST CASE" SCENARIO
1986 - 2000

Year	(1) Cost of Oil \$/bbl	(2) \$/bbl	(3) \$/ton	(4) \$/bbl	(5) Fuel Saving \$/bbl	(6) JEA's SJRPP Output 000 bbl	(7) Total Fuel Saving 000 \$	(8) Net Debt Service at 10.5% 000 \$	(9) Renewal and Replacement Fund 000 \$	(10) Plant OCM 000 \$	(11) Total (8)+(9)+(10) 000 \$	(12) Total \$/bbl	(13) Net Saving 000 \$	(14) Net Saving \$/bbl	(15) Blount Island & Trans. \$/bbl	(16) Net Saving \$/bbl	(17) Total Saving 000 \$
1981	27.90	4.84	38.76	1.63													
1982	29.55	5.15	42.53	1.79													
1983	34.00	5.92	46.64	1.96													
1984	38.00	6.62	50.79	2.14													
1985	44.00	7.66	55.37	2.33													
1986	50.00	8.71	60.04	2.53	6.18	1,686,300	104,213	-	-	9,915	9,915	.59	94,298	5.59	-	5.59	94,298
1987	55.00	9.58	66.02	2.78	6.80	2,529,450	172,003	-	-	16,062	16,062	.64	155,941	6.17	-	6.17	155,941
1988	65.00	11.32	71.45	3.01	8.31	3,372,600	280,263	99,127	15,489	21,102	137,718	4.08	142,545	4.23	.47	3.76	126,568
1989	75.00	13.06	77.32	3.25	9.81	3,372,600	330,852	86,736	15,489	24,958	127,183	3.77	203,669	6.04	.47	5.57	187,692
1990	85.00	14.81	83.73	3.52	11.29	3,372,600	380,767	83,638	15,489	26,947	126,074	3.74	254,693	7.55	.47	7.08	238,716
1991	90.00	15.68	90.35	3.80	11.88	3,372,600	400,665	80,540	15,489	29,106	125,135	3.71	275,530	8.17	.47	7.70	259,553
1992	100.00	17.42	97.63	4.11	13.31	3,372,600	448,893	78,391	15,489	31,413	125,311	3.72	323,560	9.59	.47	9.12	307,603
1993	105.00	18.29	105.53	4.44	13.85	3,372,600	467,105	78,391	15,489	31,962	127,842	3.79	339,263	10.06	.47	9.59	323,266
1994	115.00	20.03	114.06	4.80	15.23	3,372,600	513,647	78,391	15,489	36,660	130,540	3.87	383,107	11.36	.47	10.89	367,110
1995	120.00	20.90	121.28	5.19	15.71	3,372,600	529,835	78,391	15,489	39,594	133,474	3.96	396,361	11.75	.47	11.28	390,304
1996	130.00	22.64	131.27	5.61	17.03	3,372,600	574,354	78,391	15,489	42,765	136,645	4.05	437,709	12.98	.47	12.51	421,712
1997	140.00	24.39	144.07	6.06	18.33	3,372,600	618,198	78,391	15,489	46,171	140,051	4.15	478,147	14.18	.47	13.71	462,370
1998	150.00	26.13	155.72	6.55	19.58	3,372,600	660,355	78,391	15,489	49,881	143,761	4.26	516,594	15.32	.47	14.85	500,617
1999	160.00	27.87	168.32	7.08	20.79	3,372,600	701,164	78,391	15,489	53,860	147,740	4.38	553,424	16.41	.47	15.94	537,447
2000	165.00	28.74	181.94	7.66	21.08	3,372,600	710,944	78,391	15,409	58,177	152,057	4.51	558,887	16.57	.47	16.10	542,910
																	Total 4,906,047

Assumptions

1. Fuel escalation rates based on October, 1980 Chase Econometrics study as shown in Exhibit RDC-6.
2. Capacity factor of 70%.
3. Heat rates of 10,100 for SJRPP and 10,800 for oil.
4. JEA cost of capital of 10.5%.
5. Interest during construction capitalized through 1997.
6. Renewal and replacement fund requirements based on 12.5% of debt service.
7. OCM escalated at 8% annually.
8. 50% Blount Island and 100% transmission cost, with I.D.C. of \$147.5 million.

Assumptions

West Rates - Oil 10,000 Btu/kwh
 Coal 10,100 Btu/kwh
 Fuel Cost - Chease econometric forecast per NRC-6
 O&M Cost - provided by JEA
 RFP Ownership (20 MW - Buyback 130 MW) Total \$50
 Capacity Factor - 70%

Derivation of Blount Island & SJRPP Investment Revenue Requirements is attached

FPL
DETAIL - TOTAL "WORST CASE" ANNUAL COSTS

Year	Straight Line Depreciation	Operating & Maintenance Expenses	Return (1)	Other Operating Expenses (2)	FPL Payment - JEA Debt Service	FPL Payment Renewal & (3) Repl. Fund	Total FPL Revenue Requirements	Total FPL Annual Costs w/o O&M
	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)
1986	6,591	9,915	33,060	21,450			71,016	61,101
1987	11,359	16,062	55,756	35,333			118,510	102,448
1988	11,359	23,102	53,161	33,330	83,638	9,293	213,883	190,781
1989	11,359	24,957	50,299	31,955	83,638	9,293	211,501	186,544
1990	11,359	26,947	47,589	30,652	83,638	9,293	209,478	182,531
1991	11,359	29,106	45,017	29,416	83,638	9,293	207,829	178,723
1992	11,359	31,433	42,570	28,242	83,638	9,293	206,535	175,102
1993	11,359	33,962	40,239	27,121	83,638	9,293	205,612	171,650
1994	11,359	36,660	38,013	26,049	83,638	9,293	205,012	168,352
1995	11,359	39,594	35,880	25,026	83,638	9,293	204,790	165,196
1996	11,359	42,765	33,834	24,044	83,638	9,293	204,933	162,168
1997	11,359	46,171	31,868	23,100	83,638	9,293	205,429	159,258
1998	11,359	49,880	29,974	22,188	83,638	9,293	206,332	156,412
1999	11,359	53,860	28,137	21,305	83,638	9,293	207,592	153,732
2000	11,359	58,177	26,320	20,432	83,638	9,293	209,219	151,042

(1) Calculated based on capital costs as follows: Debt 16%; Preferred 14%; Equity 17%

(2) Includes income taxes and taxes other than income taxes.

(3) Based on a 10.5% interest rate on JEA bonds

FPL
BLOUNT ISLAND - "WORST CASE" COST

	FPL Capital Revenue Requirement*	FPL Payment JEA Debt Service	FPL Payment Renewal & Replace. Fund	Total 000 \$	
					¢/kwh
1986	8,632	0	0	8,632	.51
1987	8,230	0	0	8,230	.33
1988	7,872	6,590	732	15,194	.45
1989	7,533	6,590	732	14,855	.43
1990	7,211	6,590	732	14,533	.42
1991	6,906	6,590	732	14,228	.41
1992	6,615	6,590	732	13,937	.41
1993	6,337	6,590	732	13,659	.40
1994	6,072	6,590	732	13,394	.39
1995	5,318	6,590	732	13,140	.38
1996	5,574	6,590	732	12,896	.38
1997	5,339	6,590	732	12,661	.37
1998	5,113	6,590	732	12,435	.36
1999	4,892	6,590	732	12,214	.36
2000	4,671	6,590	732	11,993	.35

Assumptions:

*FPL's portion of Blount Island Total Cost = 28.8 million

Capital cost assumptions are based on: Debt 16%
Preferred 14%
Equity 17%

PROJECTED SJRPP SAVINGS - COMPOSITE "EXPECTED CASE" SCENARIO

1. Fuel - DRI fuel escalation rates per PSC staff	
2. Capacity Factor - 70%	
3. Heat rates - SJAPP - 10,100 Btu/kwh	
	FPL - 10,000 Btu/kwh
4. O&M Cost - escalated at 8% annually	
	JEA OII - 10,800 Btu/kwh
	JEA Cost - escalated at 8% annually
5. Cost of Capital - JEA - 90%	
	FPL - Debt - 11%
	Preferred - 10%
	Equity - 17%
6. Ownership - JEA 80%	
	FPL 20%
7. Blount Island Cost - JEA 201.6 (includes transmission)	
	FPL 28.9
	Total 230.4 million
8. Composite totals differ from sum of JEA and FPL totals due to rounding.	
	Total 10,080,810

JEA
PROJECTED SJRPP SAVINGS - "EXPECTED CASE" SCENARIO
1986 - 2000

Year	(1) \$/mm	(2) \$/hwh	(3) \$/ton	(4) \$/hwh	(5) \$/hwh	(6) hwh	(7) \$/hwh	(8) \$/hwh	(9) \$/hwh	(10) \$/hwh	(11) \$/hwh	(12) \$/hwh	(13) \$/hwh	(14) \$/hwh	(15) \$/hwh	(16) \$/hwh	(17) \$/hwh
	Cost of Oil	Cost of Coal	Cost of Coal	Cost of Coal	Fuel Saving	JEA's SJRPP Output	Total Fuel Saving	Net Debt Service at 9%	JEA SJRPP Fixed Costs and O&M	Renewal and Replacement	O&M	Total	Net Saving (7)-(11)	Net Saving	Blount Island & Trans.	Net Saving	Total Saving
1981	29.85	5.20	46.56	1.96	6.28	1,606,300	105,900	-	-	-	9,915	-59	95,985	5.69	-	5.69	95,985
1982	34.33	5.98	51.12	2.15	7.11	2,529,450	179,840	-	-	-	16,062	-64	163,778	6.47	-	6.47	163,778
1983	38.58	6.72	56.16	2.36	8.03	3,372,600	270,820	83,086	12,604	12,604	23,102	3.52	152,028	4.51	.39	4.12	138,925
1984	43.13	7.51	62.64	2.64	9.09	3,372,600	306,569	73,105	12,604	12,604	24,958	3.29	195,702	5.78	.39	5.39	182,594
1985	48.61	8.47	70.80	2.98	10.25	3,372,600	345,692	71,086	12,604	12,604	26,947	3.28	235,055	6.97	.39	6.58	221,952
1986	55.06	9.59	78.72	3.31	11.52	3,372,600	388,524	68,868	12,604	12,604	29,106	3.28	277,946	8.24	.39	7.85	264,843
1987	61.75	10.76	86.64	3.65	12.89	3,372,600	434,728	66,550	12,604	12,604	31,433	3.28	324,041	9.61	.39	9.22	310,938
1988	69.13	12.04	95.28	4.01	14.42	3,372,600	486,329	66,147	12,604	12,604	33,962	3.34	373,616	11.08	.39	10.69	360,533
1989	77.38	13.48	104.40	4.39	16.12	3,372,600	543,663	66,147	12,604	12,604	36,660	3.42	428,252	12.70	.39	12.31	415,149
1990	86.49	15.06	114.24	4.81	18.03	3,372,600	608,080	66,147	12,604	12,604	39,594	3.51	489,735	14.52	.39	14.13	476,432
1991	96.10	16.74	124.08	5.22	19.85	3,372,600	679,493	66,147	12,604	12,604	42,765	3.60	547,945	16.25	.39	15.86	514,851
1992	106.58	18.56	134.54	5.67	21.63	3,372,600	759,493	66,147	12,604	12,604	46,171	3.70	604,571	17.93	.39	17.54	591,408
1993	118.17	20.59	146.40	6.16	23.55	3,372,600	844,060	66,147	12,604	12,604	49,881	3.81	665,615	19.74	.39	19.35	652,512
1994	130.94	22.81	158.88	6.69	25.62	3,372,600	940,955	66,147	12,604	12,604	53,860	3.93	731,449	21.69	.39	21.30	718,346
1995	145.06	25.27	172.08	7.24	27.90	3,372,600	1,040,955	66,147	12,604	12,604	58,177	4.06	804,027	23.84	.39	23.45	790,924
1996	158.53	27.61	184.32	7.76													
1997	171.86	29.94	197.52	8.31													
1998	186.31	32.45	211.44	8.90													
1999	201.93	35.17	226.80	9.55													
2000	218.92	38.13	243.12	10.23													
																	Total 5,919,415

Assumptions:

1. Fuel escalation rates based on Data Resources, Inc. study provided by PSC staff.
2. Capacity factor of 70%.
3. Heat rates of 10,100 for SJRPP and 10,800 for oil.
4. JEA cost of capital of 9%.
5. Interest during construction capitalized through 1987.
6. Blount Island and replacement fund requirements based on 12.5% of debt service.
7. O&M escalated at 4% annually.
8. Six Blount Island and 100% transmission cost, with I.D.C. of \$138.5 million.

FPL
PROJECTED SJRPP SAVINGS - "EXPECTED CASE" SCENARIO

Year	FUEL			FPL's		Investment		CAPITAL & O&M		SAVINGS		BLOUNT ISLAND COST *		NET SAVINGS	
	Cost of Oil \$/BBL	Cost of Oil \$/wh	Cost of Coal \$/ton	Cost of Coal \$/wh	Fuel Savings \$/wh	Total Fuel Savings \$/wh	Requirements 000 \$	Revenue 000 \$	Annual Expense 000 \$	Total Fixed Costs 000 \$	Total Savings 000 \$	Total Annual Cost 000 \$	Total Net Savings 000 \$	Total Net Savings \$/wh	Total Net Savings \$/wh
1981	29.85	4.81	46.54	1.96											
1982	34.33	5.53	51.12	2.15											
1983	38.58	6.22	56.16	2.36											
1984	43.13	6.96	62.64	2.64											
1985	48.61	7.84	70.80	2.90											
1986	55.06	8.88	78.72	3.31	5.57	1,686,300	93,927	54,408	9,915	64,323	29,604	1,76	7,687	21,917	1.30
1987	61.75	9.95	86.64	3.65	6.30	2,529,300	159,359	91,161	15,062	107,223	52,136	2,06	7,320	44,816	1.77
1988	69.13	11.15	95.28	4.01	7.14	3,372,600	240,804	162,714	23,102	185,816	54,788	1,63	13,015	41,973	1.24
1989	77.38	12.40	104.40	4.39	8.09	3,372,600	272,843	159,056	24,957	184,013	88,830	2,63	12,724	76,106	2.25
1990	86.49	13.95	114.24	4.81	9.14	3,372,600	308,256	155,592	26,947	182,539	125,717	3.73	12,444	113,273	3.36
1991	96.10	15.50	124.08	5.22	10.28	3,372,600	346,703	152,305	29,106	181,411	165,292	4.90	12,182	153,110	4.54
1992	106.58	17.19	134.64	5.67	11.52	3,372,600	388,524	149,179	31,431	180,612	207,912	6.16	11,931	195,981	5.81
1993	118.17	19.06	146.40	6.16	12.90	3,372,600	435,065	146,199	33,962	180,161	254,904	7.56	11,892	243,012	7.21
1994	130.94	21.12	158.88	6.69	14.43	3,372,600	486,666	143,352	36,662	180,012	306,654	9.09	11,461	295,193	8.75
1995	145.08	23.40	172.00	7.24	16.16	3,372,600	545,012	140,627	39,594	180,221	364,792	10.82	11,242	353,549	10.49
1996	158.53	25.57	184.32	7.76	17.81	3,372,600	600,660	138,013	42,765	180,778	419,882	12.45	11,032	408,850	12.12
1997	171.86	27.72	197.52	8.31	19.41	3,372,600	654,632	135,500	46,171	181,671	472,951	14.02	10,810	462,121	13.70
1998	186.31	30.05	211.44	8.90	21.15	3,372,600	713,305	133,079	49,880	182,959	530,346	15.73	10,634	519,712	15.41
1999	201.93	32.57	226.80	9.55	23.02	3,372,600	776,372	130,731	53,860	184,591	591,781	17.55	10,443	581,338	17.24
2000	218.92	35.31	243.12	10.23	25.08	3,372,600	845,848	128,409	58,177	186,586	659,262	19.55	10,253	649,009	19.25
															Total 4,159,960

Assumptions:

Heat Rates - Oil 10,000 Btu/wh
Coal 10,100 Btu/wh
Fuel Cost - DPJ fuel calculation rates per FPSC staff
O&M Cost - provided by JEA
FPL Ownership (220 MW - Buyback 330 MW) total 550 MW
Capacity Factor - 70%

*Derivation of Blount Island & SJRPP Investment Revenue Requirements is attached.

Year	FPL DETAIL - TOTAL "EXPECTED" ANNUAL COSTS					
	Straight Line Depreciation	Operating & Maintenance Expenses	Return (1)	Other Operating Expenses (2)	FPL Payment - JEA Debt (3) Service	FPL Payment - Renewal & (3) Repl. Fund
	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)
1906	6,591	9,915	27,141	20,676		
1987	11,359	16,062	45,775	34,027		64,323
1988	11,359	23,102	43,644	32,085	68,063	107,223
1989	11,359	24,957	41,295	30,776	68,063	185,816
1990	11,359	26,947	39,070	29,537	68,063	184,013
1991	11,359	29,106	36,958	28,362	68,063	182,539
1992	11,359	31,433	34,950	27,244	68,063	181,411
1993	11,359	33,962	33,035	26,179	68,063	180,612
1994	11,359	36,660	31,207	25,160	68,063	180,161
1995	11,359	39,594	29,457	24,185	68,063	180,012
1996	11,359	42,765	27,778	23,250	68,063	180,221
1997	11,359	46,171	26,163	22,352	68,063	180,778
1998	11,359	49,880	24,608	21,486	68,063	181,671
1999	11,359	53,860	23,100	20,646	68,063	182,959
2000	11,359	58,177	21,608	19,816	68,063	184,591
						186,586
						54,408
						91,161
						162,714
						159,056
						155,592
						152,305
						149,179
						146,199
						143,352
						140,627
						138,013
						135,500
						133,079
						130,731
						128,409

(1) Calculated based on capital costs as follows: Debt 11%; Preferred 10%; Equity 17%

(2) Includes income taxes and taxes other than income taxes.

(3) Based on a 9% interest rate on JEA bonds.

FPL
BLOUNT ISLAND - "EXPECTED COST"

	FPL Capital Revenue Requirement*	FPL Payment - JEA Debt Service	FPL Payment Renewal & Replace. Fund	Total 000 \$	<u>¢/kwh</u>
1986	7,687	0	0	7,687	.46
1987	7,320	0	0	7,320	.29
1988	7,009	5,405	601	13,015	.39
1989	6,718	5,405	601	12,724	.38
1990	6,438	5,405	601	12,444	.37
1991	6,176	5,405	601	12,182	.36
1992	5,925	5,405	601	11,931	.35
1993	5,686	5,405	601	11,892	.35
1994	5,455	5,405	601	11,461	.34
1995	5,236	5,405	601	11,242	.33
1996	5,026	5,405	601	11,032	.33
1997	4,824	5,405	601	10,830	.32
1998	4,628	5,405	601	10,634	.32
1999	4,437	5,405	601	10,443	.31
2000	4,247	5,405	601	10,253	.30

Assumptions:

*FPL's portion of Blount Island total cost = 28.8 million

Capital cost assumptions are based on Debt 11%; Preferred 10%; Equity 17%

FCG - PROJECTED COAL UNIT SAVINGS

Year	FUEL				FPL's		Total		Investment ^{1/}		CAPITAL + O&M		SAVINGS					
	Cost of Oil		Cost of Coal		Fuel	Savings	SJRPP	Fuel	Revenue	Annual	Total Fixed Costs		Total Net Savings					
	\$/BBL	¢/kwh	\$/ton	¢/kwh	Savings	¢/kwh	Output	Savings	000	000	Expense	000	000	¢/kwh				
															000	000	000	000
						kwh	\$	\$	\$	\$	\$	\$	\$	\$				
1981	36.00	5.81	50.50	2.20	3.61	3,372,600	195,948	89,540	24,886	114,406	3.39	81,522	2.42					
1982	39.60	6.39	55.55	2.41	3.98	3,372,600	215,846	89,540	26,877	116,417	3.45	99,429	2.95					
1983	43.56	7.03	61.11	2.66	4.37	3,372,600	237,094	89,540	29,027	118,567	3.52	118,527	3.51					
1984	47.92	7.73	67.22	2.92	4.81	3,372,600	261,039	89,540	31,349	120,889	3.58	140,150	4.16					
1985	52.71	8.50	73.94	3.21	5.29	3,372,600	287,008	89,540	33,857	123,397	3.66	163,611	4.85					
1986	57.98	9.35	81.33	3.54	5.81	3,372,600	315,675	89,540	36,566	126,106	3.74	189,569	5.62					
1987	63.78	10.29	89.46	3.89	6.40	3,372,600	347,715	89,540	39,491	129,031	3.83	218,684	6.48					
1988	70.15	11.31	98.41	4.28	7.03	3,372,600	382,116	89,540	42,650	132,190	3.92	249,926	7.41					
1989	77.17	12.45	108.25	4.71	7.74	3,372,600	420,563	89,540	46,062	135,602	4.02	284,961	8.45					
1990	84.89	13.69	119.08	5.18	8.51	3,372,600	462,383	89,540	49,747	139,287	4.13	323,096	9.58					
1991	93.38	15.06	130.99	5.70	9.36	3,372,600	508,925	89,540	53,727	143,267	4.25	365,658	10.84					
1992	102.72	16.57	144.09	6.26	10.31	3,372,600	559,514	89,540	58,025	147,565	4.38	411,949	12.21					
1993	112.99	18.22	158.50	6.89	11.33	3,372,600	615,500	89,540	62,667	152,207	4.51	463,293	13.74					
1994	124.29	20.05	174.35	7.58	12.47	3,372,600	677,218	89,540	67,681	157,221	4.66	519,997	15.42					
1995	136.72	22.05	191.78	8.34	13.71	3,372,600	744,670	89,540	73,095	162,635	4.82	582,035	17.26					
1996	150.39	24.26	210.96	9.17	15.09	3,372,600												
1997	165.43	26.68	232.05	10.09	16.59	3,372,600												
1998	181.97	29.35	255.26	11.10	18.25	3,372,600												
1999	200.17	32.29	280.78	12.21	20.08	3,372,600												
2000	220.18	35.51	308.86	13.43	22.08	3,372,600												

1/ Carrying charges at 11%, 30-yr. levelized.

Unit size = 550 MW
Capital Cost (1986 \$) \$1,480/kw including IDC
O&M: Fixed \$18.82/kw
Var. 4.31 mill/kwh
Escalation at 8%
Fuel cost from FCG Economic Oil Displacement Study
ESC at 10% for oil & coal

FPL
BLOUNT ISLAND - "EXPECTED COST"

	FPL Capital Revenue Requirement*	FPL Payment - JEA Debt Service	FPL Payment Renewal & Replace. Fund	Total 000 \$	Total ¢/kwh
1986	7,687	0	0	7,687	.46
1987	7,320	0	0	7,320	.29
1988	7,009	5,405	601	13,015	.39
1989	6,718	5,405	601	12,724	.38
1990	6,438	5,405	601	12,444	.37
1991	6,176	5,405	601	12,182	.36
1992	5,925	5,405	601	11,931	.35
1993	5,686	5,405	601	11,892	.35
1994	5,455	5,405	601	11,461	.34
1995	5,236	5,405	601	11,242	.33
1996	5,026	5,405	601	11,032	.33
1997	4,824	5,405	601	10,830	.32
1998	4,628	5,405	601	10,634	.32
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2000	4,247	5,405	601	10,253	.30

Assumptions:

*FPL's portion of Blount Island total cost = 28.8 million

Capital cost assumptions are based on Debt 11%; Preferred 10%; Equity 17%

FCG - PROJECTED COAL UNIT SAVINGS

Year	FUEL			FPL's			Investment ^{1/}			CAPITAL + O&M			SAVINGS		
	Cost of Oil			SJRRP			Revenue			Annual			Total Net Savings		
	Cost of Coal			Output			Requirements			Expense			Total Fixed Costs		
	\$/BBL	¢/kwh	¢/ton	000	kwh	000	000	\$	000	\$	000	\$	000	\$	¢/kwh
1981	36.00	5.81	50.50	3,372,600	195,948	89,540	24,886	114,406	3.39	81,522	2.42				
1982	39.60	6.39	55.55	3,372,600	215,846	89,540	26,877	116,417	3.45	99,429	2.95				
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1994	124.29	20.05	174.35	3,372,600	677,218	89,540	67,681	157,221	4.66	519,997	15.42				
1995	136.72	22.05	191.78	3,372,600	744,670	89,540	73,095	162,635	4.82	582,035	17.26				
1996	150.39	24.26	210.96	3,372,600											
1997	165.43	26.68	232.05	3,372,600											
1998	181.97	29.35	255.26	3,372,600											
1999	200.17	32.29	280.78	3,372,600											
2000	220.18	35.51	308.86	3,372,600											

^{1/} Carrying charges at 11%, 30-yr. levelized.

Unit size = 550 MW

Capital Cost (1986 \$) \$1,480/kw including IDC

O&M: Fixed \$18.82/kw

Var. 4.31 mill/kwh

Escalation at 8%

Fuel cost from FCG Economic Oil Displacement Study

USC at 10% for oil & coal

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that copies of late-filed Exhibit 23 (consisting of 10 sheets) and late-filed Exhibit 25A (consisting of 1 sheet labeled Sheet 5A) were furnished on May 27, 1981, to the following:

BY HAND:

Arthur R. Shell, Jr., Esq.
Staff Counsel
Florida Public Service Commission
101 East Gaines Street
Tallahassee, Florida 32301

BY U.S. MAIL:

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George W. Kent, Jr., Esq.
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Orange Park, Florida 32073

Richard D. Melson

Richard D. Melson
Hopping Boyd Green & Sams
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Tallahassee, Florida 32301
(904) 222-7500

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Application of Jacksonville)	DOCKET NO. 810045-EU ()
Electric Authority and Florida)	ORDER NO. 10108-A
Power and Light Company for Certi-)	ISSUED: 8-25-81
fication of Need for St. John's)	
River Power Parks Units 1 and 2.)	

AMENDATORY ORDER

BY THE COMMISSION:

On February 4, 1981, this Commission issued Order No. 10108 granting certification of need for Jacksonville Electric Authority and Florida Power and Light Company for St. John's River Power Parks Units 1 and 2. Upon subsequent consideration of that Order, we note that in the second paragraph on page six (6), line ten (10) of page six (6), the figure "\$558,877" should have been stated as \$558,887,000. Additionally, on line 13 of the same page the period "1986-200" should have been the period 1986-2000. The purpose of this Order is to include said words in the manner in which they were intended.

Therefore, in consideration thereof, it is

ORDERED by the Florida Public Service Commission that the second paragraph of Order No. 10180 issued on February 2, 1981, be and the same is hereby reflected to read as follows:

We also examined a "worst case" scenario utilizing a higher estimated cost of capital and estimates of fuel escalation rates compiled by Chase Econometrics, which project a smaller differential between the costs of coal and oil and are thus less favorable to the application in terms of economic justification. Under these "worse case" assumptions, JEA's projected fuel savings would be \$94,298,000 in 1986; \$254,693,000 in 1990; and \$558,887,000 in the year 2000. FPL's savings would be \$22,236,000 in 1986; \$134,190,000 in 1990; and \$429,889,000 in the year 2000. Total peninsular savings for the period 1986-2000 under this "worst case" scenario would be \$8 billion (nominal dollars).

It is further

ORDERED that Order No. 10108 be and the same is hereby affirmed in all other respects.

By ORDER of the Florida Public Service Commission, this 25th day of August 1981.

(S E A L)


Steve Tribble
COMMISSION CLERK

ARS

BEFORE THE GOVERNOR AND CABINET
OF THE STATE OF FLORIDA

In Re:)

Jacksonville Electric Authority)
St. Johns River Power Park,)
Power Plant Site Certification)
Application)

DOAH CASE NO. 81-357

The following persons were present and participated in
the disposition of this matter:

Honorable Bob Graham
Governor

Honorable George Firestone
Secretary of State

Honorable Jim Smith
Attorney General

Honorable Bill Gunter
Treasurer and Insurance Commissioner

Honorable Gerald A. Lewis
Comptroller

Honorable Doyle Conner
Commissioner of Agriculture

Honorable Ralph D. Turlington
Commissioner of Education

FINAL ORDER ADOPTING HEARING
OFFICER'S ORDER RECOMMENDING BOARD
FINDING OF CONSISTENCY AND COMPLIANCE
WITH EXISTING LAND USE PLANS AND ZONING ORDINANCES

BY THE GOVERNOR AND CABINET:

Having heard presentations by the parties, reviewed the
Recommended Order dated July 8, 1981, as modified by the
Amended Recommended Order dated July 20, 1981, (attached and
incorporated as Exhibits "A" and "B"), and being fully advised
herein, it is

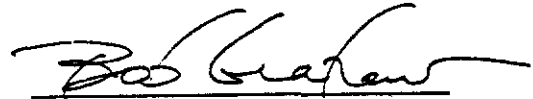
ORDERED:

1. The Recommended Order as modified by the Amended
Recommended Order is adopted.
2. The proposed site is found and held to be in conformity
with existing land use plans and zoning ordinances in effect as
of this date.
3. The responsible zoning or planning authorities are
ordered to refrain from hereafter changing such land use plans

or zoning ordinances so as to affect the proposed site unless certification is denied.

DONE AND ORDERED THIS 5th day of September, 1981, in Tallahassee, Florida, subsequent to a vote of the Governor and Cabinet at a duly constituted Cabinet meeting of September 1, 1981

FOR THE GOVERNOR AND FLORIDA
CABINET


BOB GRAHAM
Governor

VOTE:

For

7

Against

0

Copies Furnished to All Parties.

STATE OF FLORIDA
DIVISION OF ADMINISTRATIVE HEARINGS

IN RE: JACKSONVILLE ELECTRIC AUTHORITY)
ST. JOHNS RIVER POWER PARK,)
POWER PLANT SITE CERTIFICATION) CASE NO. 81-357
APPLICATION.)
_____)

FINDINGS OF FACT, CONCLUSIONS OF LAW,
AND RECOMMENDED ORDER

Pursuant to the requirements of Section 403.508,
Florida Statutes, the undersigned conducted a land use hearing
in this cause on May 5, 1981, in Jacksonville, Florida.

APPEARANCES

For Applicant Jacksonville Electric Authority:

Gary P. Sams, Esquire
Hopping, Boyd, Green & Sams
420 Lewis State Bank Building
Post Office Box 6526
Tallahassee, Florida 32301

For State of Florida Department of Environmental
Regulation:

Louis F. Hubener, Esquire
Assistant General Counsel
Department of Environmental
Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301

For State of Florida Department of Veteran
and Community Affairs:

C. Laurence Keeseey, Esquire
Department of Veteran and
Community Affairs
Carlton Building, Room 204
Tallahassee, Florida 32301

For Sea Oats Garden Circle:

Mrs. L. B. (Priscilla) Andrews
Sea Oats Garden Circle
115 Palm Avenue
Jacksonville, Florida 32218

For Heckscher Drive Community Club:

Jean Ila Creech, Spokesperson
Heckscher Drive Community Club
5900 Heckscher Drive
Jacksonville, Florida 32226

For Agriculural Stabilization and
Conservation Service:

Douglas I. Moore
Chairman-Duval County
The Agricultural Stabilization
and Conservation Service of
the U. S. Department of Agriculture
12275 Holstein Drive
Jacksonville, Florida 32226

For Clean Air Coalition, Inc.:

John Kern, President
Clean Air Coalition, Inc.
630 Edgewood Avenue
Jacksonville, Florida 32205

For the Jacksonville Chamber of Commerce, Inc.:

Gerald Bartles
Executive Vice President
Jacksonville Chamber of Commerce, Inc.
Post Office Box 329
Jacksonville, Florida 32201

This land use hearing is part of the site certification proceeding in accordance with the Florida Electrical Power Plant Siting Act, Part II, Chapter 403, Florida Statutes. Having considered all the testimony, evidence and argument presented, the Hearing Officer enters the following:

FINDINGS OF FACT

1. The Department of Environmental Regulation published notice of this land use hearing on March 21, 1981 in the Florida Times-Union newspaper. Notice was also published in the Florida Administrative Weekly. The Applicant, Jacksonville Electric Authority, (hereinafter JEA) posted notice of this hearing at the proposed site and the Department of Environmental Regulation (hereinafter DER) mailed notice of this hearing to the chief executives of the local and regional authorities with responsibility for zoning and land use planning whose jurisdiction includes the site.

2. JEA is an electric utility and agency of the City of Jacksonville. Its application in this proceeding seeks site certification for the construction of a coal-fired electric generating plant and ancillary facilities, including a coal unloading facility and associated transmission lines, all of which are to be located in Duval County, Florida.

3. The proposed site comprises approximately 1,636 acres located north of the St. Johns River in northern Duval County, immediately contiguous to JEA's existing Northside

Generating Station.

4. Ordinance 80-1290-700 of the City of Jacksonville was adopted specifically for the purpose of zoning the land which comprises the site for which certification is sought in a classification which allows the land use JEA intends by its application. The Ordinance zones the site as GU, Government Use, a zoning classification which does allow the use to which the land will be put by the Applicant should the site be certified. By the terms of this Ordinance, the classification GU shall apply to the subject land on the date that Fee Simple title to that land passes to the Jacksonville Electric Authority. To the extent that Fee Simple title to that land has not already passed to the Jacksonville Electric Authority, the subject land is currently zoned IH, Industrial Heavy. JEA is a governmental agency of the City of Jacksonville and possesses all powers of eminent domain necessary to acquire the land comprising the site.

The foregoing zoning classification does not apply to any land located within Government Lot 2, Section 6, Township 1 South, Range 28 East. JEA has stated that it has no intent to develop any part of Government Lot 2 within the proposed site and it is therefore not considered part of the site.

5. The site certification application includes a proposed coal unloading facility to be located on approximately 55 acres of Blount Island, contiguous to the St. Johns River, and owned by the Jacksonville Port Authority, another agency of the City of Jacksonville. That 55-acre parcel is currently zoned IW, Industrial Waterfront, and a coal unloading facility is consistent with the uses allowed within the IW zoning classification. ✓

6. The site certification application includes certain directly associated transmission lines to connect the proposed generating facility to the existing transmission network. The preferred corridors for these directly associated transmission lines extend in the same general direction as the existing transmission lines from JEA's Northside Generating Station and will run to existing substations in all cases. Transmission lines,

substations and similar installations are classified as "essential services" and as such are permitted in any zoning district within Duval County without any unique zoning to allow that land use.

7. The use of the proposed site, including the coal handling facility and directly associated transmission lines, are all consistent with the elements of the 2005 Comprehensive Plan of the City of Jacksonville relating to land use. The plant site and the coal unloading facility appear on the land use plan map as "water related industrial" uses, and JEA has stated its intent to comply with the locational criteria for transmission lines found in the electric utility element of the City of Jacksonville 2005 Comprehensive Plan.

The 2005 Comprehensive Plan has been approved by the State Department of Community Affairs and the Northeast Florida Regional Planning Council for consistency with state and regional land use planning requirements.

CONCLUSIONS OF LAW

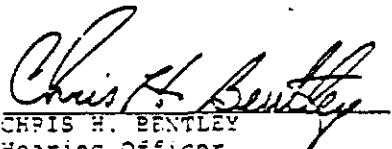
8. All parties and the public were afforded proper notice of this proceeding as required by law.

9. The sole issue for determination at the land use hearing required by Section 403.508, Florida Statutes, is whether or not the proposed site is consistent and in compliance with existing land use plans and zoning ordinances. As shown by the Findings of Fact above, the proposed site in this cause is consistent, and in compliance with, existing land use plans and zoning ordinances so long as JEA holds Fee Simple title to the land which comprises the proposed site.

RECOMMENDED ORDER

Therefore, it is hereby recommended that the land use proposed for the site is consistent and in compliance with existing land use plans and zoning ordinances so long as JEA holds Fee Simple title to the subject land.

DONE and ORDERED this 8th day of July, 1981, in
Tallahassee, Florida.


CHRIS H. BENTLEY
Hearing Officer
Division of Administrative
Hearings
The Oakland Building
2004 Apalachee Parkway
Tallahassee, Florida 32301
(904) 488-9675

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Post Office Box 49
Orange Park, Florida 32073

FILED WITH THE CLERK OF THE
DIVISION OF ADMINISTRATIVE
HEARINGS THIS 8th DAY OF
JULY, 1981.

STATE OF FLORIDA
DIVISION OF ADMINISTRATIVE HEARINGS

IN RE: JACKSONVILLE ELECTRIC AUTHORITY)
ST. JOHNS RIVER POWER PARK,)
POWER PLANT SITE CERTIFICATION)
APPLICATION.)

CASE NO. 81-357

AMENDED RECOMMENDED ORDER

Findings of Fact, Conclusions of Law, and a Recommended Order were entered in this cause by the undersigned on July 8, 1981. That Recommended Order stated "Therefore, it is hereby recommended that the land use proposed for the site is consistent and in compliance with existing land use plans and zoning ordinances so long as JEA holds Fee Simple title to the subject land." The condition of that recommendation, that JEA hold Fee Simple title to certain lands, was intended to apply only to that part of the site comprising approximately 1,636 acres located north of the St. Johns River in northern Duval County, and immediately contiguous with JEA's existing Northside Generating Station. It was not intended to apply to the proposed coal unloading facility on Blount Island, or the associated transmission line corridors. The zoning applicable to those two parts of the overall site do not require that JEA hold Fee Simple title. Therefore, the Findings of Fact, Conclusions of Law, and Recommended Order dated July 8, 1981 is amended to read as follows:

"Therefore, it is hereby recommended that the land use proposed for the site is consistent and in compliance with existing land use plans and zoning ordinances so long as JEA holds Fee Simple title to the land which comprises that part of the site consisting of approximately 1,636 acres located north of the St. Johns River in northern Duval County, and immediately contiguous to JEA's existing Northside Generating Station."

DONE and ORDERED this 20TH day of July, 1981, in
Tallahassee, Florida.

#81-357
July 20, 1981
Amended Recommended Order
Page Two


CHRIS H. BENTLEY
Hearing Officer
Division of Administrative
Hearings
The Oakland Building
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Orange Park, Florida 32073

Filed with the Clerk of the
Division of Administrative
Hearings this 20th day of July,
1981.

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1.0 PURPOSE OF THE PROPOSED FACILITY AND ASSOCIATED TRANSMISSION

This chapter provides a discussion of the factors which led to the decision by Jacksonville Electric Authority (JEA) and Florida Power & Light Company (FPL) to construct a coal-fired generating facility known as the St. Johns River Power Park (SJRPP) at the Eastport site located in Duval County. The facility will consist of two jointly owned 600 MW class units built at a project cost of 1,388 million dollars by 1988 (excluding allowance for funds used during construction).

As shown in Section 1.1.1, the utilities' current load forecast projections demonstrate the need for this project for reliability purposes (Section 1.1.3) starting in 1988. In addition, this project offers both JEA and FPL the capability to significantly reduce the level of oil consumption on their systems prior to that time.

Section 1.2 presents an analysis of the potential annual oil displacement of 10 million barrels of oil associated with this project and the resultant fuel cost savings. This analysis indicates that JEA and FPL should construct these units at the earliest possible in-service date to take advantage of the benefits associated with reducing dependence on foreign oil. Among these benefits are long term economic benefits to each utility's customers, diversification of the fuel mix along with an attendant increase in reliability, and furtherance of state and national energy goals. Current schedules call for the commercial operation of the first unit by December, 1985 and the second unit by May, 1987. Section 1.2 also discusses the effects of the Florida Energy Efficiency and Conservation Act on the proposed project. As demonstrated therein, even with the attainment of the conservation goals, the proposed facility is presently needed for oil displacement at the earliest possible time and will be needed for reliability purposes at a later date.

1.1 SYSTEM DEMAND AND RELIABILITY

The information provided in this section is organized and presented to reflect the joint participation of JEA and FPL in the construction and future operation of the proposed facility. To accomplish this, each subsection under 1.1 is organized so that the information is first presented for JEA as the lead utility and then for FPL.

1.1.1 Load Characteristics

The JEA is a municipally owned electric utility serving the northeast corner of peninsular Florida (see Figure 1.1-1). The JEA retail service territory is comprised of three counties, Duval, St. Johns, and Clay with a total of 225,980 customers as of December 31, 1980. Approximately 85 percent of the net energy for load generated during 1980 was used by three customer classes: residential (37 percent), commercial (14 percent), and industrial (34 percent).

To serve this load, JEA generating capacity is comprised of three generating plants. These generating facilities consist of 11 fossil steam units and 9 gas turbines. Table 1.1-1 is a listing of JEA's existing generating facilities.

The power generated by JEA is distributed to the load over a transmission system comprised of 477 miles of overhead and 43 miles of underground cable. JEA is also interconnected to other Florida utilities through two 230 kV and one 115 kV ties.

FPL is an investor owned utility serving the south and eastern portions of peninsular Florida (see Figure 1.1-2). The FPL service territory encompasses a total of 2,247,688 customers in 35 counties as of December 31, 1980. Of the energy sales for 1980, approximately 92 percent went to serve the needs of residential, commercial, and industrial

customers. Unlike JEA, FPL residential customers used 50 percent of the sales with commercial customers using 34 percent and industrial only 8 percent.

The existing FPL generating capacity is comprised of 13 generating plants distributed geographically around its service territory. These generating facilities consist of 3 nuclear steam units, 26 fossil steam units, 48 gas turbines, 2 diesel installations, and 2 combined cycle units. Table 1.1-2 is a listing of FPL's existing generating facilities.

The FPL bulk transmission system is composed of 316 miles of 500 kV and 1,950 miles of 240 kV lines. The underlying network is composed of 1,377 miles of 138 kV, 602 miles of 115 kV, and 311 miles of 69 kV transmission lines. FPL is also interconnected to other Florida utilities through seven 240 kV, five 138 kV, three 115 kV ties and to Georgia Power Company through one 500 kV tie.

1.1.1.1 Load Analysis

Jacksonville Electric Authority

The JEA's history and forecast of energy use by customer class is presented in Table 1.1-3 and represents the most current estimate of JEA's energy use by customer class. This forecast yielded a long term (1979-2000) compound annual growth rate of 2.8 percent in total net energy for load. The energy use by residential, commercial, and industrial customers is expected to grow during this period at annual rates of at 2.8, 3.6, and 3.5 percent, respectively.

Table 1.1-4 presents JEA's historical and forecasted seasonal peak demand developed from JEA's most current Electric Energy and Demand forecast. The annual system peak load is expected to grow at a rate of 3.4 percent over the forecast period (1979-2000). Beginning in 1985, the JEA

system is expected to switch from a summer peaking system to a winter peaking system. This expected switch is a result of growth in residential electric heat saturation through the year 2000.

Figure 1.1-3 is a graphic representation of JEA's annual load duration curve for 1979. This figure shows the percentage of energy supplied against the percentage of the time of occurrence and illustrates the varying magnitude of the load during the period. This annual load duration curve is typical for the JEA system.

It should be noted that the official JEA forecast presented does not include the effects of the conservation goals adopted by the Florida Public Service Commission (FPSC) under the Florida Energy Efficiency and Conservation Act (FEECA). In its Order Number 10108 (dated June 26, 1981) certifying the need for SJRPP, the FPSC found that the JEA would develop a capacity need by 1991 assuming that its FEECA conservation goals are achieved.

Florida Power & Light Company

The FPL's history and forecast of energy use by customer class is presented in Table 1.1-5 and represents FPL's most current energy forecast. The results of this forecast show that for the period 1980 through 1990, the compound annual growth rate of net energy for load is expected to be from 3.1 to 5.1 percent per year.

Table 1.1-6 presents FPL's historical and forecasted seasonal peak demand developed from FPL's most current seasonal peak forecast. The annual system peak load is expected to grow at a compound growth rate of 1.7 to 3.8 percent over the forecast period (1980 - 1990). Under this forecast FPL expects that the winter peak will continue to grow at approximately the same rate as the summer peak and that FPL will be a winter peaking company.

Figure 1.1-4 is a graphic representation of FPL's annual load duration curve for 1979. This figure illustrates the varying magnitude of the load during the period and represents a typical shape for the FPL system.

The FPL forecast presented in this section incorporates the expected results of those programs which FPL will use to reduce energy and seasonal peak growth in response to the conservation goals adopted by the FPSC on November 13, 1980.

1.1.1.2 Demand Projections

This section presents a summary of the load and energy forecast methodology used by JEA and FPL. For a more detailed explanation, see Appendix M.

Jacksonville Electric Authority

Gilbert Associates, Inc. was contracted in 1980 by JEA to develop a forecast of energy and peak demand requirements for JEA for the period 1980 through 2000.

This forecast was developed by members of the professional staff of Gilbert Associates, Inc. and Wharton Econometric Forecasting Associates, Inc. with assistance from the JEA System Planning Staff.

The 20 year forecast of energy and demand requirements for the JEA system was produced from a system of economic, demographic, and electric energy and peak load models which were developed specifically for the JEA service territory by means of econometric analysis of regional data. The essential features of the methodology employed and a summary of key forecast results are presented below.

Forecast Methodology

Analysis was performed at the highest level of disaggregation possible consistent with the available data. Specifically, the net energy for load forecast for the JEA system was developed by forecasting energy use in each of the following JEA sales and energy classifications:

- Rate 10 - Residential Service
- Rate 20 - Small General Service
- Rate 30 - Large General Service
- Rate 40 - Industrial
- Rate 45 - Other Public Utilities
- Rates 50-90 - Street Lighting
- Losses and Adjustments

Total system peak load requirements were forecast for the 1st and 3rd quarters of each year throughout the forecast period (1980-2000).

In order to produce the energy and demand forecasts, a system of long run forecasting models were constructed specific to the JEA service territory. The integrated forecasting system consisted of the following five component models:

1. Wharton Quarterly and Annual Macroeconomic Models of the U.S. economy
2. Regional Economic Model of the Jacksonville Standard Metropolitan Statistical Area (SMSA) of Baker, Clay, Duval, Nassau, and St. John Counties
3. Regional Demographic Model consisting of two submodels
 - Duval County
 - Jacksonville SMSA Less Duval County

4. Service Area Econometric Energy Model by class of service

5. Peak Load Model

Figure 1.1-5 illustrates the relationships between the various component models. As can be seen, data produced by the Wharton Quarterly and Annual Macro Economic Models of the U.S. economy is used as input into both the Regional Economic Model and the Regional Demographic Model. Data used in the Regional Economic and Demographic Models is also used in both the Service Area Econometric Energy Model and the Peak Load Model.

Regional Economic Model

The Regional Economic Model is a modified export base type model. Industries which are significant exporters to areas outside of the Jacksonville SMSA are modelled as a function of national and regional activity and of regional wage rates relative to national wage rates. Industries which are primarily regional are modelled as a function of regional activity variables including: (1) employment in other regional industries, (2) real personal disposable income, and (3) population. Regional wage rates by industry are thus a function of national wage rates in the same industry, the regional price level relative to the national price level, and the tightness of the regional labor market relative to the national labor market as measured by ratios of employment to labor force. Total wages paid to area residents are determined by adding up the wage bills (wage rates times employment) for establishments located in the SMSA, and correcting for the net wages earned by commuters. The other components of personal income such as transfer payments, dividends, interest and rent, and supplements to wages are determined by combinations of regional and national variables.

Regional Demographic Models

In order to identify and provide a detailed forecast of the population within the JEA service area (which essentially consists of Duval County), separate population models were constructed for Duval County and for the balance of the other counties contained within the Jacksonville SMSA. The population models employed are of the single year of age cohort (a group of individuals having a statistical factor in common) survival type and have the capability to generate population estimates by single year of age, race and sex. The models were started as of 1970 using the 1970 U.S. Census data for the counties currently comprising the Jacksonville SMSA. U.S. survivorship rates by single years of age were adjusted to reflect total regional mortality. National fertility rates by cohort were also adjusted to reflect total regional fertility. The regional mortality and fertility statistics were obtained from the intercensal population estimates reported in Current Population Reports Series P-25. Net migration rates were specified outside the model to produce total population forecasts consistent with the employment forecasts of the Regional Economic Model.

This approach was chosen as an alternative to the University of Florida population projections by County (Bulletin No.53). JEA feels this methodology has several distinct advantages:

- While University of Florida estimates for the State as a whole are based upon rigorous methodology and appear accurate, estimates by County are based on a simple ratio - share procedure.
- Since JEA's service area encompasses only a few counties, population estimates are very sensitive to small errors resulting from sharing of State projections to the County level.
- JEA methodology maximizes use of available data disaggregated to the County and SMSA level.

Service Area Econometric Energy Model

The Service Area Econometric Energy Model forecasts electricity sales by class of service and is driven by the combined output of the Regional Economic and Demographic models. Driving variables for the energy model include manhours, employment, alternate energy prices including the JEA forecasted price of electricity, population, households, per capita income, and wage rates relative to the cost of capital. The energy model incorporates the effects of alternate fuel prices and labor-capital substitution on electricity demand. Historical weather conditions are explicitly included as well.

Peak Load Model

The JEA Peak Load Model consists of econometric equations for the first and third quarter system peak loads. This model is driven by regional electricity sales obtained from the Service Area Econometric Energy Model, residential air conditioning saturation, and residential electric heat saturation. The combined effects of these saturation levels and weather variables are explicitly identified in the peak load equations.

Energy and Demand Requirements

Three separate forecasts of JEA system energy and demand requirements were developed using the integrated forecasting system described above. These three forecasts are identified as the Most Probable, Low Growth Case, and High Growth Case. The Low and High Growth forecasts were developed to illustrate the possible range of energy and demand requirements which would result from alternate regional and national economic forecasts and alternate local demographic forecasts.

Most Probable Forecast - This forecast yielded a long term (1979-2000) compound annual growth rate of 2.8 percent in net energy for load and a compound annual growth rate of 3.4 percent in annual system peak load.

Beginning in 1985, the JEA system is expected to switch from a summer (third quarter) peaking system to a winter (first quarter) peaking system. This conversion to a winter peaking system results from the expectation that residential electric heat saturation will grow rapidly from its present level of approximately 30 percent to a saturation level of 95 percent by the year 2000. At the same time, air conditioning saturation, which already is at about 86 percent, cannot be expected to contribute to similar strong growth rates in summer (third quarter) system peak load despite the forecast of increases in the saturation level of central air conditioning systems.

The expected growth in electric space heating is induced by large increases in the price of alternate heating fuels (oil and natural gas) relative to the average price of electricity. A major assumption upon which the above conclusions rest is that JEA will be able to essentially remove the current large positive differential in JEA's average electricity rate versus the national average price. Inherent in this assumption is the expectation that JEA will realize a rapid switchover from the current 100 percent reliance upon oil-fired generation to 90 percent non-oil-fired generation by the year 2000. The result of such a generation fuel switchover would be a 6.6 percent compound annual growth in electricity price, which would be substantially below the 8.0 percent growth rate expected for the national average electric price.

High and Low Growth Cases - The Higher and Lower Growth forecast cases were based upon higher and lower alternative national economic forecasts which in turn led to higher and lower regional economic and demographic forecasts. During the period 1979 through 2000, the lower forecast assumptions yield a compound annual growth rate of 2.3 percent in net energy for load and 3.0 percent in annual system peak load. During the same forecast period, the higher growth assumptions yield a compound annual growth rate of 3.2 percent in net energy for load and 3.7 percent in annual system peak load. As with the Most Probable forecast, the Low and High

Growth Cases also forecast that the JEA system will convert to a winter peaking system by about 1985. Additionally, annual system load factor in the Most Probable forecast is expected to be about 51 percent in the year 2000 while for the Low and High Growth Cases annual system load factor in the year 2000 are forecast to be 49 percent and 52 percent, respectively.

Conservation Scenario

An effort was made to estimate the potential impact upon the Most Probable forecast of the introduction of residential appliances of improved efficiency ratings and also of the potential impact of various load management strategies. The Conservation Scenario is intended to provide a quantitative estimate of the potential impact upon the Most Probable Forecast of the introduction of residential appliances which conform to the DOE efficiency improvement targets and also the potential impact of load control of water heaters, electric space heating and, to a limited extent, central air conditioners. The conservation adjustments were aimed exclusively at the residential class and were determined only for specific points in time - 1985, 1990, 1995 and 2000. The energy sales forecasts and the coincident peak demand contributions for all other customer classes were not adjusted for the above considerations and remain the same as in the unadjusted Most Probable Forecast.

Load Control Reductions

The total impact of residential load control on winter system peak was computed by assuming that some form of control would be applied to water heaters and electric space heating. For each of the years 1985, 1990, 1995 and 2000, the total winter peak load reduction due to load control was estimated as the sum of the water heater and electric space heating load reduction.

The impact of residential load control on summer system peak was determined only for 1985 due to the fact that subsequent to that time it is expected that the winter peak will dominate and reductions to summer peak will not be required. For 1985, the total summer peak reduction was estimated by computing the load reductions resulting from control of water heaters and central air units.

The estimated reductions in annual residential energy sales (GWh) and residential coincident demand (MW) contributions to the system winter and summer peak loads are as follows:

- . Appliance efficiency improvements were estimated to cause a reduction in both annual residential energy sales (kWh) and also the residential class coincident demand contributions to the winter and summer system peak loads. By 1985, appliance efficiency improvements were estimated to cause a 294 GWh or 11.5 percent reduction in Most Probable residential energy sales. By the year 2000, when essentially the total appliance stock will have been upgraded to meet the DOE efficiency targets, the reduction in residential sales was estimated to amount to 587 GWh, or 14.3 percent.
- . Appliance efficiency improvements were estimated to reduce system winter peak load by 108 MW in 1985 and 220 MW by the year 2000. Similarly, appliance efficiency improvements were estimated to reduce the 1985 summer peak load by 99 MW. By the year 2000, the summer peak load reduction was estimated to total 152 MW.
- . The residential load control program was assumed to impact only the summer and winter peak load, with annual energy consumption being unaffected. In the year 1985, it was estimated that control of water heaters and electric space heating would result in a reduction of 123 MW from the system's winter peak load. It was further

estimated that control of electric water heaters and central air conditioning systems could reduce the 1985 summer peak load by 78 MW. By the year 2000 control of electric water heaters and electric space heating would result in a winter peak load reduction of 202 MW. No control of end-use appliances affecting the summer peak was calculated for the years 1990, 1995 and 2000 due to the fact that JEA will have become a firm winter peaking system by 1985.

Florida Power & Light Company

FPL forecasts customers, sales (energy), peak demand and load factor using both econometric and engineering models where appropriate. An econometric model is based upon the relationships between the variables to be forecasted and the economic and social environment, i.e., customers, sales and peak demand are estimated as a function of such local and national economic measures as real per capita personal income, population of the FPL service territory, Florida employment, and Gross National Product (GNP). An engineering model bases its forecast on the number of appliances and their consumption, projected improvements in appliance efficiency, and improvements in the thermal efficiency of buildings. FPL utilizes a combination of these two types of models and Monte Carlo simulation not only to project the forecast variables but also to determine the uncertainty surrounding the forecast of net energy and peak loads.

Forecast Methodology

The forecast is broken into three areas - customers, sales (energy), and peak load. The following discusses each model separately.

Customer Forecasts

Customers are forecast using econometric models for the following six classes: residential, commercial, industrial, street and highway, resale and other. The basis for the customer forecasts are projections of FPL's service territory population.

Residential customers are forecast from population forecasts of the 21 major counties in the FPL service territory and estimated residential household size. The population of the FPL service area is derived from the University of Florida's and the National Planning Association's forecasts of population by county. The estimate of household size is derived from National Planning Association's forecasts for Florida and SMSA in FPL's service territory as well as FPL's own estimate. The residential customers forecast is derived by dividing the population forecast by the household size forecast.

Commercial customers are forecast by using FPL's residential customers from the previous year to account for the delay in the opening of such commercial ventures as shopping centers and restaurants following the occupancy of new residential homes. Industrial customers are forecast using GNP; since GNP is a measure of the nation's output of final goods and services, it tends to be highly correlated with FPL's industrial customers.

Street and highway and other public authority customers are forecast using population projections of the FPL service territory.

Resale customers are forecast as a function of the population of Florida.

Energy Forecast Model

The economy of the FPL service area is dominated by tourism, construction, agriculture, service industries, and light manufacturing. To adequately forecast the energy requirements for the area, this unique mix has to be recognized.

In order to more accurately evaluate and project the patterns of growth for the coming years, separate forecasting equations were developed for each of the major classes of users: residential, commercial, and

industrial. The remainder of total sales is forecast by extrapolation of historical trends. These models are a combination of econometric and engineering methodologies.

The residential energy forecast begins with an estimate of the variables that influence the residential sector. Real per capita personal income in Florida, real price per residential kilowatt-hour (kWh), air conditioning saturation, electric heating saturation, and cooling and heating degree days are the variables selected to explain the trends in use per customer.

It is expected that residential conservation will have a pronounced effect on energy consumption in the future; therefore, FPL explicitly accounts for seven types of conservation: appliance efficiency, Watt-Wise homes, solar water heating, home audit programs, the State Residential Building Energy Code, residential pool pump program, and time of use (T-O-U) rates. The effect of each source of conservation on residential consumption is forecast separately.

The commercial sector in Florida is comprised primarily of tourist and service industries. After considerable study, a model was derived in which commercial sales per customer are a function of total non-agricultural employment in Florida and the real price per commercial kilowatt-hour. The total employment variable is used as a measure of the general economic conditions because it tracks the business cycle. The commercial sector's sales are further modified by the effects of T-O-U rates and an audit program described in FPL's Energy Management Plan for the 80's.

Industrial energy use represents about 7 percent of the total energy sales and is incorporated into the forecast by considering two factors. First, industrial sales are correlated with manufacturing employment in Florida. The industrial sector's sales are further modified by the effects of T-O-U rates and an audit program described in FPL's Energy Management Plan for the 80's.

Peak Load Model

Unpredictable variations in weather conditions can result in considerable variation in the use of air conditioning during the summer and electric heating during the winter. For analytical purposes, the summer peak load was separated into two components: non-weather sensitive and weather sensitive.

The non-weather sensitive component is defined as the minimum load during the hours when the summer peak usually occurs. This demand is predominantly determined by the economic environment and shows the load when weather sensitive appliances are at their minimal usage. This portion is forecast on a per customer basis by using real price of electricity and real per capita personal income in Florida.

The weather sensitive component is defined as the difference between the actual peak and the non-weather sensitive component for the period. It represents the load in excess of the base load which is primarily a function of weather conditions. The summer weather sensitive component is forecast on a per customer basis and is related to the minimum temperature on the peak day, the real price of electricity, and the saturation of air conditioners.

The winter peak forecast is based on the number of residential customers which have electric heat, the minimum temperature on the winter peak day, and the number of winter customers.

Regression analysis is used to develop the summer non-weather sensitive load, the summer weather sensitive load, and the winter peak load models. Having developed the regression equations, the relevant variables are then projected to determine the summer non-weather sensitive, summer weather sensitive, and winter peak load forecasts. Both the summer and winter peak load forecasts are then modified by the effects of certain types of conservation which are described below.

Conservation

The conservation models reflect the proposed programs to meet the FPSC rules establishing statewide energy conservation goals as required by the Florida Energy Efficiency and Conservation Act (FPSC Docket No. 800522-EG).

The regression techniques described previously are used to derive equations that forecast long term energy and peak demand. The coefficients derived are based on history and may not predict the effects of future changes in technology or consumer life-style. In order to have a realistic forecast, these future changes must be predicted and incorporated into the forecast separately from the regression equations. The changes must be identified, assumptions made about the significant parameters, and then the results must be incorporated into the forecast.

It is important to note that the total energy reduction attributed to conservation cannot necessarily be calculated by summing the energy reductions of each individual conservation program, and then subtracting this figure from the econometric model's baseline forecast. The reasons why this cannot be done are as follows:

First, as explained above, the econometric model's forecast is not a single number, but an entire band. Thus, the program results might vary depending upon where, in the banded econometric forecast, reference is being made. The second problem involves the engineering models which were used to develop the program results. It is difficult to incorporate a laboratory comparison into a forecast. The third problem area with respect to using engineering models involves the possibility of double counting of results. The fourth potential problem of engineering models is their failure to account for increased electricity use as a result of customers electric bills being lower after conservation measures are installed. The fifth potential problem area involving the use of engineering models is the difference between potential and probable results. As a result of these problems, care must be taken when evaluating the impact of conservation programs. See Appendix M for a more detailed explanation.

Eight changes have been identified as being significant and having a high probability of occurring. These are: (1) implementation and success of an energy efficient home building program (called the Watt-Wise home by FPL); (2) an increasing saturation of solar water heaters; (3) government mandated improvements in the efficiency of certain appliances; (4) home energy audit programs for the retrofit of existing homes with energy saving technologies; (5) the State Residential Building Energy Code; (6) a swimming pool pump audit program; (7) a commercial customer audit program; and (8) T-O-U rates. A more complete discussion of these programs can be found in FPL's Energy Management Plan for the 80's.

Monte Carlo Simulation

While considerable effort is exerted to insure accuracy in the forecast, there is always uncertainty as to its ultimate accuracy. Hence in making a forecast, every decision maker would like to know to what extent events may alter the forecast, in order to assess the impacts that such changes may have on the planning process.

To achieve the flexibility to respond to uncertain future events, FPL has moved away from discrete forecasts. Plans made on the basis of a single set of forecast numbers do not have the flexibility necessary for unforeseen economic and technological growth.

Instead, FPL uses a simulation approach which is designed to allow: (1) the individual and/or simultaneous evaluation of a large number of alternatives, and (2) the internal development by the model of probabilities for these alternatives. Using this approach requires that a probability distribution be assigned to each independent (or exogenous) variable. For example, a weather variable has been shown to be uniformly distributed through a range of values. The price variables might be described quite differently. Thus, different forecasts for the independent variables may be evaluated by changing the distribution parameters or by

utilizing a deterministic solution to the simulation model. The result of this simulation approach is a range of forecast values to be used instead of a single discrete forecast.

Load Management

Accurate forecasts of future electrical demand require careful consideration of the potential impact of conservation. The price of electricity is an important "conservation" variable since it affects the customer's decision to consume or conserve electricity. Economic activity also affects the consumption of electricity. Improved appliance efficiency, solar water heating, and the energy efficient homes would also tend to reduce the rate of growth of electricity. These variables are considered in the load forecast and were previously discussed.

In addition, FPL is currently looking into alternative load management measures that will help reduce the peak load while improving load factor. By improving load factor, existing facilities can be utilized to the maximum extent possible. To achieve this, FPL initiated several test programs involving utility control of residential loads such as air conditioning and water heating. The results of these tests will be used in evaluating implementation techniques on a large scale basis. In addition, FPL will be implementing other load management programs such as time-of-use rates for both residential and commercial sectors, the previously discussed pool pump program, and curtailable rates for commercial and industrial customers.

In spite of these efforts, however, FPL needs the proposed plant from both a capacity and oil displacement standpoint. Were this new coal capacity to be deferred because of load management, the results may be an increase in oil consumption since the utilization of existing oil-fired capacity will be increased. Moreover, as with all new programs, there is a degree of uncertainty associated with these load management programs. This uncertainty is a result of the lag inherent in customer acceptance and

response to these programs. Should customer acceptance be less than that expected by FPL, the company could find itself in the position of having insufficient time to react to this reduced response due to the long lead times required to build a power plant. This could lead to severe penalties being imposed on the public. FPL believes, however, that load management can be successful and will monitor customer response to these programs and adjust its plans as required to reflect their implementation and acceptance. Even if these programs are fully successful, the need for the capacity of this plant still exists, albeit with a slight delay. Until then, however, the need for the plant is fully justified and cost effective on an oil-reduction basis.

Summary

The use of a range (or distribution) of forecast values representing upper and lower bounds for each of the explanatory variables resulted in the development of banded peak load and energy forecasts. The forecast of summer peak load projects a compound annual growth rate in the 1980-1990 period ranging from 1.3 to 3.9 percent. The energy sales forecast has a low annual growth rate of 3.1 percent and a high annual growth rate of 5.1 percent.

1.1.1.3 Capacity Exchanges

The Energy Broker Program

The Florida Electric Power Coordinating Group, Inc. Energy Broker Program is a voluntary, coordinated effort by the generating utilities in Peninsular Florida to achieve maximum utilization of on-line generating capability. The Energy Broker program is a method of informing the individual participants as to the best match of economy interchange sales and purchases between participants pursuant to their bi-lateral contracts which could produce the greatest savings to the group as a whole. Over the

12 months ending September 30, 1980, the Energy Broker participants have exchanged over 2,400,000 MWh of energy and shared in over \$40 million of economy energy savings.

Participation in the Energy Broker Program as of December, 1980, consists of 14 investor and municipally owned utility systems representing over 99 percent of the generating capability in Peninsular Florida. JEA and FPL are active participating members of this program.

It should be noted that the Energy Broker concerns itself with short-term, non-firm sales and purchases of economy energy.

Jacksonville Electric Authority

Historical and Projected Purchases/Sales

JEA historically has not participated in any firm capacity sales or purchases. However, it is the policy of JEA to participate in any firm power sales or purchases which result in reliable cost effective service. JEA, in February, 1981, signed a firm power purchase contract with the Southern Company which will commence in 1983 and end in 1992. The contract provides for "coal-by-wire" as follows:

<u>From</u>	<u>Through</u>	<u>Capacity</u>
January 1, 1983	December 31, 1986	300 MW
January 1, 1987	December 31, 1987	500 MW
January 1, 1988	December 31, 1992	400 MW

These unit power purchases are from specific Southern Company coal units now under construction. Chapter 8, Section 8.1.3, discusses the potential of firm sales or purchases.

Economic Power Purchases

JEA is presently purchasing 100 MW of economy power from the Southern Company. This power is produced from coal-fired units and aids JEA in reducing its dependence on oil-fired generation. This contract will increase to 300 MW in August of 1982 and will continue at that level through 1986 and provides for the purchase on an economic basis, subject to its availability, from the Southern Company. This means that this power is provided on an interruptible basis and is not considered a firm power purchase.

Florida Power & Light Company

Historical and Projected Purchases/Sales

FPL's historical experience with purchases or sales to other utilities has been pursuant to interconnection agreements; there have been no firm capacity sales or purchases in the past. However, FPL has contracted for the future purchase of firm coal-fired power from Tampa Electric Company's (TECO) Big Bend Unit No. 4. This contract becomes effective on the in-service date of Unit No. 4, which is expected by April, 1985, and continues through December, 1987.

Under the terms of the contract, FPL will receive the following capacities:

<u>From</u>	<u>Through</u>	<u>Capacity</u>
In-Service Date	December 31, 1985	292 MW
January 1, 1986	December 31, 1986	208 MW
January 1, 1987	December 31, 1987	104 MW

FPL has also entered into an agreement, in February, 1981, with the Southern Company to buy firm power purchases from 1983 through 1992. Under the terms of the contract, FPL will receive the following amounts of firm coal power:

<u>From</u>	<u>Through</u>	<u>Capacity</u>
January 1, 1983	December 31, 1986	350 MW
January 1, 1987	December 31, 1987	650 MW
January 1, 1988	December 31, 1992	1000 MW

These contracts will enable FPL to further serve its customers' needs with non-oil generated electricity.

Economic Power Purchases

FPL is currently purchasing 100 MW of coal-fired generation from the Southern Company. The purchase of this power is on an economic basis and will be available to FPL through 1986. The energy is priced at Southern's incremental system-wide energy costs and economically dispatched against the cost of FPL's own generation. The terms of the existing service schedule, designated Schedule E, commit the Southern system to provide this power to FPL subject to availability. That is, it is provided on an interruptible basis and thus not considered a firm capacity source.

1.1.2 System Capacity

This section provides a summary of both JEA's and FPL's approach to generation planning, as it is applied in general and in the specific case of this proposed project. A detailed explanation may be found in Appendix M, Section M.3 and M.4.

Future system additions are determined by a utility through a planning process which identifies and evaluates potential system expansion alternatives. This planning process, whether performed internally by the utility or through the use of consultants, generally involves three main steps:

1. forecast of future system loads
2. identification of available options to meet forecasted loads
3. if additional generation is deemed to be required, determination of amount and type of generation to be added

There are many subjective judgements and analytical studies involved in each step of the process. Among these are such items as economic assumptions, customer mix, load and unit characteristics, generation mix, and the system reliability criteria chosen. Furthermore, changes in either social, regulatory, or technological areas could impact the final outcome and need to be factored into the process. As a result, the planning process must be able to adapt to changing conditions. This is accomplished through a periodic re-evaluation of the expansion plan. By accomplishing this, the customer is assured that an adequate and reliable system is provided as economically as possible.

As a result of this process, the construction of the proposed plant offers both utilities the flexibility needed to meet an uncertain planning environment.

In addition to their internal planning process, JEA and FPL also participate in several regional planning efforts which insure the most efficient and economic development of the future energy supply for the ratepayer of Florida. These regional planning efforts are:

Southeastern Electric Reliability Council

The Southeastern Electric Reliability Council (SERC) is one of the nine regional councils of the National Electric Reliability Council. Both JEA and FPL are members of the Peninsular Florida subregion, and adhere to the SERC planning guidelines established to accomplish the following goal: "to augment further the reliability of bulk power supply in the areas serviced by its member systems".

Florida Electric Power Coordinating Group, Inc.

The purpose of the Florida Electric Power Coordinating Group is to "engage in the active coordination of planning, construction, and utilization of generation and transmission facilities in Florida". For example, both JEA and FPL have participated in several studies such as the investigation of the advantages and disadvantages of centralized dispatch for Peninsular Florida.

1.1.3 Reserve Margins

This section explains both JEA's and FPL's analysis of reserve margins associated with the planning process.

Jacksonville Electric Authority

As the system load grows, generating capacity must be increased to maintain an acceptable level of service reliability. To achieve an acceptable level of reliability, utilities install generation capacity which is greater than the expected peak demand. This reserve capacity provides for maintenance of generating units, forced outages, and load growth in excess of estimates.

One criterion often used to measure the adequacy of installed reserve capacity is the percentage of installed capacity to peak load. This method, however, ignores the effect of differences in system load characteristics and variations in the characteristics of the types and sizes of installed and planned generating units.

Another method sometimes used is to maintain reserves equal to the capacity of one or more of the largest units on the system. Historically, JEA has used this method to insure the adequacy of its installed reserve capacity. However, while this criterion provides sufficient reserves to cover the loss of the largest unit, it does not consider the relationship between units on the system and differences in load characteristics.

A third, more recent, method of gauging the adequacy of the generating system is to apply probabilistic methods to capacity planning. This method allows consideration of the effects on the system of unit size and design, and of uncertainties as to forced outage rates, maintenance schedules and the load forecast. These methods provide a reliability index in terms of loss-of-load probability (LOLP) or expectation of loss-of-load hours (LOLH).

While no one criteria completely establishes the generation reserve margin needed to reliably meet the expected load with the expected generation configuration, JEA believes a probabilistic approach such as LOLP or LOLH offers a method to quantify the uncertainties under which a generation expansion plan must be made. It should be noted that in the final analysis of the design index, it is the perceived risk level that is acceptable to the utility and its customers which determines the level of reliability. As mentioned previously, the reliability level must consider the load forecast, unit size, and maintenance schedules. One of the largest uncertainties is the load forecast which is a composite of the many factors which influence demand growth. Factors such as economic growth, population growth, and regulatory policies can have tremendous impact on a load forecast due to the uncertain nature of each. Unit sizes also play an important part in the reliability of a system. As larger and larger units

are added to a system and come to represent a large portion of the installed system capacity, a larger reserve margin is usually required to maintain the same level of reliability as in the past. Planned maintenance also enters into the reliability consideration. As the size and number of units on a system increase, it becomes necessary for the utility to schedule maintenance during both valley and peak periods. To maintain an acceptable level of risk, system reserve levels must increase.

By using LOLP or LOLH as a reliability index, generation expansion plans can be compared on the basis of a measurable "risk level" which takes into consideration the uncertainties in the planning process and allows an evaluation of a wide range of alternatives.

In order to develop a probabilistic criterion for determining the adequacy of planned and installed generating capacity, JEA examined the 20 year period between 1958 and 1977 to determine the historic system reliability. A computer program (PROMOD) was used to make this analysis. This program considered peak load, energy sales, load shapes, and generating unit forced outage rates, as well as scheduled and unscheduled maintenance requirements. A reliability index measured in expected LOLH (i.e., number of hours per year for which demand may exceed generation) was calculated. This index was computed using the load distribution for all hours in a year. This calculation showed that for the 1958-1977 period the JEA system had a calculated median LOLH of 120 hours/year exclusive of any assistance from tie lines.

A check on the reasonableness of the 120 LOLH figure was made and it was found that this translated into providing reserve equal to approximately the capacity of the largest generating unit. This is not surprising since traditionally generation capacity additions and reserve requirements were based on covering the loss of the largest unit. JEA believes, as a result of this analysis, that a reliability level of 120 LOLH should be used as one of the criteria to determine the in-service dates of future units.

In-service dates of future JEA generation additions were determined by using PROMOD and applying the 120 LOLH criterion. Once the generation addition schedule was determined, JEA reviewed the effect of long term maintenance schedules on system LOLH. Maintenance of generating units is imperative if the integrity of the generating system is to be upheld. Maintenance consists of both minor and major overhaul procedures which are conducted periodically according to manufacturer recommendations. Since this usually involves removing the unit from service for extended periods, care must be taken in scheduling these maintenance requirements as they have a significant impact on the system risk level.

Using the load and energy forecast prepared by Gilbert Associates, Inc., and the technique described above, it was found that the first unit would be required in July, 1991 and the second unit in January, 1993. Tables 1.1-7 and 1.1-8 illustrate JEA's generation reserve analysis for 1980 through 1989 for both the forecasted summer and winter peaks.

Florida Power & Light Company

Reserve Margins as a Planning Criterion

Electric utilities typically have installed generation capacity that is greater than their current level of peak demand. This additional capacity is necessary so that utilities can continue to provide reliable service to customers in the event of contingencies such as when some plants are shut down for refueling, scheduled maintenance, unscheduled breakdowns, or when demand exceeds expected or forecasted levels.

There are two principal reliability criteria used frequently by the electric industry to attempt to define an adequate level of capacity: percent reserve margin and LOLP. Percent reserves is defined as capacity in excess of a certain forecasted or expected consumer demand. LOLP is a probabilistic method that attempts to quantify the expected risk of not

being able to serve the consumer's demand for electricity. Either of these methods serves as an adequate planning tool since there is a strong correlation between the two.

At the outset, it is important to recognize that there is no precise formulation which yields the optimum required capacity level. Accordingly, these levels are established based on a consideration of specific system characteristics and a perceived risk level that is acceptable, or desirable, to the company and its customers. Under current circumstances, FPL believes that a 20 - 25 percent reserve margin is reasonable and appropriate for its system planning purposes. Factors entering into this determination are more fully discussed below.

One of the major difficulties in developing an acceptable reserve margin is the uncertainty associated with the load forecast. Assessment of future demand growth is complex and controversial. Many of the factors determining demand growth are uncertain, for example, economic growth, consumer purchasing behavior, effects of potential conservation measures, and new standards for electric appliances.

Thus, the amount of reserve capacity planned by Florida Power & Light depends upon system load characteristics, number, size, and type of units, and the perceived amount of uncertainty with growth forecasts.

Factors Affecting Reserve Margins

During the 1960's, the loss of load probability methods of analyzing system reliability came into common use by the utility industry. A LOLP index of one day in 10 years is a widely used planning criterion within the industry for large interconnected systems. To achieve this standard, planned reserve margins generally have averaged 15 to 30 percent. Use of LOLP criteria is regarded by FPL as a planning aid which helps establish and verify the adequacy of planned reserve margins.

The size and type of units that make up the system must be considered in arriving at the appropriate level of reserves. Large units (700-800 MW) represent a large percentage of system capacity and load. Consequently, reserve margin requirements tend to increase to accommodate the loss of any such unit.

Planned maintenance outages are typically scheduled by utilities to coincide with seasonal periods of reduced customer load. As the number of units on a system increases, it is impossible to schedule all necessary unit maintenance during these periods and, therefore, system reserves have to increase to allow units to be maintained during peak periods at an acceptable level of risk.

In addition, long construction lead times, delays in project schedules, and the previously mentioned uncertainties in the load forecast tend to increase risk and require a higher reserve margin to compensate.

Finally, another major consideration in the development of reserve margins is FPL's responsibility to the Florida Subregion of SERC. FPL and other members voluntarily share operating reserve requirements for spinning reserve and supplemental reserve. FPL's reserve requirements represent its ability to react to system emergencies and forced maintenance outages. They must be maintained if FPL is to provide adequate and reliable generation to its customers and meet its operating reserve responsibilities to other Florida utilities.

The above factors, if ignored in determining adequate reserves, would tend to increase system risk to unacceptable levels. To compensate for this, FPL has for some time followed a 20 - 25 percent generating reserve margin target. It must be noted that FPL's target reserve margin levels are based on the "most probable" value within FPL's load forecast band. As such, actual reserve margin levels may be materially lower under the "high" band of the forecast and, conversely, higher under the "low" band.

Planned Outage Methodology

As previously discussed, forced and planned maintenance outages are major considerations when planning for reserve margins.

FPL's overhaul schedule for 26 steam units is based on system capability and predicted system loads. FPL schedules a complete turbine-generator inspection every 5 years with shorter outages in other years for boiler cleaning and auxiliary maintenance. The operating condition of units, any modifications recommended by turbine-generator manufacturers, unit upgrading, transmission line limitations, area protection, available manpower, budgetary limitations, and numerous other variables are considered in the development of the system schedule.

FPL must provide sufficient generation reserves to allow for planned maintenance outages without jeopardizing the system's ability to meet the demand while maintaining sufficient available capacity to allow for emergencies.

Supportive Study

FPL's successful use of percent reserve margins as a capacity expansion planning criterion is based on the established reserve/risk relationship that is characteristic of FPL's system. Therefore, if the system characteristics change through time (i.e., supply and demand parameters), so can this reserve/risk relationship. It then becomes necessary to periodically re-confirm and possibly re-establish the relationship to ensure that FPL's risk level falls within expected values with relation to the reserve margin planning criterion.

Preliminary results of a recent comprehensive study on generation reliability show the continuing strong correlation between reserves and risk as they relate to the FPL system. This further validates the use of percent reserves as a planning criterion to provide adequate and reliable

generation. Also, an assessment of FPL's current expansion plans reconfirms the need for the proposed coal units on a risk evaluation basis as well as the percent reserve criterion.

FPL will continue to utilize state-of-the-art techniques for system planning and further investigate the development of new methods to keep up with the growing complexity of the planning function in the electric utility industry.

Effect of Unit Operation on FPL Generating Capability

FPL's planned generating capability additions for the years 1980 through 1989 are presented in Table 1.1-9. As shown in this table, FPL needs the capacity of these units in 1988 and 1990 in order to maintain its planning criterion of 20 to 25 percent reserves. Present schedules, however, which are based on the mutual needs of the joint project partners, call for the first unit to be commercially available by the summer peak of 1986 with the second unit being available by the summer peak of 1987. Table 1.1-10 shows the generating capability that will result from the earlier addition of the second unit.

As described in Section 1.1.1.1, FPL expects to be a winter peaking company. Nevertheless, FPL continues to base its generating expansion plans on expected summer peaks. The reasons for this are threefold: (1) cooler intake air and water temperatures make the generating units more efficient during the winter (see Table 1.1-2 showing a difference of greater than 500 MW between summer and winter ratings for existing units); (2) projected winter peaks do not generally exceed the summer peak by a sufficient amount to offset increased unit efficiency; and (3) winter peaks tend to be of short duration as compared to summer peaks. FPL, therefore, considers the summer peak dominant and plans accordingly. Additionally, FPL continuously monitors and re-evaluates its forecast and consequently, the above described relationship is periodically re-examined.

In addition to its capacity needs, FPL intends to utilize the addition of these units to reduce its dependence on oil-fired generation. Section 1.2 further discusses FPL's oil displacement objectives.

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JACKSONVILLE ELECTRIC AUTHORITY
EXISTING GENERATING FACILITIES

Plant	Unit No.	Location	Type	Fuel		Commercial In-Service Month/Year	Expected Retirement Month/Year	Gen Max Nameplate kW	Net Capability	
				Pri	Alt				Summer MW	Winter MW
Southside		Duval County 45/2S/ 26E						356600	314.3	322.3
	1		FS	HO	11/50	11/90		37500	26.4	27.4
	2		FS	HO	1/51	1/91		37500	28.6	31.6
	3		FS	HO	1/55	1/95		50000	46.3	48.3
	4		FS	HO	11/58	1/98		75000	70.1	71.1
	5		FS	HO	9/64	9/04		156600	142.9	143.9
	1-2		CT	LO	2/69	10/80		--	--	--
Kennedy		Duval County 39/ 2S/27E						479100	443.8	493.5
	8		FS	HO	7/55	7/95		50000	43.1	46.1
	9		FS	HO	1/58	1/98		50000	42.8	45.8
	10		FS	HO	12/61	12/01		149600	130.2	136.2
	1		CT	LO	2/69	Unknown		17000	12.9	15.4
	2		CT	LO	2/69	10/80		--	--	--
	3-6		CT	LO	7/73	Unknown		212500	214.8	250.0
Northside		Duval County 12/1S/27E						1439700	1232.2	1270.2
	1		FS	HO	11/66	11/06		297500	262.4	262.4
	2		FS	HO	3/72	3/12		297500	262.4	262.4
	3		FS	HO	7/77	7/17		563700	499.4	499.4
	1-2		CT	LO	10/68	10/80		--	--	--
	3-6		CT	LO	1/75	Unknown		248400	208.0	246.0
SYSTEM TOTAL									1990.3	2086.0

Table 1.1-2 (Revision 1)

FLORIDA POWER & LIGHT COMPANY

EXISTING GENERATING FACILITIES

Plant	Unit No.	Location	Type	Fuel		Commercial In-Service Month/Year	Expected Retirement Month/Year	Gen Max Nameplate kW	Net Capability	
				Pri	Alt				Summer MW	Winter MW
Turkey Point		Dade County 27/57S/40E						2,337,790	2,039.5	2,105.5
	1		FS	HO	NG	4/67	Unknown	402,050	367.0	370.0
	2		FS	HO	NG	4/68	Unknown	402,040	367.0	370.0
	3		N	N	No	12/72	Unknown	759,970	646.0	676.0
	4		N	N	No	9/73	Unknown	759,970	646.0	676.0
	1-5		D	LO	No	4/68	Unknown	13,750	13.5	13.5
Lauderdale		Broward County 30/50S/42E						1,133,972	1,126.0	1,250.0
	4		FS	HO	NG	9/57	Unknown	156,250	137.0	139.0
	5		FS	HO	NG	4/58	Unknown	156,250	137.0	139.0
	1-12		CT	LO	NG	8/70	Unknown	410,736	426.0	486.0
	13-14		CT	LO	NG	8/72	Unknown	410,736	426.0	486.0
								1,679,086	1,581.5	1,651.5
Port Everglades		City of Hollywood 23/50S/42E								
	1		FS	HO	NG	6/60	Unknown	225,250	204.0	206.0
	2		FS	HO	NG	4/61	Unknown	225,250	204.0	206.0
	3		FS	HO	NG	7/64	Unknown	402,050	367.0	370.0
	4		FS	HO	NG	4/65	Unknown	402,050	367.0	370.0
	1-12		CT	LO	NG	8/71	Unknown	410,736	426.0	486.0
	1-5		D	LO	No	4/68	Unknown	13,750	13.5	13.5

Table 1.1-2 (Revision 1) (Continued)

FLORIDA POWER & LIGHT COMPANY

EXISTING GENERATING FACILITIES

Plant	Unit No.	Location	Type	Fuel		Commercial In-Service Month/Year	Expected Retirement Month/Year	Gen Max Nameplate kW	Net Capability	
				Pri	Alt				Summer MW	Winter MW
Riviera		City of Riviera Beach 33/42S/43E						739,590	653.3	662.0
	1		FS	HO	NG	11/46	Unknown	43,750	40.0	41.0
	2		FS	HO	NG	11/53	Unknown	75,000	69.0	71.0
	3		FS	HO	NG	6/62	Unknown	310,420	272.0	275.0
	4		FS	HO	NG	3/63	Unknown	310,420	272.0	275.0
Cape Canaveral		Brevard County 19/24S/36E						804,100	729.0	739.0
	1		FS	HO	NG	4/65	Unknown	402,050	367.0	370.0
	2		FS	HO	NG	5/69	Unknown	402,050	362.0	366.0
St. Lucie		St. Lucie County 16/36S/41E						850,000	777.0	795.0
	1		N	N	No	12/76	Unknown	850,000	777.0	795.0
Sanford		Volusia County 16/19S/30E						1,028,450	861.0	871.0
	3		FS	HO	NG	5/59	Unknown	156,250	137.0	139.0
	4		FS	HO	No	7/72	Unknown	436,100	362.0	366.0
	5		FS	HO	No	6/73	Unknown	436,100	362.0	366.0
Putnam		Putnam County 16/10S/27E						580,000	446.0	518.0
	1		CC	HO	LO	4/79	Unknown	290,000	223.0	259.0
	2		CC	HO	LO	8/77	Unknown	290,000	223.0	259.0

Table 1.1-2 (Revision 1) (Continued)

FLORIDA POWER & LIGHT COMPANY

EXISTING GENERATING FACILITIES

Plant	Unit No.	Location	Type	Fuel		Commercial In-Service Month/Year	Expected Retirement Month/Year	Gen Max Nameplate kW	Net Capability	
				Pri	Alt				Summer MW	Winter MW
Ft. Myers		Lee County 35/43S/25E						1,302,300	1,176.0	1,337.0
	1		FS	HO	NO	12/58	Unknown	156,250	137.0	139.0
	2		FS	HO	NO	7/69	Unknown	402,050	367.0	370.0
	1-12		CT	LO	NO	6/74	Unknown	744,000	672.0	828.0
Manatee		Manatee County 18/33S/20E						1,726,600	1,566.0	1,580.0
Martin	1		FS	HO	NO	10/76	Unknown	863,300	783.0	790.0
	2		FS	HO	NO	12/77	Unknown	863,300	783.0	790.0
		Martin County 29/39S/38E						863,300	783.0	790.0
	1		FS	HO	NO	12/80	Unknown	863,300	783.0	790.0
Cutler*		Dade County 24/55S/40E							11,738	12,296
								305,500	197.0	202.0
	5		FS	HO	NG	11/54	Unknown	75,000	67.0	70.0
	6		FS	HO	NG	7/55	Unknown	161,500	130.0	132.0
Palatka*		Putnam County 16/10S/27E						109,500	107.0	111.0
	1		FS	HO	NG	8/51	Unknown	34,500	32.0	34.0
	2		FS	HO	NG	8/56	Unknown	75,000	75.0	77.0
									12,042	12,609
TOTAL SYSTEM INCLUDING EXTENDED COLD-STANDBY AS OF DECEMBER 31, 1980 =										
TOTAL SYSTEM AS OF DECEMBER 31, 1980 =										

* The Company currently has four fossil fuel units on extended cold standby (ECS) status.

Table 1.1-3

JACKSONVILLE ELECTRIC AUTHORITY

HISTORY AND FORECAST OF ENERGY CONSUMPTION

Year	Rural and Residential			Commercial			Industrial	
	GWH	Average No. of Customers	Average kWh Consumption Per Customer	GWH	Average No. of Customers	GWH	Average No. of Customers	Average No. of Customers
1970	1676	152242	11011	641	18040	1215	376	
1971	1751	157625	11106	705	18425	1353	383	
1972	1898	163786	11592	753	18943	1492	413	
1973	2141	170242	12574	721	19331	1617	459	
1974	1989	178758	10615	768	19664	1604	480	
1975	2021	184160	10977	793	19986	1708	508	
1976	2141	187685	11409	824	20522	1790	507	
1977	2314	190914	12119	867	21084	1881	506	
1978	2367	195537	12097	897	21777	1965	526	
1979	2291	199232	11490	891	21970	2026	532	
1980	2266	202415	11195	844	22038	2039	571	
1981	2253	202620	11119	875	21992	2066	553	
1982	2318	204320	11345	911	22222	2233	566	
1983	2385	206160	11569	937	22427	2401	578	
1984	2515	208110	12085	970	22749	2528	600	
1985	2558	210170	12171	984	22741	2582	594	
1986	2648	212310	12472	1009	22876	2687	599	
1987	2726	214540	12706	1030	22951	2780	600	
1988	2831	216840	13056	1054	23173	2876	613	
1989	2936	219200	13394	1081	23421	3005	628	

Table 1.1-3 (Continued)

JACKSONVILLE ELECTRIC AUTHORITY

HISTORY AND FORECAST OF ENERGY CONSUMPTION

Year	Street & Highway Lighting GWH	Other Sales to Ultimate Consumers GWH	Total Sales to Ultimate Consumers GWH	Sales for Resale GWH	Utility Use & Losses GWH	Net Energy For Load GWH
1970	32	0	3564	248	286	4098
1971	52	0	3861	262	331	4454
1972	57	0	4200	270	361	4831
1973	65	0	4644	321	316	5281
1974	66	0	4336	309	323	4968
1975	65	0	4587	349	382	5318
1976	69	0	4824	395	356	5575
1977	68	0	5130	428	394	5952
1978	70	0	5299	458	399	6156
1979	71	0	5279	463	361	6103
1980	79	0	5228	464	358	6050
1981	69	0	5263	475	343	6081
1982	69	0	5531	480	356	6367
1983	70	0	5793	486	366	6645
1984	70	0	6083	492	378	6953
1985	71	0	6195	498	383	7076
1986	72	0	6416	504	393	7313
1987	72	0	6608	510	401	7519
1988	73	0	6834	516	411	7761
1989	73	0	7095	522	422	8039

Table 1.1-4

JACKSONVILLE ELECTRIC AUTHORITY

HISTORY AND FORECAST OF SEASONAL PEAK DEMAND AND ANNUAL NET ENERGY FOR LOAD

Year	Summer, Peak Demand Net MW		Net Energy For Load - GWh	Load Factor %	Year	Winter Peak Demand Net MW	
	Interruptible	Total				Interruptible	Total
1970	0	834	4098	56.1	1970-71	0	733
1971	0	898	4454	56.6	1971-72	0	811
1972	0	1013	4831	54.3	1972-73	0	891
1973	0	1090	5281	55.3	1973-74	0	829
1974	0	1067	4968	53.2	1974-75	0	825
1975	0	1116	5318	54.5	1975-76	0	948
1976	0	1181	5575	53.6	1976-77	0	1160
1977	0	1243	5952	54.5	1977-78	0	1123
1978	0	1303	6156	56.1	1978-79	0	1180
1979	0	1218	6103	57.2	1979-80	0	1146
1980	0	1296	6050	53.3	1980-81	0	1169
1981	0	1279	6081	54.3	1981-82	0	1244
1982	0	1329	6367	54.7	1982-83	0	1318
1983	0	1375	6645	55.2	1983-84	0	1401
1984	0	1429	6953	55.5	1984-85	0	1464
1985	0	1444	7076	55.2	1985-86	0	1544
1986	0	1485	7313	54.1	1986-87	0	1630
1987	0	1514	7519	52.7	1987-88	0	1714
1988	0	1552	7761	51.7	1988-89	0	1798
1989	0	1596	8039	51.0	1989-90	0	1874

Table 1.1-5A

FLORIDA POWER & LIGHT COMPANY
HISTORY AND FORECAST OF ENERGY CONSUMPTION
LOW BAND OF FORECAST^a

Year	Rural and Residential			Commercial			Industrial		
	GWH	Average No. of Customers	Average kWh Consumption Per Customer	GWH	Average No. of Customers	GWH	GWH	Average No. of Customers	Average No. of Customers
1970	11814	1115070	10595	6476	121353	2044	2044	5055	5055
1971	13080	1194015	10955	7395	129371	2236	2236	5116	5116
1972	14653	1289027	11367	8389	139743	2468	2468	5208	5208
1973	16823	1397228	12040	10180	158977	2755	2755	5275	5275
1974	16802	1498262	11214	11041	168991	2646	2646	7147	7147
1975	17313	1555834	11128	11851	171575	2534	2534	8977	8977
1976	17626	1607015	10968	12117	177046	2596	2596	9994	9994
1977	19073	1677532	11370	12885	184676	2756	2756	11796	11796
1978	20736	1758838	11790	13748	192850	2993	2993	13799	13799
1979	21062	1854884	11355	14373	202673	3147	3147	14837	14837
1980	22433	1954240	11473	15089	212956	3348	3348	14734	14734
1981	23253	2051528	11334	15571	226777	3421	3421	14958	14958
1982	23688	2080586	11385	15963	232300	3518	3518	16330	16330
1983	24434	2104530	11610	16374	235900	3640	3640	16590	16590
1984	24837	2128004	11672	17111	239800	3681	3681	17120	17120
1985	25292	2155375	11734	17877	243900	3722	3722	18150	18150
1986	25700	2208509	11637	18674	252000	3767	3767	19490	19490
1987	26144	2264192	11547	19502	259200	3823	3823	20880	20880
1988	26712	2321446	11507	20516	266400	3868	3868	22300	22300
1989	27026	2379957	11356	21315	274000	3893	3893	23770	23770

^a The "Low" represents a forecasted number for which there is a 10 percent chance that the actual value will be less than the forecast.

Table 1.1-5A (Continued)

FLORIDA POWER & LIGHT COMPANY

HISTORY AND FORECAST OF ENERGY CONSUMPTION
LOW BAND OF FORECAST^a

Year	Street & Highway Lighting GWH	Other Sales to Ultimate Consumers GWH	Total Sales to Ultimate Consumers GWH	Sales for Resale GWH	Utility Use & Losses GWH	Net Energy For Load GWH
1970	185	1810	22329	786	1998	25113
1971	204	1927	24842	947	2095	27884
1972	216	2080	27806	1122	2570	31498
1973	240	1119	31117	1350	2718	35185
1974	257	409	31236	1475	2754	35465
1975	285	524	32507	1604	3040	37151
1976	308	482	33129	1801	3095	38025
1977	329	474	35517	2012	3183	40712
1978	343	478	38298	2304	3104	43706
1979	358	463	39403	2563	3376	45342
1980	372	463	41705	3003	3742	48450
1981	385	482	43112	3548	3794	50454
1982	390	507	44066	3728	3987	51781
1983	387	538	46373	3945	4289	53607
1984	382	548	46559	4214	4415	55188
1985	372	565	47828	4443	4545	56816
1986	361	576	49078	4736	4679	58493
1987	353	587	50409	4993	4818	60220
1988	344	602	51772	5264	4960	61996
1989	336	617	53187	5532	5106	63825

^a The "Low" represents a forecasted number for which there is a 10 percent chance that the actual value will be less than the forecast.

Table 1.1-5B

FLORIDA POWER & LIGHT COMPANY

HISTORY AND FORECAST OF ENERGY CONSUMPTION
MOST PROBABLE FORECASTS

Year	Rural and Residential			Commercial			Industrial		
	GWH	Average No. of Customers	Average kWh Consumption Per Customer	GWH	Average No. of Customers	GWH	GWH	Average No. of Customers	
1970	11814	1115070	10595	6476	121353	2044	2044	5055	
1971	13080	1194015	10955	7395	129371	2236	2236	5116	
1972	14653	1289027	11367	8389	139743	2468	2468	5208	
1973	16823	1397228	12040	10180	158977	2755	2755	5275	
1974	16802	1498262	11214	11041	168991	2646	2646	7147	
1975	17313	1555834	11128	11851	171575	2534	2534	8977	
1976	17626	1607015	10968	12117	177046	2596	2596	9994	
1977	19073	1677532	11370	12885	184676	2756	2756	11796	
1978	20736	1758838	11790	13748	192850	2993	2993	13799	
1979	21062	1854884	11355	14373	202673	3147	3147	14837	
1980	22433	1955240	11473	15089	212956	3348	3348	14734	
1981	23253	2051528	11334	15571	226777	3421	3421	14958	
1982	24250	2121300	11432	16315	236864	3599	3599	16654	
1983	25474	2199808	11580	17071	246613	3794	3794	17344	
1984	26150	2277649	11481	18009	256700	3874	3874	18320	
1985	26845	2358859	11381	18999	266900	3955	3955	19860	
1986	27559	2431616	11334	20043	277500	4037	4037	21460	
1987	28293	2507413	11284	21144	287000	4121	4121	23120	
1988	29043	2585850	11232	22306	296800	4208	4208	24840	
1989	29817	2665917	11185	23531	306900	4295	4295	26630	

a The "Most Probable" represents a forecasted number for which there is an equal probability of being above or below.

Table 1.1-5B (Continued)

FLORIDA POWER & LIGHT COMPANY

HISTORY AND FORECAST OF ENERGY CONSUMPTION
MOST PROBABLE FORECAST^a

Year	Street & Highway Lighting GWH	Other Sales to Ultimate Consumers GWH	Total Sales to Ultimate Consumers GWH	Sales for Resale GWH	Utility Use & Losses GWH	Net Energy For Load GWH
1970	185	1810	22329	786	1998	25113
1971	204	1927	24842	947	2095	27884
1972	216	2080	27806	1122	2570	31498
1973	240	1119	31117	1350	2718	35185
1974	257	409	31236	1475	2754	35465
1975	285	524	32507	1604	3040	37151
1976	308	482	33129	1801	3095	38025
1977	329	474	35517	2012	3183	40712
1978	343	478	38298	2304	3104	43706
1979	358	463	39403	2563	3376	45342
1980	372	463	41705	3003	3742	48450
1981	385	482	43112	3548	3794	50454
1982	399	519	45082	3834	4084	53000
1983	405	559	47303	4104	4471	55878
1984	402	577	49012	4417	4646	58075
1985	395	598	50792	4738	4829	60359
1986	388	618	52645	5069	5019	62733
1987	382	638	54578	5406	5216	65200
1988	375	657	56589	5754	5421	67764
1989	368	679	58690	6105	5634	70429

^a The "Most Probable" represents a forecasted number for which there is an equal probability of being above or below.

Table 1.1-5C

FLORIDA POWER & LIGHT COMPANY

HISTORY AND FORECAST OF ENERGY CONSUMPTION
HIGH BAND OF FORECAST^a

Year	Rural and Residential			Commercial			Industrial		
	GWH	Average No. of Customers	Average kWh Consumption Per Customer	GWH	Average No. of Customers	GWH	GWH	Average No. of Customers	Average No. of Customers
1970	11814	1115070	10595	6476	121353	2044	2044	5055	5055
1971	13080	1194015	10955	7395	129371	2236	2236	5116	5116
1972	14653	1289027	11367	8389	139743	2468	2468	5208	5208
1973	16823	1397228	12040	10180	158977	2755	2755	5275	5275
1974	16802	1498262	11214	11041	168991	2646	2646	7147	7147
1975	17313	1555834	11128	11851	171575	2534	2534	8977	8977
1976	17626	1607015	10968	12117	177046	2596	2596	9994	9994
1977	19073	1677532	11370	12885	184676	2756	2756	11796	11796
1978	20736	1758838	11790	13748	192850	2993	2993	13799	13799
1979	21062	1854884	11355	14373	202673	3147	3147	14837	14837
1980	22433	1955240	11473	15089	212956	3348	3348	14734	14734
1981	23253	2051528	11334	15571	226777	3421	3421	14958	14958
1982	25129	2147984	11699	16934	239900	3732	3732	16860	16860
1983	27002	2248351	12010	18096	252100	4023	4023	17720	17720
1984	27831	2352863	11829	19173	265200	4125	4125	18930	18930
1985	28736	2462286	11670	20310	278400	4228	4228	20730	20730
1986	29605	2545004	11633	21509	290400	4339	4339	22460	22460
1987	30533	2632240	11600	22775	301200	4464	4464	24270	24270
1988	31451	2722107	11554	24178	312700	4559	4559	26150	26150
1989	32449	2815574	11525	25589	324200	4674	4674	28130	28130

^a The "High" represents a forecasted number for which there is a 10 percent chance that the actual value will be greater than the forecast.

Table 1.1-5C (Continued)

FLORIDA POWER & LIGHT COMPANY

HISTORY AND FORECAST OF ENERGY CONSUMPTION
HIGH BAND OF FORECAST^a

Year	Street & Highway Lighting GWH	Other Sales to Ultimate Consumers GWH	Total Sales to Ultimate Consumers GWH	Sales for Resale GWH	Utility Use & Losses GWH	Net Energy For Load GWH
1970	185	1810	22329	786	1998	25113
1971	204	1927	24842	947	2095	27884
1972	216	2080	27806	1122	2570	31498
1973	240	1119	31117	1350	2718	35185
1974	257	409	31236	1475	2754	35465
1975	285	524	32507	1604	3040	37151
1976	308	482	33129	1801	3095	38025
1977	329	474	35517	2012	3183	40712
1978	343	478	38298	2304	3104	43706
1979	358	463	39403	2563	3376	45342
1980	372	463	41705	3003	3742	48450
1981	385	482	43112	3548	3794	50454
1982	414	537	46746	3954	4230	54930
1983	430	594	50145	4360	4740	59245
1984	428	614	52171	4722	4947	61840
1985	422	641	54337	5048	5164	64549
1986	415	663	56531	5455	5390	67376
1987	412	686	58870	5831	5626	70327
1988	405	709	61302	6233	5873	73408
1989	400	740	63852	6641	6130	76623

^a The "High" represents a forecasted number for which there is a 10 percent chance that the actual value will be greater than the forecast.

Table 1.1-6A

FLORIDA POWER & LIGHT COMPANY
HISTORY AND FORECAST OF SEASONAL PEAK DEMAND AND ANNUAL NET ENERGY FOR LOAD
LOW BAND OF FORECAST^a

Year	Summer Peak Demand		Net Energy For Load - GWh	Load Factor %	Year	Winter Peak Demand	
	Interruptible ^b	Total				Interruptible ^b	Total
1970	30	5001	25113	57	1970-71	0	5059
1971	118	5378	27884	59	1971-72	0	4676
1972	0	6011	31498	60	1972-73	0	5953
1973	0	6894	35185	58	1973-74	0	6258
1974	0	7235	35465	56	1974-75	0	5807
1975	0	7076	37151	60	1975-76	0	7287
1976	0	7598	38025	57	1976-77	117	8606
1977	0	7841	40712	59	1977-78	0	8617
1978	0	8345	43706	60	1978-79	0	8791
1979	0	8650	45342	59	1979-80	178	9732 ^c
1980	178	9623 ^c	48450	NA	1980-81	200 ^d	10738 ^d
1981	180	9630	50454	NA	1981-82	183	9805
1982	183	9439	51781	NA	1982-83	185	9845
1983	185	9610	53607	NA	1983-84	187	10060
1984	187	9785	55188	NA	1984-85	190	10285
1985	190	9963	56816	NA	1985-86	192	10510
1986	192	10205	58493	NA	1986-87	195	10745
1987	195	10366	60220	NA	1987-88	197	10980
1988	197	10543	61996	NA	1988-89	200	11225
1989	200	10745	63825	NA	1989-90	203	11470

^a The "Low" represents a forecasted number for which there is a 10 percent chance that the actual value will be less than the forecast.

^b Historical values represent actual load curtailed. Future values are for curtailable load. FPL's Energy Management Plan for the 80's describes efforts to attract additional curtailable loads.

^c Actual

^d Actual as of January 13, 1981.

Table 1.1-6B

FLORIDA POWER & LIGHT COMPANY
HISTORY AND FORECAST OF SEASONAL PEAK DEMAND AND ANNUAL NET ENERGY FOR LOAD
MOST PROBABLE FORECAST^a

Year	Summer Peak Demand		Net Energy For Load - GWh	Load Factor %	Year	Winter Peak Demand ^a	
	Interruptible ^b	Total				Interruptible ^b	Total
1970	30	5001	25113	57	1970-71	0	5059
1971	118	5378	27884	59	1971-72	0	4676
1972	0	6011	31498	60	1972-73	0	5953
1973	0	6894	35185	58	1973-74	0	6258
1974	0	7235	35465	56	1974-75	0	5807
1975	0	7076	37151	60	1975-76	0	7287
1976	0	7598	38025	57	1976-77	117	8606
1977	0	7841	40712	59	1977-78	0	8617
1978	0	8345	43706	60	1978-79	0	8791
1979	0	8650	45342	59	1979-80	178	9732 ^c
1980	178	9623 ^c	48450	57	1980-81	200 ^d	10738 ^d
1981	183	9630	50454	54	1981-82	189	10330
1982	189	9972	53000	59	1982-83	194	10660
1983	194	10317	55878	60	1983-84	200	10950
1984	200	10690	58075	60	1984-85	206	11280
1985	206	11077	60369	61	1985-86	212	11620
1986	212	11445	62733	62	1986-87	218	11965
1987	218	11792	65200	62	1987-88	224	12325
1988	224	12179	67764	63	1988-89	231	12700
1989	231	12621	70429	63	1989-90	238	13080

^a The "Most Probable" represents a forecasted number for which there is an equal probability of being above or below.

^b Historical values represent actual load curtailed. Future values are for curtailable load. FPL's Energy Management Plan for the 80's describes efforts to attract additional curtailable loads.

^c Actual

^d Actual as of January 13, 1981.

Table 1.1-6C

FLORIDA POWER & LIGHT COMPANY
HISTORY AND FORECAST OF SEASONAL PEAK DEMAND AND ANNUAL NET ENERGY FOR LOAD
HIGH BAND OF FORECAST^a

Year	Summer Peak Demand		Net Energy For Load - GWh	Load Factor %	Year	Winter Peak Demand	
	Interruptible ^b	Total				Interruptible ^b	Total
1970	30	5001	25113	57	1970-71	0	5059
1971	118	5378	27884	59	1971-72	0	4676
1972	0	6011	31498	60	1972-73	0	5953
1973	0	6894	35185	58	1973-74	0	6258
1974	0	7235	35465	56	1974-75	0	5807
1975	0	7076	37151	60	1975-76	0	7287
1976	0	7598	38025	57	1976-77	117	8606
1977	0	7841	40712	59	1977-78	0	8617
1978	0	8345	43706	60	1978-79	0	8791
1979	0	8650	45342	59	1979-80	178	9732 ^c
1980	178	9623 ^c	48450	NA	1980-81	200 ^d	10738 ^d
1981	185	9630	50454	NA	1981-82	192	10805
1982	192	10422	54930	NA	1982-83	200	11385
1983	200	10810	59245	NA	1983-84	207	11740
1984	207	11214	61840	NA	1984-85	216	12110
1985	216	11632	64549	NA	1985-86	224	12495
1986	224	12256	67376	NA	1986-87	233	12885
1987	233	12634	70327	NA	1987-88	242	13290
1988	242	13077	73408	NA	1988-89	251	13710
1989	251	13621	76623	NA	1989-90	261	14140

^a The "High" represents a forecasted number for which there is a 10 percent chance that the actual value will be greater than the forecast.

^b Historical values represent actual load curtailed. Future values are for curtailable load. FPL's Energy Management Plan for the 80's describes efforts to attract additional curtailable loads.

^c Actual

^d Actual as of January 13, 1981.

Table 1.1-7 (Revision 1)

JACKSONVILLE ELECTRIC AUTHORITY
GENERATION EXPANSION PLAN
GENERATION AND RESERVE ANALYSIS
AT TIME OF SUMMER PEAK

	Generation Added/ (Retired) (MW)	Fuel Type	Total Net Summer Capability (MW)	Net Summer Peak Load ^a (MW)	Reserves (MW) (%)	
1980	-	-	1350.9 ^b	1296 ^c	54.9	4.2
1981	262.4 Northside 1 ^d 118.0 Northside 3 ^d	Oil Oil	1731.3	1279	452.3	35.4
1982	85.0 Northside 2 ^d 12.9 Kennedy CT1 ^d 53.7 Kennedy CT3 ^d 53.7 Kennedy CT4 ^d	Oil Oil Oil Oil	1936.6	1329	607.6	45.7
1983	53.7 Kennedy CT6 ^d 300.0 Southern ^e	Oil Coal	2290.3	1375	915.3	66.6
1984	330.0 Southern ^e	Coal	2290.3	1429	861.3	60.3
1985	300.0 Southern ^e	Coal	2290.3	1444	846.3	58.6
1986	275.0 SJRPP 1 300.0 Southern ^e	Coal Coal	2565.3	1485	1080.3	72.7
1987	275.0 SJRPP 2 500.0 Southern ^e	Coal Coal	3040.3	1514	1526.3	100.8
1988	400.0 Southern ^e	Coal	2940.3	1552	1388.3	89.5
1989	400.0 Southern (12.9 Kennedy CT1)	Coal Oil	2927.4	1596	1331.4	83.4

a Gilbert forecast

b Net capability reflects units which are currently derated

c Actual

d Restoration of existing unit

e Firm purchase of unit power from Southern Company

Table 1.1-8 (Revision 1)

JACKSONVILLE ELECTRIC AUTHORITY
GENERATION EXPANSION PLAN
GENERATION AND RESERVE ANALYSIS
AT TIME OF WINTER PEAK

	Generation Added/ (Retired) (MW)	Fuel Type	Total Net Winter Capability (MW)	Net Winter Peak Load ^a (MW)	Reserves (MW)	(%)
1980/81	-	-	1417.7 ^b	1169	248.7	21.3
1981/82	262.4 Northside 1 ^c 118.0 Northside 3 ^c	Oil Oil	1798.1	1244	554.1	44.5
1982/83	85.0 Northside 2 ^c 15.4 Kennedy CT1 ^c 62.5 Kennedy CT3 ^c 62.5 Kennedy CT4 ^c 62.5 Kennedy CT6 ^c 300.0 Southernd ^d	Oil Oil Oil Oil Oil Coal	2386.0	1318	1068.0	81.0
1983/84	300.0 Southernd ^d	Coal	2386.0	1401	985.0	70.3
1984/85	300.0 Southernd ^d	Coal	2386.0	1464	922.0	63.0
1985/86	300.0 Southernd ^d	Coal	2386.0	1544	842.0	54.5
1986/87	275.0 SJRPP 1 500.0 Southernd ^d	Coal Coal	2861.0	1630	1231.0	75.5
1987/88	275.0 SJRPP 2 400.0 Southernd ^d	Coal Coal	3036.0	1714	1322.0	77.1
1988/89	400.0 Southernd ^d (15.4 Kennedy CT1)	Coal Oil	3020.6	1798	1222.6	68.0
1989/90	400.0 Southernd ^d	Coal	3020.6	1874	1146.6	61.2

a Gilbert forecast

b Net capability reflects units which are currently derated

c Restoration of existing unit

d Firm purchase of unit power from Southern Company

Table 1.1-9 (Revision 1)

FLORIDA POWER & LIGHT COMPANY
PLANNING GENERATION AND RESERVE ANALYSIS

	Generation Added/ (Retired) (MW)	Fuel Type	Total Net Summer Capacity (MW)	Net Summer Peak Load (MW)	Reserves	
					(MW)	(%)
1980	-	-	10955a	9623c	1332	13.8
1981	783 Martin 1d 783 Martin 2 60 Dade	Oil Oil Solid Waste	12581	9630	2951	30.6
1982	67 Cutler 5e 130 Cutler 6e (646) (Turkey Point 4)f	Oil Oil Nuclear	12132	9972	2160	21.7
1983	634 St. Lucie 28 (646) (Turkey Point 3)f 666 Turkey Point 4f 350 Southernh	Nuclear Nuclear Nuclear Coal	13136	10317	2819	27.3
1984	666 Turkey Point 3f 350 Southernh	Nuclear Coal	13802	10690	3112	29.1
1985	292 TECOI 350 Southernh	Coal Coal	14094	11077	3017	27.2
1986	208 TECOI 350 Southernh 275 SJRPP 1j	Coal Coal Coal	14285	11445	2840	24.8
1987	104 TECOI 650 Southernh 700 Martin 3	Coal Coal Coal	15181	11792	3389	28.7
1988	275 SJRPP 2j 1000 Southernh	Coal Coal	15702	12179	3523	28.9
1989	700 Martin 4 1000 Southernh	Coal Coal	16402	12621	3781	30.0

Table 1.1-9 (Revision 1) (Continued)

FLORIDA POWER & LIGHT COMPANY
PLANNING GENERATION AND RESERVE ANALYSIS

- a Excludes units on cold-standby status: Palatka 107 MW and Cutler 197 MW. Cutler Unit No. 4 retired.
- b Most Probable load forecast. The "Most Probable" represents a forecasted number for which there is an equal probability of being above or below.
- c Actual-occurred on July 14, 1980.
- d Martin Unit No. 1 was placed in commercial operation in December, 1980.
- e Reactivation of Cutler Plant from cold-standby status (Units No. 5 and 6).
- f Turkey Point Steam Generator replacement. Increase of 20 MW anticipated after replacement.
- g Total capability is 802 MW. Sale of 168 MW has been offered to other utilities.
- h Purchase of unit power from Southern Company.
- i Purchase of unit power from Tampa Electric Company's Big Bend Unit No. 4.
- j FPL's share of output from proposed unit to be jointly owned with Jacksonville Electric Authority. Combination of joint ownership and firm power purchases. For planning purposes, the in-service date of the SJRPP units are as shown above. The contract between JEA and their architect/engineer specifies the first unit in December, 1985 and the second unit in May, 1987.

Table 1.1-10 (Revision 1)

FLORIDA POWER & LIGHT COMPANY
GENERATION AND RESERVE ANALYSIS

		<u>Generation Added/ (Retired) (MW)</u>	<u>Fuel Type</u>	<u>Total Net Summer Capability (MW)</u>	<u>Net Summer^b Peak Load (MW)</u>	<u>Reserves</u> <u>(MW)</u> <u>(%)</u>	
1980		-	-	10955 ^a	9623 ^c	1332	13.8
1981	783	Martin 1 ^d	Oil				
	783	Martin 2	Oil				
	60	Dade	Solid Waste	12581	9630	2951	30.6
1982	67	Cutler 5 ^e	Oil				
	130	Cutler 6 ^e	Oil				
	(646)	(Turkey Point 4) ^f	Nuclear	12132	9972	2160	21.7
1983	634	St. Lucie 2 ^g	Nuclear				
	(646)	(Turkey Point 3) ^f	Nuclear				
	666	Turkey Point 4 ^f	Nuclear				
	350	Southern ^h	Coal	13136	10317	2819	27.3
1984	666	Turkey Point 3 ^f	Nuclear				
	350	Southern ^h	Coal	13802	10690	3112	29.1
1985	292	TECO ⁱ	Coal				
	350	Southern ^h	Coal	14094	11077	3017	27.2
1986	208	TECO ⁱ	Coal				
	350	Southern ^h	Coal				
	275	SJRPP 1 ^j	Coal	14285	11445	2840	24.8
1987	275	SJRPP 2 ^j	Coal				
	104	TECO ⁱ	Coal				
	650	Southern ^h	Coal				
	700	Martin 3	Coal	15456	11792	3664	31.1
1988	1000	Southern ^h	Coal	15702	12179	3523	28.9
1989	700	Martin 4	Coal				
	1000	Southern ^h	Coal	16402	12621	3781	30.0

Table 1.1-10 (Revision 1) (Continued)

FLORIDA POWER & LIGHT COMPANY
GENERATION AND RESERVE ANALYSIS

- a Excludes units on cold-standby status: Palatka 107 MW and Cutler 197 MW. Cutler Unit No. 4 retired.
- b Most Probable load forecast. The "Most Probable" represents a forecasted number for which there is an equal probability of being above or below.
- c Actual-occurred on July 14, 1980.
- d Martin Unit No. 1 was placed in commercial operation in December, 1980.
- e Reactivation of Cutler Plant from cold-standby status (Units No. 5 and 6).
- f Turkey Point Steam Generator replacement. Increase of 20 MW anticipated after replacement.
- g Total capability is 802 MW. Sale of 168 MW has been offered to other utilities.
- h Purchase of unit power from Southern Company.
- i Purchase of unit power from Tampa Electric Company's Big Bend Unit No. 4.
- j FPL's share of output from proposed unit to be jointly owned with Jacksonville Electric Authority. Combination of joint ownership and firm power purchases.

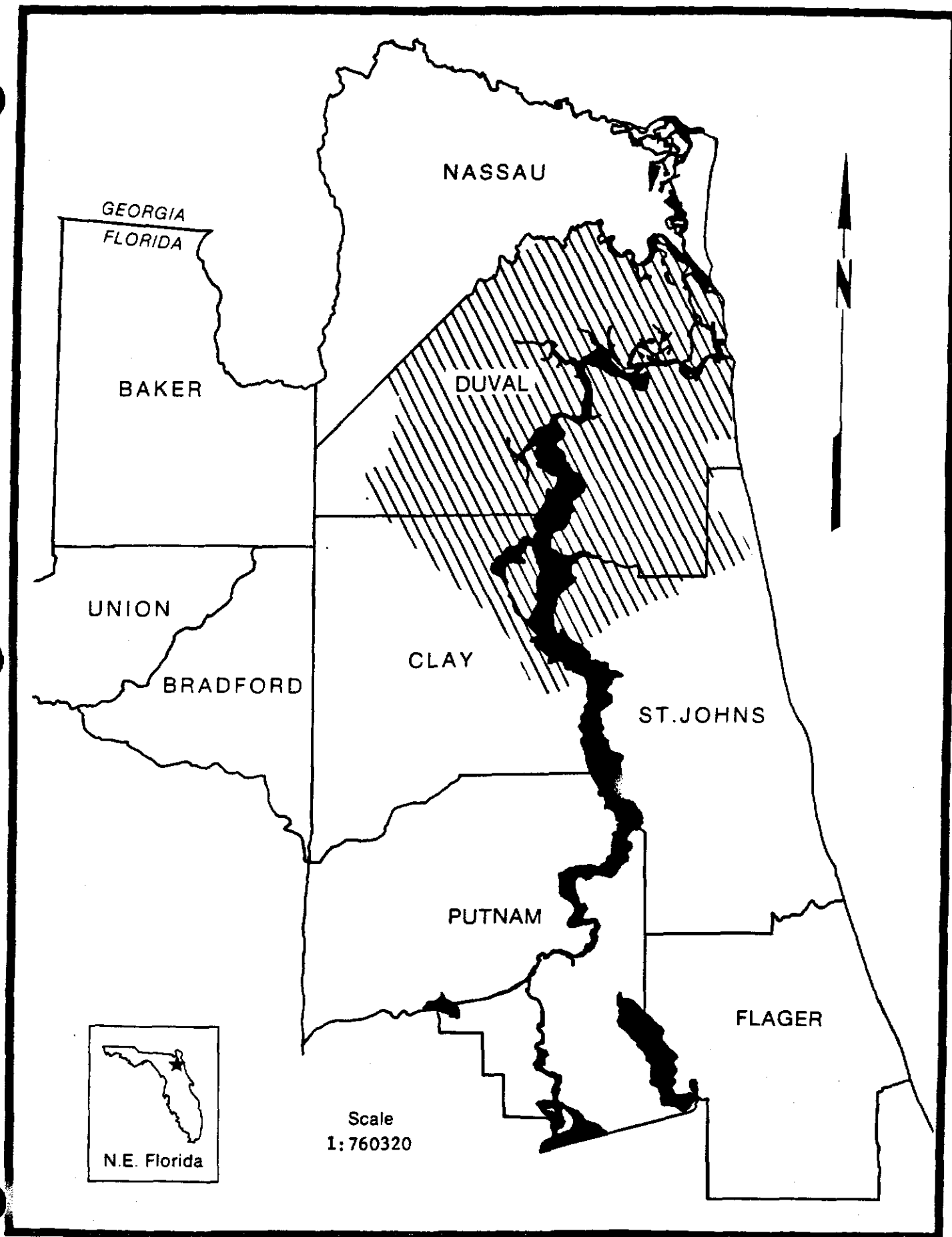


Figure 1.1-1 Jacksonville Electric Authority - Service Area

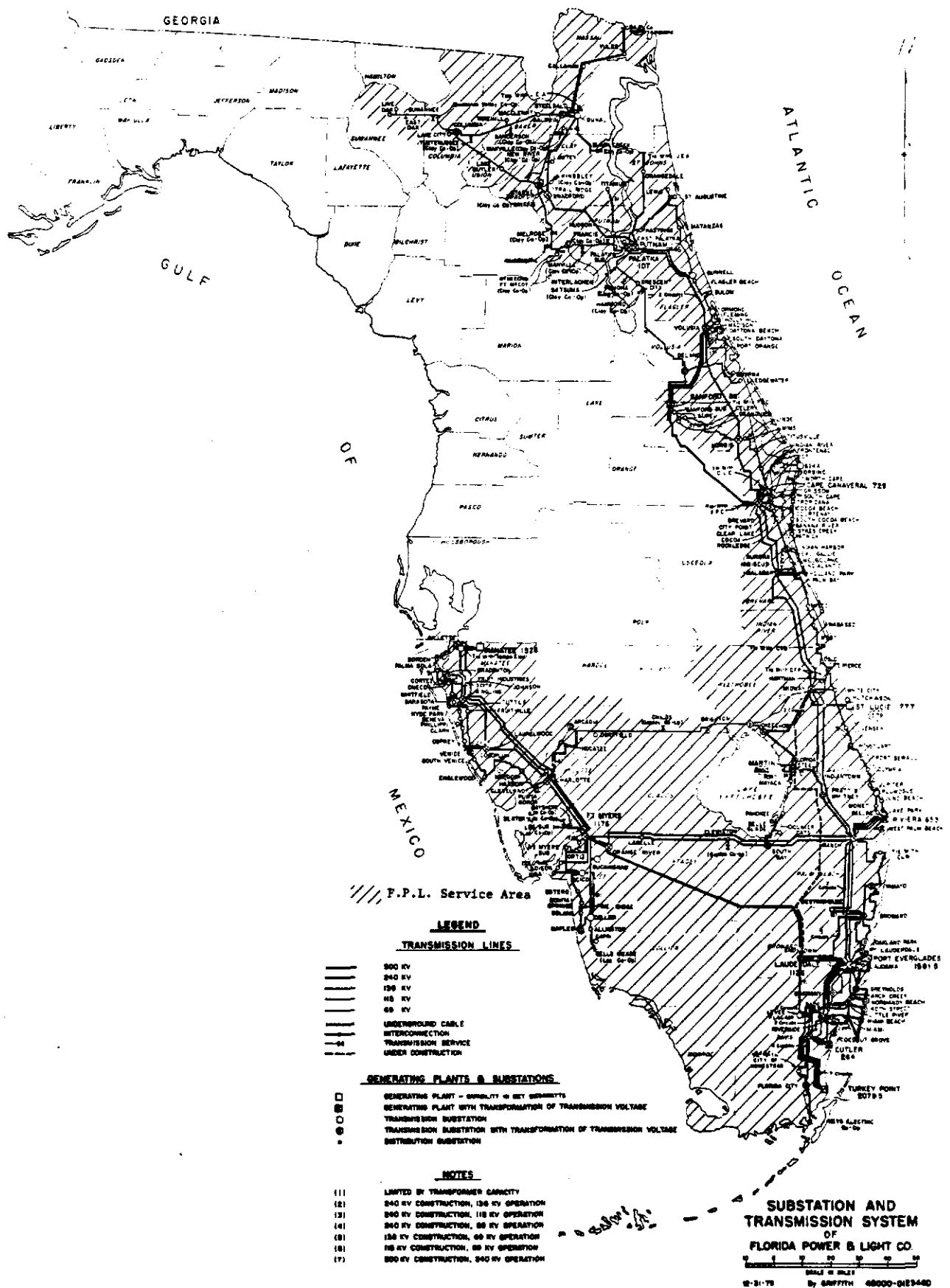


Figure 1.1-2 Florida Power & Light Company - Service Area

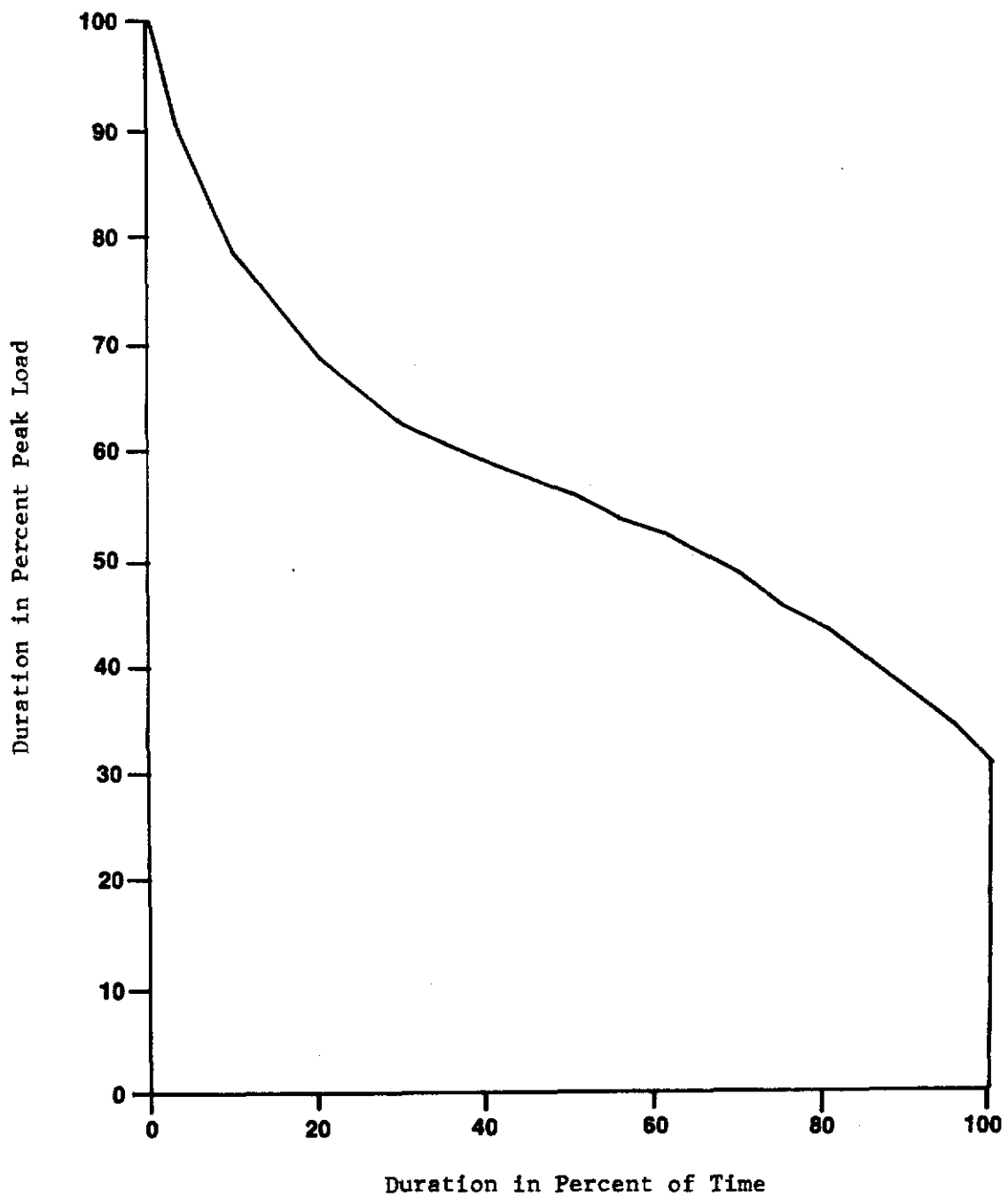


Figure 1.1-3 Jacksonville Electric Authority-1979 Annual Duration Curve

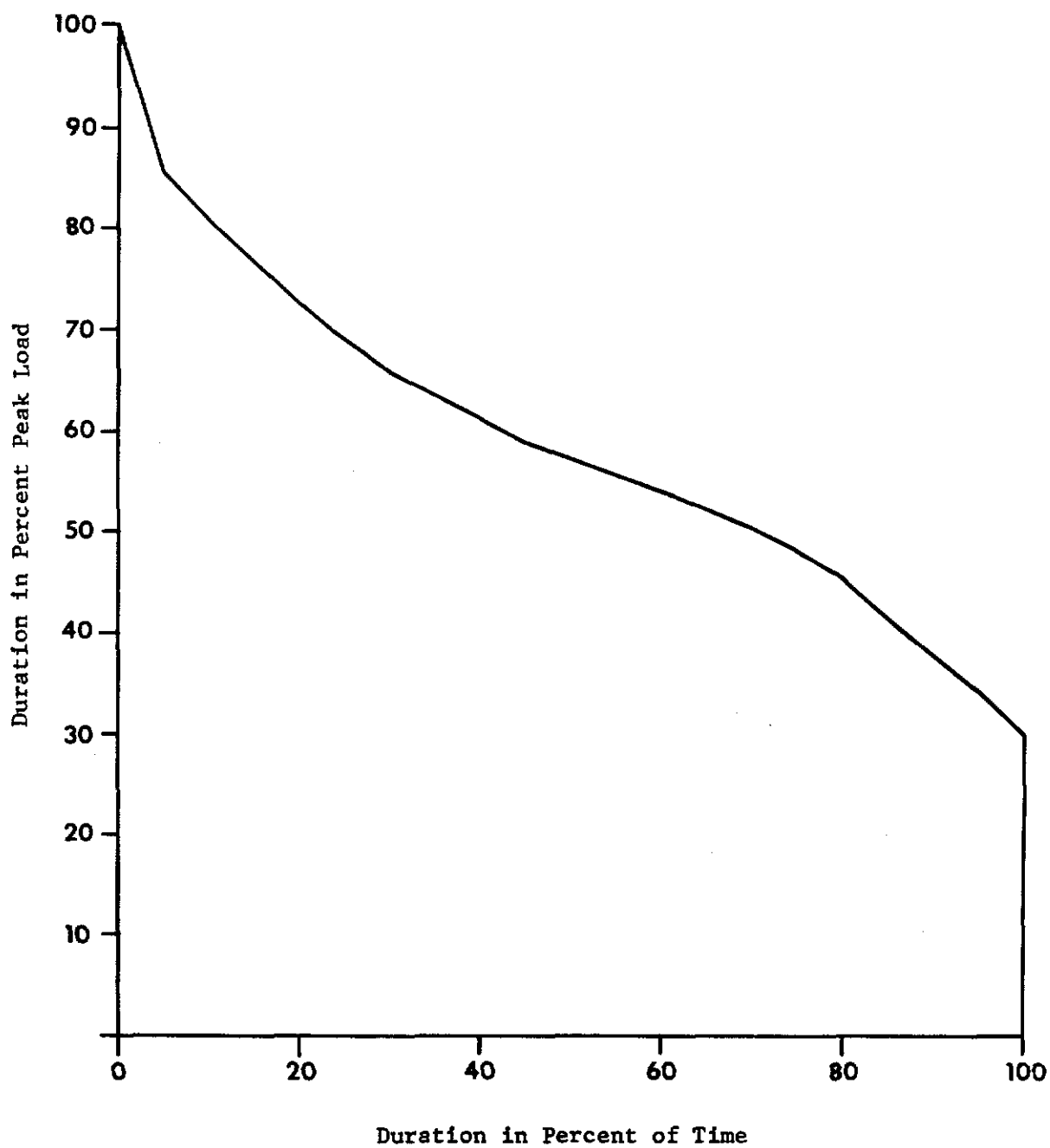


Figure 1.1-4 Florida Power & Light Company-1979 Annual Load Duration Curve

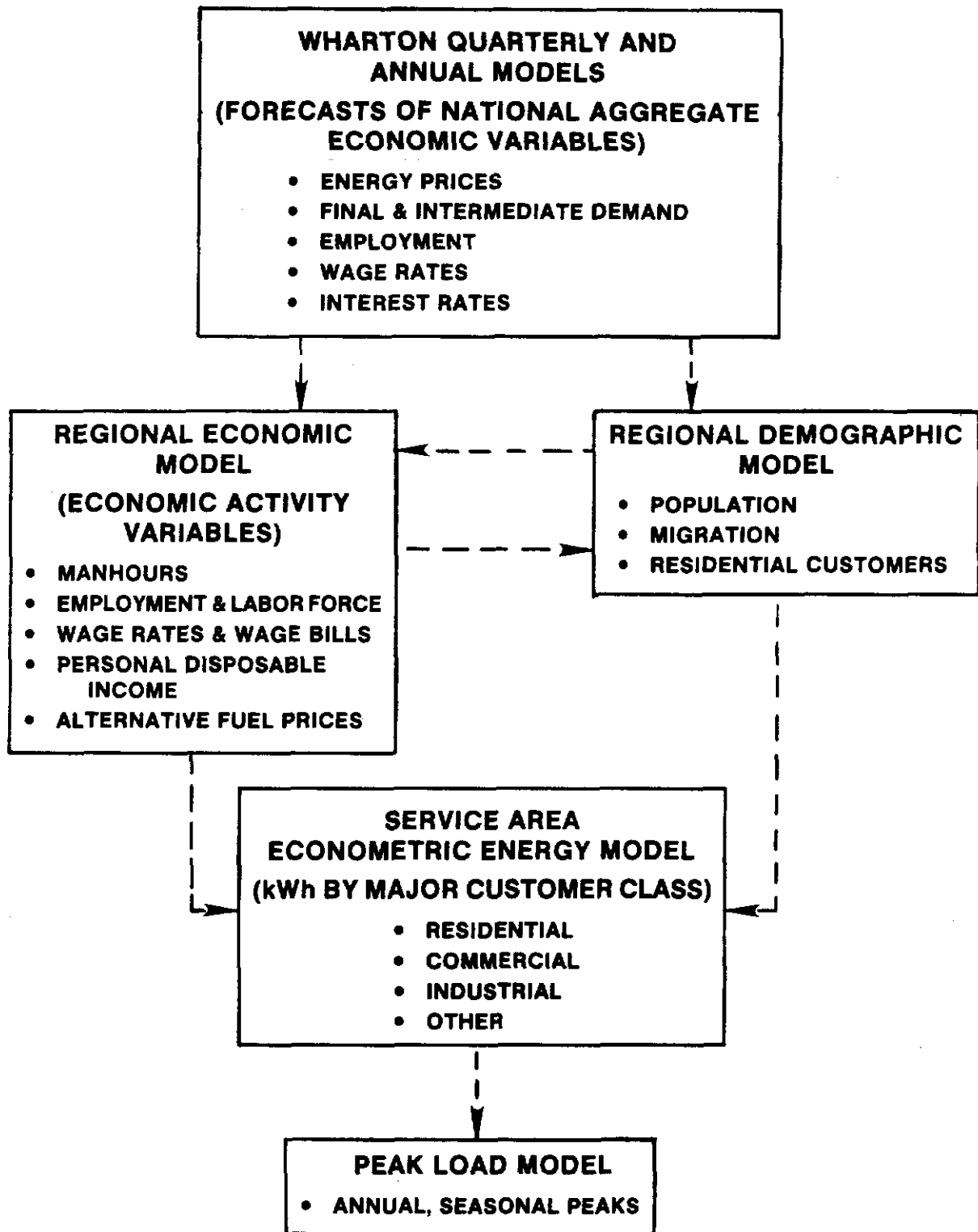


Figure 1.1-5 Jacksonville Electric Authority-Integrated Electric Energy and Demand Forecasting System

1.2 OTHER OBJECTIVES

Historically the decision to construct a new generating facility has been based on the need to adequately serve the expected growth in peak demand. Today, in an ever changing environment, other considerations must be evaluated in the decision making process. One of the most important considerations is the dependence of the utilities in Florida on foreign oil supplies. Accordingly, Florida utilities are adopting measures to reduce this dependence. This section will demonstrate that it is cost effective to reduce this dependence and that customers of both utilities would benefit financially from the burning of coal as a displacement for oil.

Both JEA and FPL believe that there is no single, exclusive solution to oil reduction. Therefore, actions must be taken that will produce a multi-pronged approach to reduce oil consumption. These actions must be judged in accordance with criteria which insure that both utilities can continue to responsibly discharge their obligations as public utilities to their customers. These criteria must provide for a careful evaluation of alternatives for oil reduction that include, not only those which are currently available and proven, but those which are under development or could be proven with additional development effort and are expected to be available in sufficient time to permit their orderly and economic implementation. (Alternatives are discussed in Chapter 8, Sections 8.2.1 and 8.2.2.)

One of the major criteria used in the evaluation of alternatives is cost effectiveness. The cost effectiveness evaluations are further complicated by the uncertainty as to the future behavior of fuel cost and supply. Estimates of future fuel costs vary widely from expert to expert. Predictions of oil supply have equally wide ranges. Therefore, cost effectiveness evaluations boil down to risk evaluations. The risk of oil price increases and supply disruptions must be weighed against the risks of higher costs for currently available options, against the future availability of more desirable options, and against the risk of coal price increases and supply problems.

Jacksonville Electric Authority

As discussed in Section 1.1.3, JEA develops a need for the proposed project to adequately serve the expected peak of 1991 and 1993 based on JEA's official load forecast. However, the combination of recent and projected crude oil price increases and JEA's 100 percent dependence on installed oil-fired generation has required JEA to evaluate the possible cost effectiveness and feasibility of options that are available to reduce its dependence on oil.

JEA is aggressively evaluating and pursuing multiple programs to develop alternative sources of energy which will reduce its dependence on oil. A major conceptual engineering study is currently under way to evaluate the potential of converting oil-fired units to burn coal. Another study will investigate the feasibility of using coal-oil-mixtures, natural gas or synthetic gas as a boiler fuel. At present, JEA is purchasing "coal-by-wire" from the Southern Company and will increase these purchases, where cost effective, when a 500 kV Florida-Southern interconnection is completed in late 1982. In addition, JEA will purchase firm power from coal units on the Southern Company system starting in 1983. (See Chapter 8, Section 8.1.3.)

While these programs offer the potential of reducing JEA's oil consumption, each alternative is limited by either magnitude of oil reductions, technical feasibilities, potential environmental restrictions, or cost. Based on evaluations performed by JEA, the most cost effective measure to reduce JEA's dependence on oil is a combination of constructing these two coal-fired units with the additional purchase of firm power from Georgia scheduled to commence in 1983. The magnitude of this purchase was sized to provide JEA with the most cost-effective combination of power purchases and new generating capacity. As the lead utility in this project and to reduce its dependence on oil at the earliest date, JEA plans to construct these units for an in-service date of December, 1985 for the first unit and May, 1987 for the second unit. Table 1.2-1 shows the expected JEA oil displacement with the construction of the proposed

project. Approximately 5 million barrels of oil will be displaced annually on the JEA system once the two units are in operation with a total savings of 25 million barrels of oil on the JEA system by 1990.

If JEA achieves its conservation goals under the Florida Energy Efficiency and Conservation Act, the first unit would not be needed until the early 1990's for capacity purposes based on the LOLH criterion discussed in Section 1.1.3. However, even if the conservation goals are achieved, the potential for oil savings still exists as a result of JEA's dependence on existing oil-fired capacity to serve the needs of its customers. This means that JEA should move to construct these two coal units so that the earliest in-service date may be obtained. Tables 1.2-2 and 1.2-3 illustrate the reserve margins at the time of summer peak both with and without the proposed project, assuming the FPSC conservation goals are fully achieved. Tables 1.2-4 and 1.2-5 do the same for the winter peak.

The JEA management believes that this project is a critical factor in the total plan to reduce JEA's current dependence on oil.

Florida Power & Light Company

As discussed in Section 1.1.3, FPL will need the proposed units to adequately serve the expected peaks of 1988 and 1990.

The need for these units still exists in the late 1980's time frame even if FPL's conservation programs are successful in reducing load. The present schedule calls for these units to be commercially available by December, 1985 and May, 1987. It is FPL's objective to use the output of these units as a direct means of reducing oil consumption until such time as the additional capacity is required for load growth. Tables 1.2-6 and 1.2-7 show FPL's reserves under the current load and energy forecast which was filed with FPL's response to the FPSC conservation goals adopted November 13, 1980 with and without the proposed project.

At present, approximately 82 percent of FPL's installed generating capacity is oil or natural gas-fired supplying 68 percent of its energy requirements. To reduce this dependence on oil, FPL is evaluating several alternatives in addition to its conservation and load management programs.

A potential alternative is to convert the existing oil and gas-fired units to another fuel source. FPL has performed an experimental test burn of coal-oil mixture (COM) in its Sanford Unit 4, but several uncertainties remain. FPL is, therefore, evaluating other conversion alternatives, including direct coal firing at Sanford or other plants, as well as attempting to resolve these uncertainties before a final conversion determination is made. The long-term operating characteristics which will enable the Company to judge operating reliability and cost of coal or COM are unknown. Coal or COM cannot be used at all of FPL's plants due to site limitations. Further, the Company does not know what environmental requirements will be imposed or recommended on commercial installations as opposed to test installations. These requirements will affect the initial capital and operating costs. Consequently, the comparative cost effectiveness of these options cannot be determined.

In addition, FPL is pursuing efforts to develop non-oil sources. These include power purchases from Tampa Electric Company's Big Bend Unit No. 4, FPL's fourth nuclear unit, St. Lucie No. 2, the construction of two coal-fired units at FPL's Martin Site and the joint participation in the proposed plant. Furthermore, FPL is purchasing "coal-by-wire" from Southern and expects to substantially increase such purchases when a 500 kV Florida-Southern interconnection is completed in late 1982. FPL will then purchase firm power from coal units on the Southern Company starting in 1983. (See Chapter 8, Section 8.1.3)

Notwithstanding these determined efforts to develop non-oil sources, FPL is expected to remain uncomfortably dependent on oil through the 1980's. FPL's projected annual oil consumption will continue to be at substantial levels between 1980 and 1989. Table 1.2-8 shows FPL's expected

oil displacement from the construction of this project. Approximately 5 million barrels of oil will be displaced annually on the FPL system once the two units are in operation.

There are many uncertainties that complicate the development of an oil reduction plan. However, the technological uncertainties associated with an alternative are usually the hardest to quantify. As a result, a technology must be demonstrated under actual conditions before prudent judgments can be made about costs and operating performance which are essential to cost effectiveness evaluations.

FPL also believes that it is in the customers' long-term interest to keep available a suitable wide range of alternatives, since these alternatives tend to compete against one another. The "competition" of one technology against another helps create the necessary climate for obtaining the most favorable commercial terms for insuring long-term cost effectiveness and reliability.

Cost Effectiveness

JEA and FPL believe that the proposed coal-fired units offer a cost effective means of meeting capacity requirements and reducing their dependence on oil in the 1985-1990 time frame. Consequently, JEA and FPL have performed a cost effectiveness calculation for the proposed project. Table 1.2-9 for JEA and Tables 1.2-10 and 1.2-11 for FPL show the expected revenue requirements of the proposed plant compared to expected oil costs for both utilities.

The cost effectiveness analysis for JEA was based on an initial (1981) fuel cost of approximately 28 \$/BBL for oil and approximately 45 \$/Ton for coal. It is expected that these fuels will escalate annually at 10.6 and 9.4 percent respectively. As a result of these assumptions, the total cumulative present value of the savings to JEA over the period (1986-2015) was \$3,508 million.

The cost effectiveness analysis for FPL was based on the same cost for coal as JEA, approximately 45 \$/Ton with an annual escalation rate of 9.4 percent. Based on the uncertainties associated with future price increases for oil, FPL used an optimistic and a pessimistic oil price forecast which resulted in FPL's initial (1980) oil cost of approximately 24 \$/BBL escalating at an average annual rate of 10.9 percent through 1990 and 8.0 percent thereafter for the low band and 15.2 percent through 1990 and 8.0 percent thereafter for the high band. These assumptions resulted in a total cumulative present value of the savings to FPL over the period (1986-2015) of \$1,348 to \$2,892 million.

During the course of the FPSC hearings on the need for SJRPP, the FPSC instructed the utilities to perform a cost-benefit analysis using coal and oil price assumptions selected by the Commission. This analysis showed a cumulative net savings of \$8,039 million (nominal dollars) by the year 2000 under the "worse" case and \$10,081 million (nominal dollars) under the "expected" case. This analysis is attached as an exhibit to the FPSC Order Number 10108 (the full text of this order is presented in the introduction to this document).

As can be seen, the project is cost effective even if viewed exclusively from its oil displacement value. Thus, even disregarding the capacity benefits of this project, it is cost effective to build these units on their present schedules.

Table 1.2-1

JACKSONVILLE ELECTRIC AUTHORITY

PROJECTED REDUCTION IN ANNUAL OIL CONSUMPTION
DUE TO PROPOSED PROJECT

	<u>Expected Annual Coal-Fired Energy</u> (MWH)	<u>Expected Annual Oil Displacement</u> (1000 BBLs)
1986	1,662,210	2,913
1987	2,636,766	4,621
1988	3,348,510	5,868
1989	3,396,690	5,952
1990	3,372,600	5,910
1991-2000	3,372,600	5,910
2001-2015	2,890,800	5,066
Average Annual Oil Displacement		5,345
Total Oil Displacement		160,354

Assumptions:

average heat content of oil - 6.2 MBtu/BBL
average system oil heat rate - 10,865 Btu/kWh
in-service date 1st unit - December, 1985
in-service date 2nd unit - May, 1987

Table 1.2-2 (Revision 1)

JACKSONVILLE ELECTRIC AUTHORITY
GENERATION EXPANSION PLAN
GENERATION AND RESERVE ANALYSIS
FPSC CONSERVATION GOALS
AT TIME OF SUMMER PEAK

	Generation Added/ (Retired) (MW)	Fuel Type	Total Net Summer Capability (MW)	Net Summer Peak Load ^a (MW)	Reserves (MW) (%)	
1980	-	-	1350.9 ^b	1296 ^c	54.9	4.2
1981	262.4 Northside 1 ^c 118.0 Northside 3 ^c	Oil Oil	1731.3	1325	406.3	30.7
1982	85.0 Northside 2 ^c 12.9 Kennedy CT1 ^c 53.7 Kennedy CT3 ^c 53.7 Kennedy CT4 ^c	Oil Oil Oil Oil	1936.6	1345	591.3	44.0
1983	53.7 Kennedy CT6 ^c 300.0 Southernd ^d	Oil Coal	2290.3	1324	966.3	73.0
1984	300.0 Southernd	Coal	2290.3	1339	951.3	71.0
1985	300.0 Southernd	Coal	2290.3	1355	935.3	69.0
1986	275.0 SJRPP 1 300.0 Southernd	Coal Coal	2565.3	1372	1193.3	87.0
1987	275.0 SJRPP 2 500.0 Southernd	Coal Coal	3040.3	1390	1650.3	118.7
1988	400.0 Southernd	Coal	2940.3	1406	1534.3	109.1
1989	400.0 Southernd (12.9 Kennedy CT1)	Coal Oil	2927.4	1424	1503.4	105.6

a FPSC conservation goals forecast

b Net capability reflects units which are currently derated

c Actual

d Restoration of existing units

e Firm purchase of unit power from Southern Company

Table 1.2-3 (Revision 1)

JACKSONVILLE ELECTRIC AUTHORITY
GENERATION EXPANSION PLAN
GENERATION AND RESERVE ANALYSIS
FPSC CONSERVATION GOALS AT TIME OF SUMMER PEAK
WITHOUT PROPOSED PROJECT

	Generation Added/ (Retired) (MW)	Fuel Type	Total Net Summer Capability (MW)	Net Summer Peak Load ^a (MW)	Reserves (MW) (%)	
1980	-	-	1350.9 ^b	1296	54.9	4.2
1981	262.4 Northside 1 ^c 118.0 Northside 3 ^c	Oil Oil	1731.3	1325	406.3	30.7
1982	85.0 Northside 2 ^c 12.9 Kennedy CT1 ^c 53.7 Kennedy CT3 ^c 53.7 Kennedy CT4 ^c	Oil Oil Oil Oil	1936.6	1345	591.6	44.0
1983	53.7 Kennedy CT6 ^c 300.0 Southernd ^d	Oil Coal	2290.3	1324	966.3	73.0
1984	300.0 Southernd	Coal	2290.3	1339	951.3	71.0
1985	300.0 Southernd	Coal	2290.3	1355	935.3	69.0
1986	300.0 Southernd	Coal	2290.3	1372	918.3	66.9
1987	500.0 Southernd	Coal	2490.3	1390	1100.3	79.2
1988	400.0 Southernd	Coal	2390.3	1406	984.3	70.0
1989	400.0 Southernd (12.9 Kennedy CT1)	Coal Oil	2377.4	1424	953.4	67.0

a FPSC conservation goals forecast

b Net capability reflects units which are currently derated

c Restoration of existing units

d Firm purchase of unit power from Southern Company

Table 1.2-4 (Revision 1)

JACKSONVILLE ELECTRIC AUTHORITY
GENERATION EXPANSION PLAN
GENERATION AND RESERVE ANALYSIS
FPSC CONSERVATION GOALS
AT TIME OF WINTER PEAK

	<u>Generation Added/ (Retired) (MW)</u>	<u>Fuel Type</u>	<u>Total Net Winter Capability (MW)</u>	<u>Net Winter Peak Load^a (MW)</u>	<u>Reserves</u> <u>(MW)</u> <u>(%)</u>	
1980/81	-	-	1417.7 ^b	1168	249.7	21.4
1981/82	262.4 Northside 1 ^c 118.0 Northside 3 ^c	Oil Oil	1798.1	1186	612.1	51.6
1982/83	85.0 Northside 2 ^c 15.4 Kennedy CT1 ^c 62.5 Kennedy CT3 ^c 62.5 Kennedy CT4 ^c 62.5 Kennedy CT6 ^c 300.0 Southern ^d	Oil Oil Oil Oil Oil Coal	2386.0	1166	1220.0	104.6
1983/84	300.0 Southern ^d	Coal	2386.0	1178	1208.0	102.5
1984/85	300.0 Southern ^d	Coal	2386.0	1193	1193.0	100.0
1985/86	300.0 Southern ^d	Coal	2386.0	1208	1178.0	97.5
1986/87	275.0 SJRPP 1 500.0 Southern ^d	Coal Coal	2861.0	1222	1639.0	134.1
1987/88	275.0 SJRPP 2 400.0 Southern ^d	Coal Coal	3036.0	1238	1798.0	145.2
1988/89	400.0 Southern ^d (15.4 Kennedy CT1)	Coal Oil	3020.6	1253	1767.6	141.1
1989/90	400.0 Southern ^d	Coal	3020.6	1267	1753.6	138.4

a FPSC conservation goals forecast

b Net capability reflects units which are currently derated

c Restoration of existing units

d Firm purchase of unit power from Southern Company

Table 1.2-5 (Revision 1)

JACKSONVILLE ELECTRIC AUTHORITY
GENERATION EXPANSION PLAN
GENERATION AND RESERVE ANALYSIS
FPSC CONSERVATION GOALS AT TIME OF WINTER PEAK
WITHOUT PROPOSED PROJECT

	Generation Added/ (Retired) (MW)	Fuel Type	Total Net Winter Capability (MW)	Net Winter Peak Load ^a (MW)	Reserves (MW) (%)	
1980/81	-	-	1417.7 ^b	1168	249.7	21.4
1981/82	262.4 Northside 1 ^c 118.0 Northside 3 ^c	Oil Oil	1798.1	1186	612.1	51.6
1982/83	85.0 Northside 2 ^c 15.4 Kennedy CT1 ^c 62.5 Kennedy CT3 ^c 62.5 Kennedy CT4 ^c 62.5 Kennedy CT6 ^c 300.0 Southern ^d	Oil Oil Oil Oil Oil Coal	2386.0	1166	1220.0	104.6
1983/84	300.0 Southern ^d	Coal	2386.0	1178	1208.0	102.5
1984/85	300.0 Southern ^d	Coal	2386.0	1193	1193.0	100.0
1985/86	300.0 Southern ^d	Coal	2386.0	1208	1178.0	97.5
1986/87	500.0 Southern ^d	Coal	2586.0	1222	1364.0	111.6
1987/88	400.0 Southern ^d	Coal	2486.0	1238	1248.0	100.8
1988/89	400.0 Southern ^d (15.4 Kennedy CT1)	Coal Oil	2470.6	1253	1217.6	97.2
1989/90	400.0 Southern ^d	Coal	2470.6	1267	1203.6	95.0

a FPSC conservation goals forecast

b Net capability reflects units which are currently derated

c Restoration of existing units

d Firm purchase of unit power from Southern Company

Table 1.2-6 (Revision 1)

FLORIDA POWER & LIGHT COMPANY
GENERATION AND RESERVE ANALYSIS

	Generation Added/ (Retired) (MW)	Fuel Type	Total Net Summer Capability (MW)	Net Summer ^b Peak Load (MW)	Reserves (MW) (%)	
1980	-	-	10955 ^a	9623 ^c	1332	13.8
1981	783 Martin 1 ^d 783 Martin 2 60 Dade	Oil Oil Solid Waste	12581	9630	2951	30.6
1982	67 Cutler 5 ^e 130 Cutler 6 ^e (646) (Turkey Point 4) ^f	Oil Oil Nuclear	12132	9972	2160	21.7
1983	634 St. Lucie 2 ^g (646) (Turkey Point 3) ^f 666 Turkey Point 4 ^f 350 Southern ^h	Nuclear Nuclear Nuclear Coal	13136	10317	2819	27.3
1984	666 Turkey Point 3 ^f 350 Southern ^h	Nuclear Coal	13802	10690	3112	29.1
1985	292 TECO ⁱ 350 Southern ^h	Coal Coal	14094	11077	3017	27.2
1986	208 TECO ⁱ 275 SJRPP 1 ^j 350 Southern ^h	Coal Coal Coal	14285	11445	2840	24.8
1987	275 SJRPP 2 ^j 104 TECO ⁱ 650 Southern ^h 700 Martin 3	Coal Coal Coal Coal	15456	11792	3664	31.1
1988	1000 Southern ^h	Coal	15702	12179	3523	28.9
1989	700 Martin 4 1000 Southern ^h	Coal Coal	16402	12621	3781	30.0

Table 1.2-6 (Revision 1) (Continued)

FLORIDA POWER & LIGHT COMPANY
GENERATION AND RESERVE ANALYSIS

- a Excludes units on cold-standby status: Palatka 107 MW and Cutler 197 MW. Cutler Unit No. 4 retired.
- b Most Probable load forecast. The "Most Probable" represents a forecasted number for which there is an equal probability of being above or below.
- c Actual-occurred on July 14, 1980.
- d Martin Unit No. 1 was placed in commercial operation in December, 1980.
- e Reactivation of Cutler Plant from cold-standby status (Units No. 5 and 6).
- f Turkey Point Steam Generator replacement. Increase of 20 MW anticipated after replacement.
- g Total capability is 802 MW. Sale of 168 MW has been offered to other utilities.
- h Purchase of unit power from Southern Company.
- i Purchase of unit power from Tampa Electric Company's Big Bend Unit No. 4.
- j FPL's share of output from proposed unit to be jointly owned with Jacksonville Electric Authority. Combination of joint ownership and firm power purchases.

Table 1.2-7

FLORIDA POWER & LIGHT COMPANY
GENERATION AND RESERVE ANALYSIS
WITHOUT PROPOSED PROJECT
AND MARTIN UNITS NO. 3 AND 4

	Generation Added/ (Retired) (MW)	Fuel Type	Total Net Summer Capacity (MW)	Net Summer ^b Peak Load (MW)	Reserves (MW)	Reserves (%)
1980	-	-	10955 ^a	9623 ^c	1332	13.8
1981	783 Martin 1d	Oil				
	783 Martin 2	Oil				
	60 Dade	Solid Waste	12581	9630	2951	30.6
1982	67 Cutler 5e	Oil				
	130 Cutler 6e	Oil				
	(646) (Turkey Point 4)f	Nuclear	12132	9972	2160	21.7
1983	634 St. Lucie 2g	Nuclear				
	(646) (Turkey Point 3)f	Nuclear				
	666 Turkey Point 4f	Nuclear	12786	10317	2469	23.9
1984	666 Turkey Point 3f	Nuclear	13452	10690	2762	25.8
1985	292 TECO ^h	Coal	13744	11077	2667	24.1
1986	208 TECO ^h	Coal	13660	11445	2215	19.4
1987	104 TECO ^h	Coal	13556	11792	1764	15.0
1988	-	-	13452	12179	1273	10.5
1989	-	-	13452	12621	831	6.7

Table 1.2-7 (Continued)

FLORIDA POWER & LIGHT COMPANY
GENERATION AND RESERVE ANALYSIS
WITHOUT PROPOSED PROJECT

- a Excludes units on cold-standby status: Palatka 107 MW and Cutler 197 MW. Cutler Unit No. 4 retired.
- b Most Probable load forecast. The "Most Probable" represents a forecasted number for which there is an equal probability of being above or below.
- c Actual-occurred on July 14, 1980.
- d Martin Unit No. 1 was placed in commercial operation in December, 1980.
- e Reactivation of Cutler Plant from cold-standby status (Units No. 5 and 6).
- f Turkey Point Steam Generator replacement. Increase of 20 MW anticipated after replacement.
- g Total capability is 802 MW. Sale of 168 MW has been offered to other utilities.
- h Purchase of unit power from Tampa Electric Company's Big Bend Unit No. 4.

Table 1.2-8

FLORIDA POWER & LIGHT

PROJECTED REDUCTION IN ANNUAL OIL CONSUMPTION
DUE TO PROPOSED PROJECT

	<u>Expected Annual Coal-Fired Energy</u> (MWH)	<u>Expected Annual Oil Displacement</u> (1000 BBLs)
1986	1,662,210	2,703
1987	2,636,766	4,287
1988	3,348,510	5,445
1989	3,396,690	5,523
1990	3,372,600	5,484
1991-2000	3,372,600	5,484
2001-2015	2,890,800	4,700
Average Annual Oil Displacement		4,959
Total Oil Displacement		148,782

Assumptions:

average heat content of oil - 6.15 MBtu/BBL
average system oil heat rate - 10,000 Btu/kWh
in-service date 1st unit - December, 1985
in-service date 2nd unit - May, 1987

Table 1.2-9

JACKSONVILLE ELECTRIC AUTHORITY
COST BENEFIT OF PROPOSED PROJECT

Year	Total Annual Savings									
	Fuel Price ^a				Fuel Cost Savings		Non-Levelized Fixed Charges ^b Million \$	Present Worth		Cumulative ^c Present Worth
	\$/Mbtu		E/MWh		Million \$	Million \$		Million \$		
	Oil	Coal	Oil	Coal						
1986 ^e	738	291	80	29	51	85	0	85	55	55
1987 ^f	816	318	88	32	56	148	0	148	88	143
1988	903	348	98	35	63	211	102	109	60	203
1989	998	381	108	38	70	238	93	145	73	276
1990	1104	417	119	42	77	260	91	169	78	354
1991	1221	456	132	46	86	290	89	201	85	439
1992	1351	499	146	50	96	324	87	237	92	531
1993	1494	546	161	55	106	358	86	272	97	628
1994	1652	597	178	60	118	398	86	312	102	730
1995	1827	653	197	66	131	442	86	356	107	837
1996	2021	715	218	72	146	492	86	406	111	948
1997	2235	782	241	79	162	546	86	460	116	1064
1998	2472	855	267	86	181	610	86	524	121	1185
1999	2734	936	295	95	200	675	86	589	125	1310
2000	3024	1024	327	103	224	755	86	669	130	1440
2001	3345	1120	361	113	248	717	86	631	113	1553
2002	3699	1225	399	124	275	795	86	709	116	1669
2003	4092	1340	442	135	307	887	86	801	120	1789
2004	4525	1466	489	143	341	986	86	900	124	1913
2005	5005	1604	541	162	379	1096	86	1010	128	2041
2006	5536	1755	596	177	421	1217	86	1131	131	2172
2007	6122	1920	661	194	467	1350	86	1264	134	2306
2008	6771	2100	731	212	519	1500	86	1414	138	2444
2009	7489	2218	809	232	577	1668	86	1582	142	2586
2010	8283	2314	895	254	641	1853	86	1767	145	2731
2011	9161	2500	989	278	711	2056	86	1970	148	2879
2012	10132	3008	1094	304	790	2284	86	2198	152	3031
2013	11206	3291	1210	332	878	2538	86	2452	156	3187
2014	12394	3601	1339	364	975	2819	86	2733	159	3346
2015	13707	3939	1480	398	1082	3128	86	3042	162	3508

^a Coal escalation rate of 9.4 percent, oil escalation of 10.6^b Assumed interest cost of money of 8.5 percent^c Present worth discount rate of 9.0 percent^d 1981 dollars^e Unit No. 1 in-service December, 1985^f Unit No. 2 in-service May, 1987^g Coal cost provided by JEA

Table 1.2-10

FLORIDA POWER & LIGHT COMPANY
COST BENEFIT OF PROPOSED PROJECT
LOW BAND OIL ESTIMATES

Year	Total Annual Savings									
	Fuel Price ^a					Non-Levelized ^f Fixed Charges Million \$	bc		Cumulative ^{bc}	
	\$/Mbtu			B/MWh	Coal		Present Worth	Million \$	Present Worth	Million \$
	Oil	Coal ^g	Oil							
1986 ^d	745	291	75	46	78	31	19	19		
1987 ^e	823	318	82	50	126	59	32	51		
1988	915	348	92	57	192	43	21	72		
1989	1015	381	102	64	216	71	32	104		
1990	1124	417	112	70	236	94	38	142		
1991	1214	456	121	75	253	114	42	184		
1992	1311	499	131	81	273	137	46	230		
1993	1416	546	142	87	293	160	48	278		
1994	1529	597	153	93	314	184	50	328		
1995	1652	653	165	99	339	212	52	380		
1996	1784	715	178	106	357	232	52	432		
1997	1926	782	193	114	384	262	53	485		
1998	2080	855	208	122	411	291	53	538		
1999	2247	936	225	129	435	318	53	591		
2000	2427	1024	243	140	472	357	54	645		
2001	2621	1120	262	149	503	390	53	698		
2002	2830	1225	283	159	536	425	52	750		
2003	3057	1340	306	171	577	469	52	802		
2004	3301	1466	330	187	631	525	52	854		
2005	3566	1604	357	195	658	554	50	904		
2006	3851	1755	385	208	702	601	50	954		
2007	4159	1920	416	222	749	650	48	1002		
2008	4492	2100	449	237	799	702	47	1049		
2009	4851	2218	485	253	853	759	46	1095		
2010	5239	2514	524	270	911	818	45	1140		
2011	5658	2750	566	288	971	880	44	1184		
2012	6111	3008	611	307	1035	945	43	1227		
2013	6600	3291	660	328	1106	1018	42	1269		
2014	7127	3601	713	349	1177	1090	40	1309		
2015	7697	3939	710	372	1255	1170	39	1348		

^a Coal escalation rate of 9.4 percent, oil escalation of 10.9 percent through 1990; 8.0 percent thereafter

^b Present worth discount rate of 10.5 percent

^c 1981 dollars

^d Unit No. 1 in-service December, 1985

^e Unit No. 2 in-service May, 1987

^f Cost schedules may vary subject to final contract terms between JEA and FPL.

^g Coal cost provided by JEA

Table 1.2-11

FLORIDA POWER & LIGHT COMPANY
COST BENEFIT OF PROPOSED PROJECT
HIGH BAND OIL ESTIMATES

Year	Total Annual Savings												
	Fuel Price ^a						Non-levelized Fixed Charges ^f Million \$	bc		Cumulative ^{bc} Present Worth Million \$			
	\$/MBtu		E/MWh		Present Worth Million \$	Present Worth Million \$							
	Oil	Coal	Oil	Coal									
1986 ^d	1174	291	117	29	88	148	47	101	61	61			
1987 ^e	1269	318	127	32	95	240	67	173	95	156			
1988	1371	348	137	35	102	344	149	195	97	253			
1989	1481	381	148	38	110	371	145	226	102	355			
1990	1601	417	160	42	118	398	142	256	104	459			
1991	1725	456	173	46	127	428	139	289	106	565			
1992	1863	499	186	50	136	459	136	323	108	673			
1993	2013	546	201	55	146	492	133	359	108	781			
1994	2174	597	217	60	157	529	130	399	110	891			
1995	2347	653	235	66	169	570	127	443	109	1000			
1996	2535	715	254	72	182	614	125	489	109	1109			
1997	2738	782	274	79	195	658	122	536	108	1217			
1998	2957	855	296	86	210	708	120	588	108	1325			
1999	3194	936	319	95	224	755	117	638	106	1431			
2000	3449	1024	345	103	242	816	115	701	105	1536			
2001	3725	1120	373	113	260	877	113	764	104	1640			
2002	4023	1225	402	124	278	938	111	827	102	1742			
2003	4345	1340	435	135	300	1012	108	904	101	1843			
2004	4693	1466	469	143	326	1099	106	993	100	1943			
2005	5068	1604	507	162	345	1164	104	1060	97	2040			
2006	5473	1755	547	177	370	1248	101	1147	95	2135			
2007	5911	1920	591	194	392	1339	99	1240	92	2227			
2008	6384	2100	638	212	426	1437	97	1340	90	2317			
2009	6895	2218	690	232	458	1545	94	1451	87	2404			
2010	7446	2514	745	254	491	1656	93	1563	86	2490			
2011	8042	2750	804	278	526	1774	91	1683	84	2574			
2012	8686	3008	869	304	565	1906	90	1816	82	2656			
2013	9380	3291	938	332	606	2044	88	1956	80	2736			
2014	10131	3601	1013	364	649	2189	87	2102	80	2816			
2015	10938	3939	1094	398	696	2351	85	2266	76	2892			

^a Coal escalation rate of 9.4 percent, oil escalation of 15.2 percent through 1990; 8.0 percent thereafter

^b Present worth discount rate of 10.5 percent

^c 1981 dollars

^d Unit No. 1 in-service December, 1985

^e Unit No. 2 in-service May, 1987

^f Cost schedules may vary subject to final contract terms between JEA and FPL.

^g Coal cost provided by JEA

1.3 CONSEQUENCES OF DELAY

Failure of JEA and FPL to complete the proposed facility as planned would result in detrimental effects on future system reliability and on levels of oil consumption. Changes to these system supply parameters would ultimately cause significant impacts on the customers of both utilities.

Effects on the customers of both utilities of omission of the proposed facility would be twofold:

- . If the units are delayed beyond the late 1980's to early 1990's, the level of service would be degraded below that normally provided to the customer. Degradation of projected reserve margins and reliability indices indicates that curtailment of service could be more frequent.
- . Cost to customers would be increased. This increased cost would be a direct result of continued dependence on oil as a fuel source.

While JEA and FPL do not have an immediate capacity need for SJRPP, delays of one, two, and three years in the commercial in-service date of the proposed units will also produce the following effects on the reserve margins of the Florida Subregion of SERC.

Peninsular Florida Reserves
At Time of Winter Peak

<u>Year</u>	<u>Percent Reserves</u> <u>Delay Time (Years)a</u>			
	0 (%)	1 (%)	2 (%)	3 (%)
1985/86	21.4	21.4	21.4	21.4
1986/87	22.4	20.2	20.2	20.2
1987/88	24.0	22.0	19.9	19.9
1988/89	22.7	22.7	20.7	18.7

(a) Assumes that only the JEA/FPL project is delayed.

Studies performed by the FCG have shown that a 25 to 30 percent reserve margin level is needed to maintain a LOLP of one day in ten for Peninsular Florida. Delay of these units would result in Peninsular Florida reserves being substantially below this desired range.

As a result of the northeast blackout of 1965, there were congressional hearings on utilities' reserve criteria, and National Electric Reliability Councils were established to examine and improve, where necessary, the power supply situation in the various geographical regions of the country. The purpose of planned reserves, therefore, is to provide the future operating system with a capacity margin sufficient to insure a reliable power supply. The appropriate standard for system reliability is largely a social policy question. It has been generally accepted that a reliable power supply is desirable, and this position has been reflected in laws at both the federal and state level.

Without adequate reserves, customers would be subject to frequent service interruptions. These service interruptions would generally affect a large number of customers, and at a minimum, would result in personal inconvenience. In addition, service interruptions, depending on the severity and duration of the outage, result in adverse effects in public health, safety, and economic losses.

Any delay in the scheduled in-service dates of SJRPP Units 1 and 2 would result in the loss of substantial fuel cost savings to JEA and FPL customers. Based on U.S. Department of Energy fuel price forecasts presented at the need for power hearing before the FPSC, delaying the SJRPP units from 1985/1987 to 1991/1993 would result in the loss of \$850 million (present worth to 1981) of oil displacement benefits to JEA. FPL has estimated that cumulative savings from constructing SJRPP as scheduled would total \$259 million (present worth to 1981 dollars) by 1990.

In addition, both JEA and FPL are concerned about the security of fuel supply if this facility is not built. As shown on Tables 1.2-1 and 1.2-8, construction of the facility as proposed would displace a combined total of approximately 10 million barrels of oil per year for JEA and FPL when both units are on-line. If the facility is not built, both utilities would be faced with continued dependence on foreign oil and their customers would continue to be vulnerable to the potential widespread effects of disruption of oil supply.

In conclusion, the proposed plant provides a portion of the new capacity projected to be needed by JEA, FPL, and Peninsular Florida over the next decade. Furthermore, the plant will provide social and economic benefits directly related to oil reduction and fuel flexibility, and allows both utilities to move towards meeting federal and state goals of minimizing dependence on foreign oil.

In addition, both JEA and FPL are concerned about the security of fuel supply if this facility is not built. As shown on Tables 1.2-1 and 1.2-8, construction of the facility as proposed would displace a combined total of approximately 10 million barrels of oil per year for JEA and FPL when both units are on-line. Cost savings from this displacement would pay for the annual revenue requirements of the plant for JEA and for FPL. (Tables 1.2-9, 1.2-10 and 1.2-11 show the non-levelized fixed charges, fuel cost savings and present value of these savings). If the facility is not built, both utilities would be faced with continued dependence on foreign oil and their customers would continue to be vulnerable to the potential widespread effects of disruption of oil supply.

In conclusion, the proposed plant provides a portion of the new capacity projected to be needed by JEA, FPL, and Peninsular Florida over the next decade. Furthermore, the plant will provide social and economic benefits directly related to oil reduction and fuel flexibility, and allows both utilities to move towards meeting federal and state goals of minimizing dependence on foreign oil.

Table 1.3-1

EFFECT OF DELAYS OF GENERATION ADDITIONS
ON JACKSONVILLE ELECTRIC AUTHORITY'S SYSTEM

Year	Generation Added/(Retired) (MW)	<u>No Delays</u>			
		Net Winter Capability (MW)	Winter Peak Load (MW)	Reserves	
				MW	%
1986/87	275 SJRPP 1 ^a	2361	1630	731	44.8
1987/88	275 SJRPP 2 ^a	2636	1714	922	53.8
1988/89	-	2636	1798	838	46.6
1989/90	-	2636	1874	762	40.7
1990/91	-	2636	1929	707	36.7
 <u>1 Year Delay</u>					
1986/87	-	2086	1630	456	28.0
1987/88	275 SJRPP 1 ^a	2361	1714	647	37.7
1988/89	275 SJRPP 2 ^a	2636	1798	838	46.6
1989/90	-	2636	1874	762	40.7
1990/91	-	2636	1929	707	36.7

^a Share of output from proposed unit to be jointly owned with Florida Power & Light Company.

Table 1.3-1 (Continued)

EFFECT OF DELAYS OF GENERATION ADDITIONS
ON JACKSONVILLE ELECTRIC AUTHORITY'S SYSTEM

<u>2 Year Delay</u>					
<u>Year</u>	<u>Generation Added/(Retired) (MW)</u>	<u>Net Winter Capability (MW)</u>	<u>Net Winter Peak Load (MW)</u>	<u>Reserves</u>	
				<u>MW</u>	<u>%</u>
1986/87	-	2086	1630	456	28.0
1987/88	-	2086	1714	372	21.7
1988/89	275 SJRPP 1 ^a	2361	1798	563	31.3
1989/90	275 SJRPP 2 ^a	2336	1874	762	40.7
1990/91	-	2636	1929	707	36.7
<u>3 Year Delay</u>					
1986/87	-	2086	1630	456	28.0
1987/88	-	2086	1714	372	21.7
1988/89	-	2086	1798	288	16.0
1989/90	275 SJRPP 1 ^a	2361	1874	487	26.0
1990/91	275 SJRPP 2 ^a	2636	1929	707	36.7

^a Share of output from proposed unit to be jointly owned with Florida Power & Light Company.

Table 1.3-2

EFFECT OF DELAYS OF GENERATION ADDITIONS
ON FLORIDA POWER & LIGHT'S SYSTEM

Year	Generation Added/(Retired) (MW)	Net Summer Capability (MW)	Net Summer ^c Peak Load (MW)	<u>No Delays</u>	
				Reserves	
				MW	%
1986	208 TECOA 275 SJRPP 1 ^b	13935	11445	2490	21.7
1987	104 TECOA 700 Martin 3 275 SJRPP 2 ^b	14806	11792	3014	25.6
1988	-	14702	12179	2523	20.7
1989	700 Martin 4	15402	12621	2781	22.0
1990	-	15402	12858	2544	19.8
<u>1 Year Delay</u>					
1986	208 TECOA	13660	11445	2215	19.4
1987	104 TECOA 275 SJRPP 1 ^b	13831	11792	2039	17.3
1988	275 SJRPP 2 ^b 700 Martin 3	14702	12179	2523	20.7
1989	-	14702	12621	2081	16.5
1990	700 Martin 4	15402	12858	2544	19.8

- a Purchase of unit power from Tampa Electric Company's Big Bend Unit No. 4.
- b FPL's share of output from proposed unit to be jointly owned with Jacksonville Electric Authority by a combination of joint ownership and firm power purchases.
- c Most Probable load forecast. The "Most Probable" represents a forecasted number for which there is an equal probability of being above or below.

Table 1.3-2 (Continued)

EFFECT OF DELAYS OF GENERATION ADDITIONS
ON FLORIDA POWER & LIGHT'S SYSTEM

Year	Generation Added/(Retired) (MW)	<u>2 Year Delay</u>			
		Net Summer Capability (MW)	Net Summer ^c Peak Load (MW)	Reserves	
				MW	%
1986	208 TECO ^a	13660	11445	2215	19.4
1987	104 TECO ^a	13556	11792	1764	15.0
1988	275 SJRPP 1 ^b	13727	12179	1548	12.7
1989	275 SJRPP 2 ^b 700 Martin 3	14702	12621	2081	16.5
1990	-	14702	12858	1844	14.3
<u>3 Year Delay</u>					
1986	208 TECO ^a	13660	11445	2215	19.4
1987	104 TECO ^a	13556	11792	1764	15.0
1988	-	13452	12179	1273	10.5
1989	275 SJRPP 1 ^b	13727	12621	1106	8.8
1990	275 SJRPP 2 ^b 700 Martin 3	14702	12858	1844	14.3

-
- a Purchase of unit power from Tampa Electric Company's Big Bend Unit No. 4.
- b FPL's share of output from proposed unit to be jointly owned with Jacksonville Electric Authority by a combination of joint ownership and firm power purchases.
- c Most Probable load forecast. The "Most Probable" represents a forecasted number for which there is an equal probability of being above or below.

1.4 ASSOCIATED TRANSMISSION

A joint study by JEA and FPL was performed with the objective of specifying the transmission system required to integrate the proposed coal units into the existing transmission network (Figure 1.4-1).

The proposed plant was assumed to consist of two 600 MW coal-fired units with each unit to be jointly owned by JEA and FPL. The scheduled in-service dates for the proposed plant were projected as 1986 and 1987 for Units 1 and 2, respectively.

Other assumptions pertaining to the scope and timing of 500 kV transmission lines in Florida had a significant impact on the results of the study. Currently planned additions include: (1) Duval-Georgia 500 kV lines No. 1 and No. 2 by 1983; (2) Martin-Poinsett 500 kV transmission line in 1984; (3) Duval-Poinsett 500 kV transmission line in 1985. It was assumed for the study that power flows into Peninsular Florida would range up to approximately 2000 MWs in 1986 and 1987.

Loadflow studies were performed for the years 1986 and 1987. These years were selected because the generation additions of Units 1 and 2 of the proposed plant would impact the transmission network in the area. From this analysis, three preferred configurations were established based on cost and system performance.

Alternative No. 1

- . Proposed Plant to Northside - 230 kV (3 lines)
- . Northside to Normandy - 230 kV (1 line)
- . Northside to Robinwood - 230 kV (1 line)

Alternative No. 2

- . Proposed Plant to Northside - 230 kV (3 lines)
- . Proposed Plant to Yulee - 230 kV (1 line)
- . Northside to Robinwood - 230 kV (1 line)

Alternative No. 3

- . Proposed Plant to Normandy - 230 kV (2 lines)
- . Proposed Plant to Robinwood - 230 kV (1 line)
- . Move termination of Northside to Fort Caroline - 230 kV line from Northside to Proposed Plant

These alternatives were evaluated and ranked based on relative capital costs and steady-state electrical performance. Although the three alternatives were nearly equivalent in cost and performance, Alternative No. 2 was initially chosen as preferred based on lowest capital requirements and highest steady-state transfer capabilities.

Alternative No. 2 was then studied to determine its suitability under dynamic stability criteria. Instances of three phase faults on lines terminating at the Northside bus were found to be most critical in affecting dynamic stability. Alternative No. 2 was found to be unsatisfactory based on its performance under breaker failure criteria. Alternative No. 3, which requires no direct transmission lines to the Northside Station, was studied and found acceptable with fast valving at the proposed plant and Northside 3 units. This feature detects mismatches between turbine mechanical power and generator electric output. If this mismatch exceeds a preset level, the turbine intercept valves are rapidly closed and left closed for approximately one second. This reduces the accelerating power to the generator and significantly increases the time which the fault can be sustained.

As a result of this study, JEA is implementing the recommendations of fast valving at the proposed plant and Northside 3 along with the construction of the transmission lines associated with Alternate No. 3. Chapter 9, Section 9.6, presents the details of the corridor selection process and the proposed corridor for Alternative No. 3. The construction of this associated transmission will enable the reliable integration of the proposed plant into the Peninsular Florida Transmission grid.

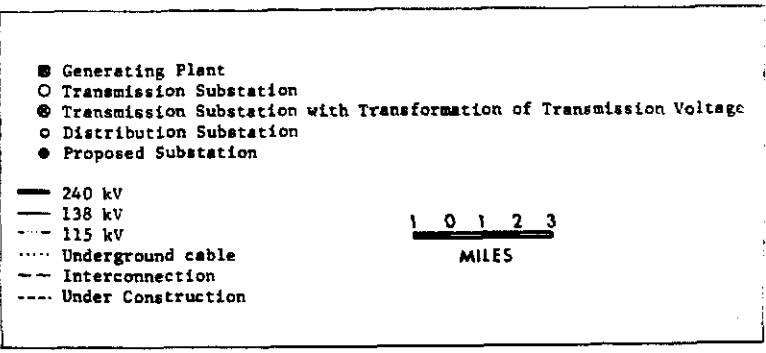
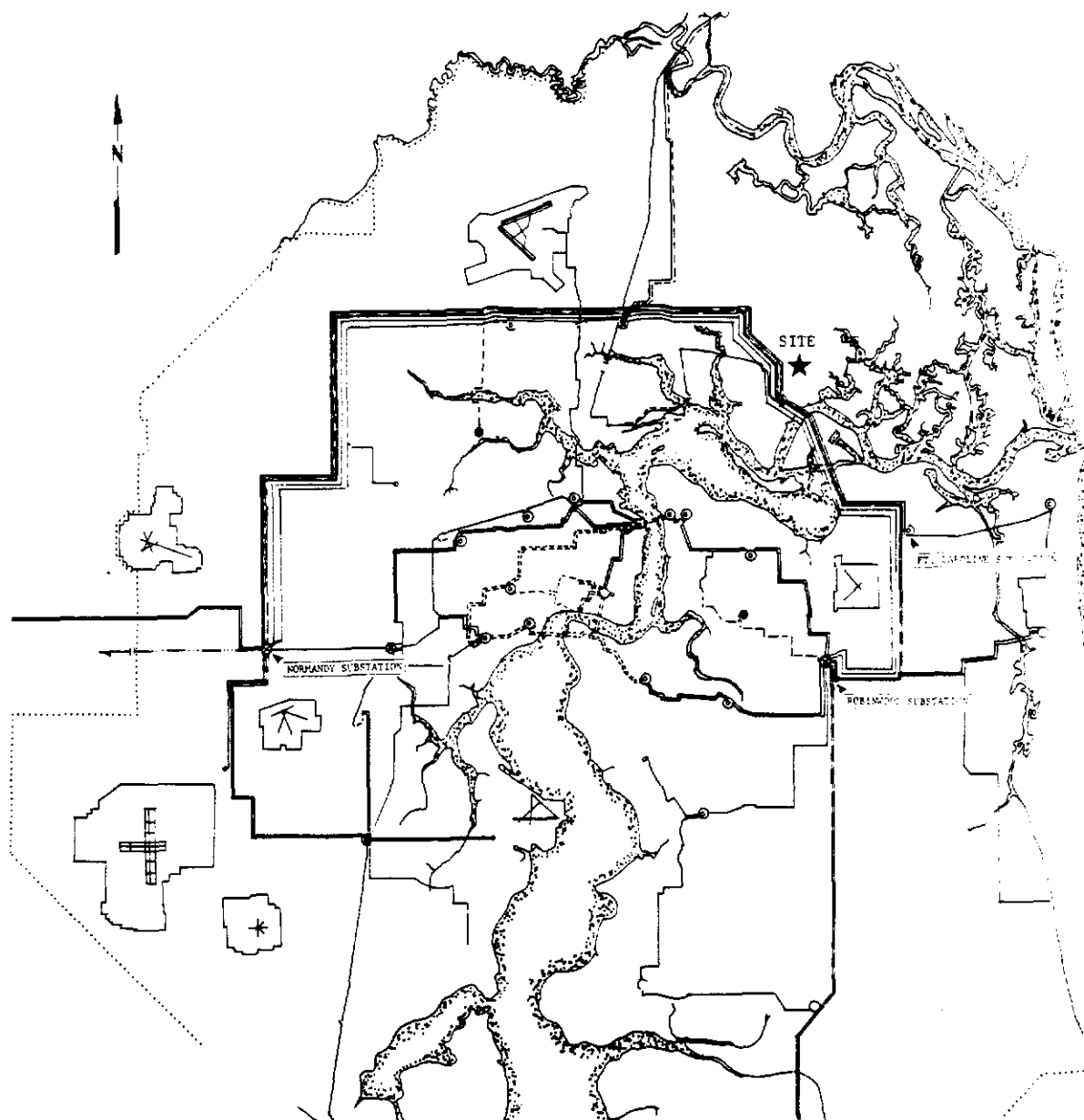


Figure 1.4-1 Existing Jacksonville Electric Authority Transmission System

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2. THE SITE

2.1 SITE LOCATION AND LAYOUT

2.1.1 Maps and Description

The location of the proposed site is illustrated in Figures 2.1-1 through 2.1-3. The site occupies approximately 1656 acres of land located in Duval County contiguous to the existing Jacksonville Electric Authority's (JEA) Northside Generating Station (NGS). The existing generating station encompasses approximately 410 acres for three oil-fired generating units. Site boundaries include New Berlin Road to the west, the City landfill to the north and marshes to the east and south. The St. Johns River is located approximately 1/2 mile to the southeast of the site.

Trees, shrubs and grasses comprise the majority of the site, totaling approximately 1,307 acres (Figure 2.1-4 and Table 2.1-1). The trees are fairly young and are scattered on the site except by the marsh areas where their density and size increase. Wetlands comprise approximately another 289 acres. A sand drag racing track with grandstands occupies approximately 60 open acres within the site boundaries at the intersection of New Berlin Road and Island Drive. The site is crossed by transmission lines from the NGS as well as by the Seaboard Coast Line Railroad, which services Blount Island.

A discussion of transmission corridors is provided in Section 2.11.

The site property is currently privately owned with an option for purchase being negotiated by the JEA.

Blount Island

The location of the proposed coal unloading facility is illustrated in Figure 2.1-3. The coal unloading site occupies approximately 55 acres of land in Duval County. This site is contiguous to the St. Johns River

Fulton-Dame Point Cutoff to the the south, salt marsh and Offshore Power Systems Corporation to the east, Undine Street to the north and the Jacksonville Port Authority to the west.

The site has been severely disturbed over the past 10 to 15 years. As a result, land cover is mostly open. Section 2.9 discusses types of vegetation found on the coal unloading site.

2.1.2 Site Modifications

The proposed site layout is shown in Figure 2.1-5. The proposed plant will consist of two 600 MW coal-fired units and is basically aligned along an axis running from northwest to southeast. The plant island will be enclosed by the service rail running northwest to southeast, which will form an oval loop around the plant structures. The stack, utilized by both units, will be just south of the center of the oval. Cooling towers will be located at the north end of the plant island.

Coal handling facilities to accommodate delivery of coal by rail and for coal storage will be located to the south of the plant island. Scrubber wastes and ash disposal areas will be located in the north and northeast sections of the site. Major facilities within the plant area include the turbine-generator, boiler, and flue gas desulfurization facilities. None of the plant facilities at the proposed site will be constructed on or below the mean high water (MHW) line (Figure 2.1-6).

The site will be developed as follows:

- 28 acres for plant area
- 9 acres for switchyard and transmission line
- 90 acres for coal handling facilities and coal storage
- 650 acres for protected, undisturbed land
- 551 acres for waste disposal
- 328 acres not presently designated for use or protection
- 1656 acres total

Blount Island

The proposed site layout for the coal handling facility on Blount Island is shown in Figure 2.1-7. Major facilities at the site are the ocean vessel coal unloading wharf, the stacker-reclaimer and coal storage pile, the railcar loading area, emergency coal stackout and the runoff holding basin with a capacity of 2.75 million gallons. Figure 2.1-8 shows the surveyed MHW, referenced to the Florida State Plane Grid. The coal unloader and wharf will be the only structures on or outside MHW.

The site will be developed as follows:

- 13 acres for coal storage
- 4 acres for holding basin
- 3 acres for the ocean vessel coal unloading wharf
- 1 acre for the rail car loading area
- 2 acres undisturbed salt marsh
- 1 acre for emergency stackout
- 31 acres not presently designated for use or protection
- 55 acres total

2.1.3 Existing and Proposed Uses

The proposed site, the majority of which is vacant land, consists of fairly young trees and palmetto. Trees, a mixture of hardwoods and pine, increase with size and density near the salt marsh, which occupies the area along the northern, eastern and southern boundaries of the site. The site has recently had large portions of the northern section harvested of pine. The site is currently used for indiscriminate dumping as well as target shooting. Trails on the site are used for off road driving by people with four wheel drive vehicles or motorcycles. A sand drag racing track within the site boundaries was previously used for organized drag racing.

A portion of the site has been proposed as a municipal landfill. No other land uses are currently proposed.

Blount Island

The proposed coal unloading site is presently made up of grasses and scrub or open water. The site is used only for occasional storage of imported automobiles from the adjacent port facility.

Table 2.1-1

LAND COVER OF PROPOSED SITE AND COAL UNLOADING FACILITY

<u>Land Cover</u>	<u>Number of Acres</u>	<u>Percentage of Total Land Area</u>
<u>PROPOSED SITE:</u>		
Wooded Land	1282	77
Grassy Scrub	25	2
Wetlands	289	17
Race Track	60 ^a	4
Total	1656	100
<u>COAL UNLOADING FACILITY:</u>		
Baccaharis Shrub	13	24
Grassy Scrub	30	54
Myrica Shrub	2	4
Wetlands	2	4
Open (water/beach)	2	4
Other	6	11
Total	55	101 ^b

-
- a Race track has 60 open acres which is used as the racing area, the property boundary actually includes 80 acres. The difference of 20 acres is included in the vegetation cover figures.
- b Due to rounding percentages do not total exactly.

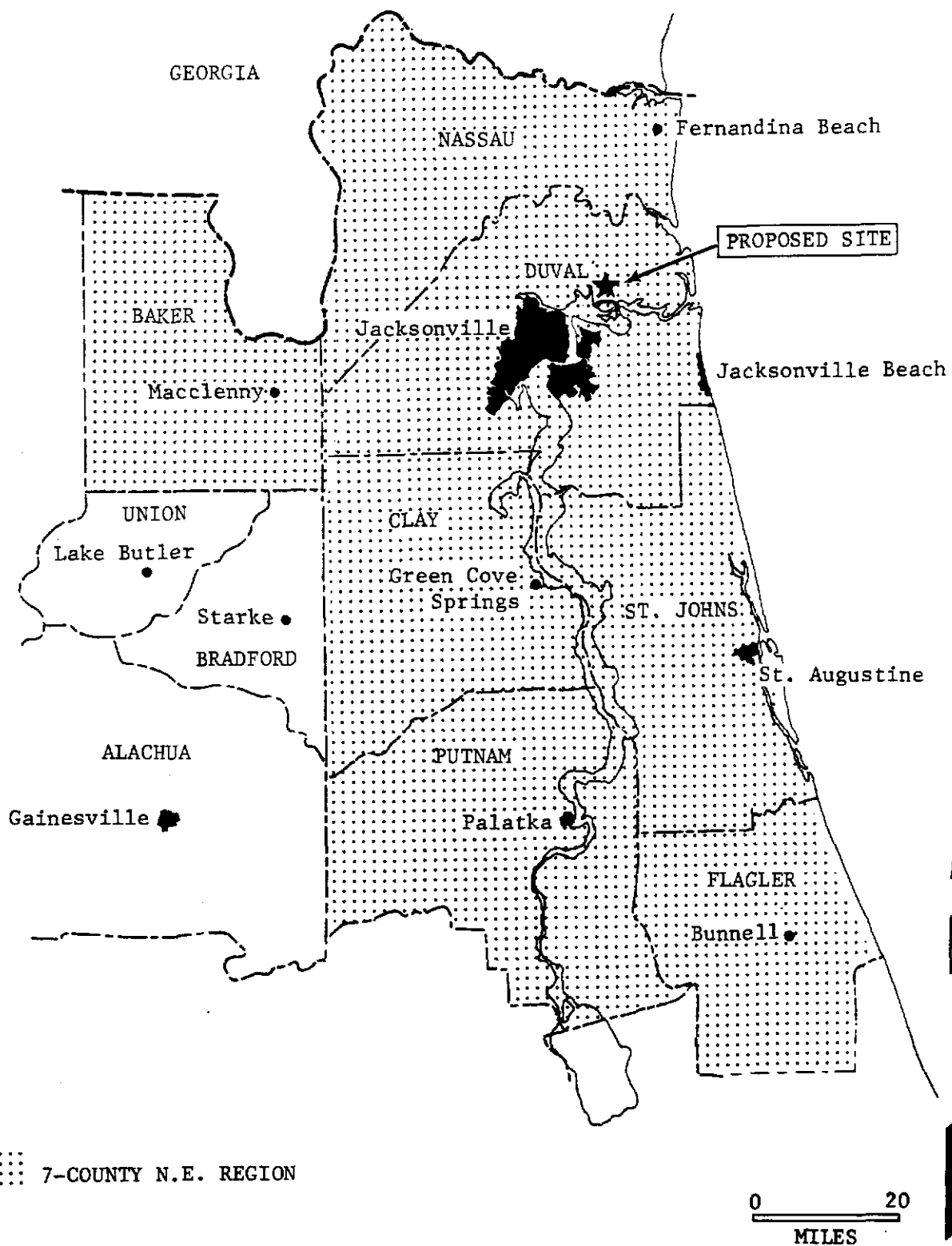


Figure 2.1-1

Regional Location Map

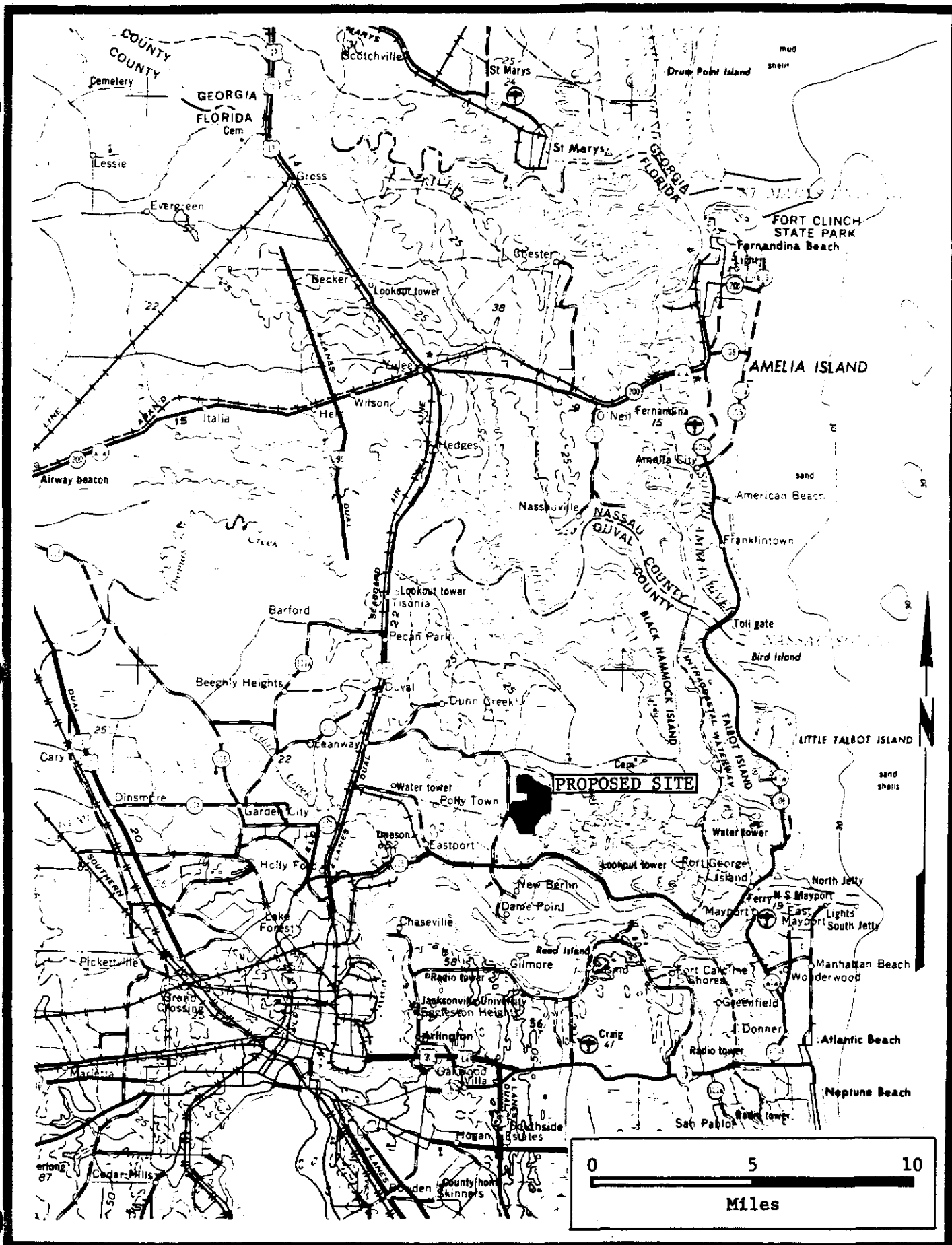


Figure 2.1-2 General Site Location

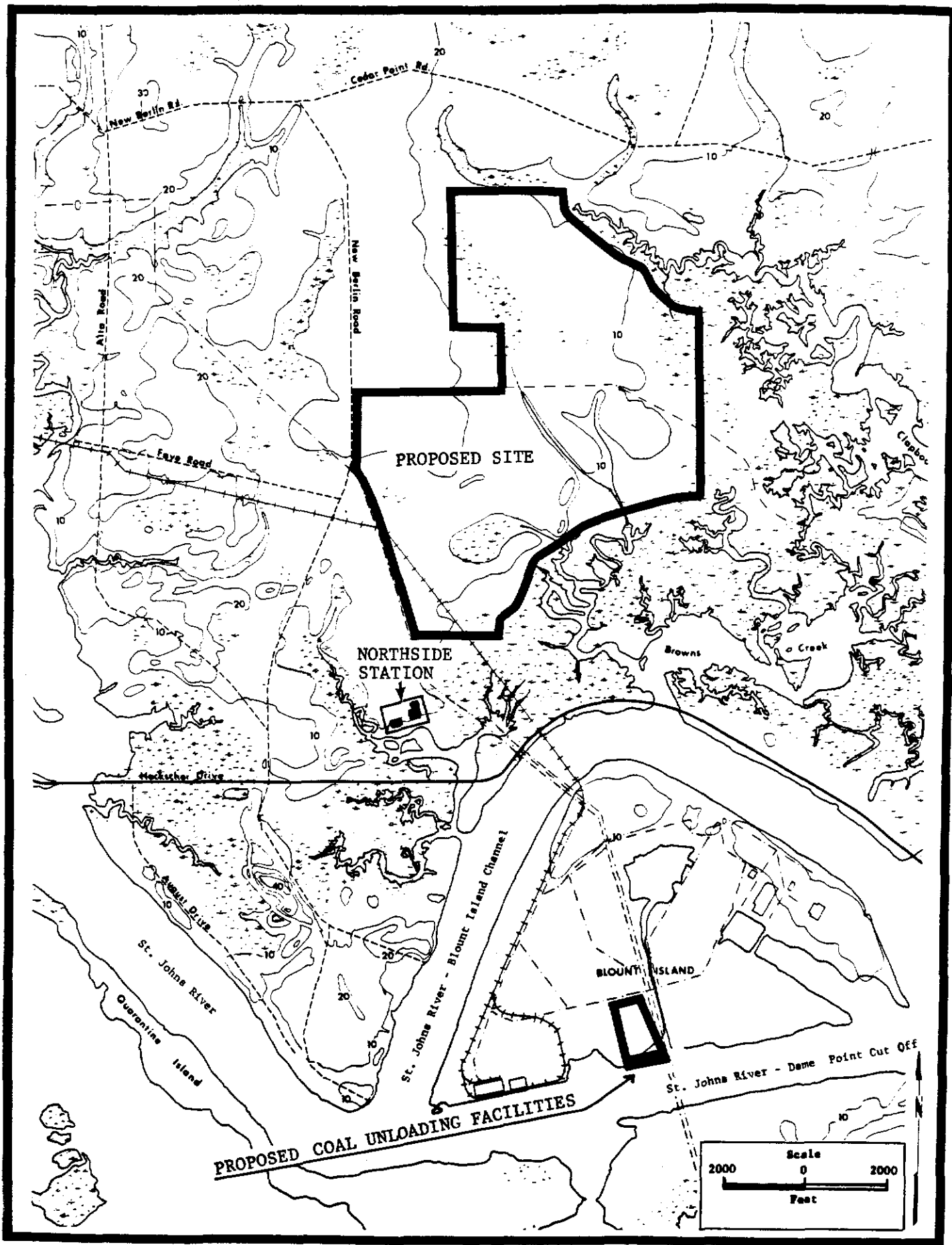


Figure 2.1-3 Location of Site in Relation to Coal Unloading Facilities

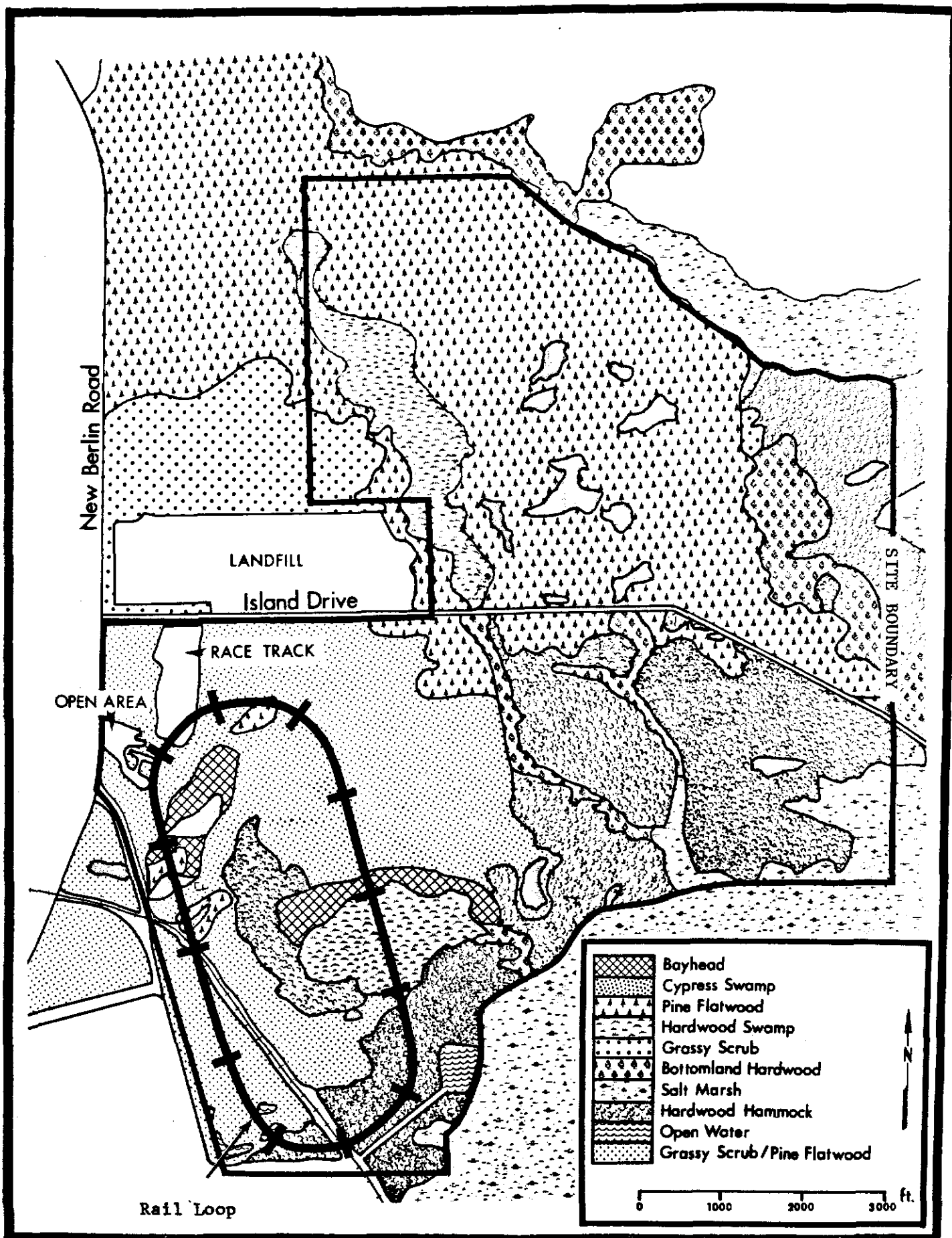


Figure 2.1-4 Site Land Use

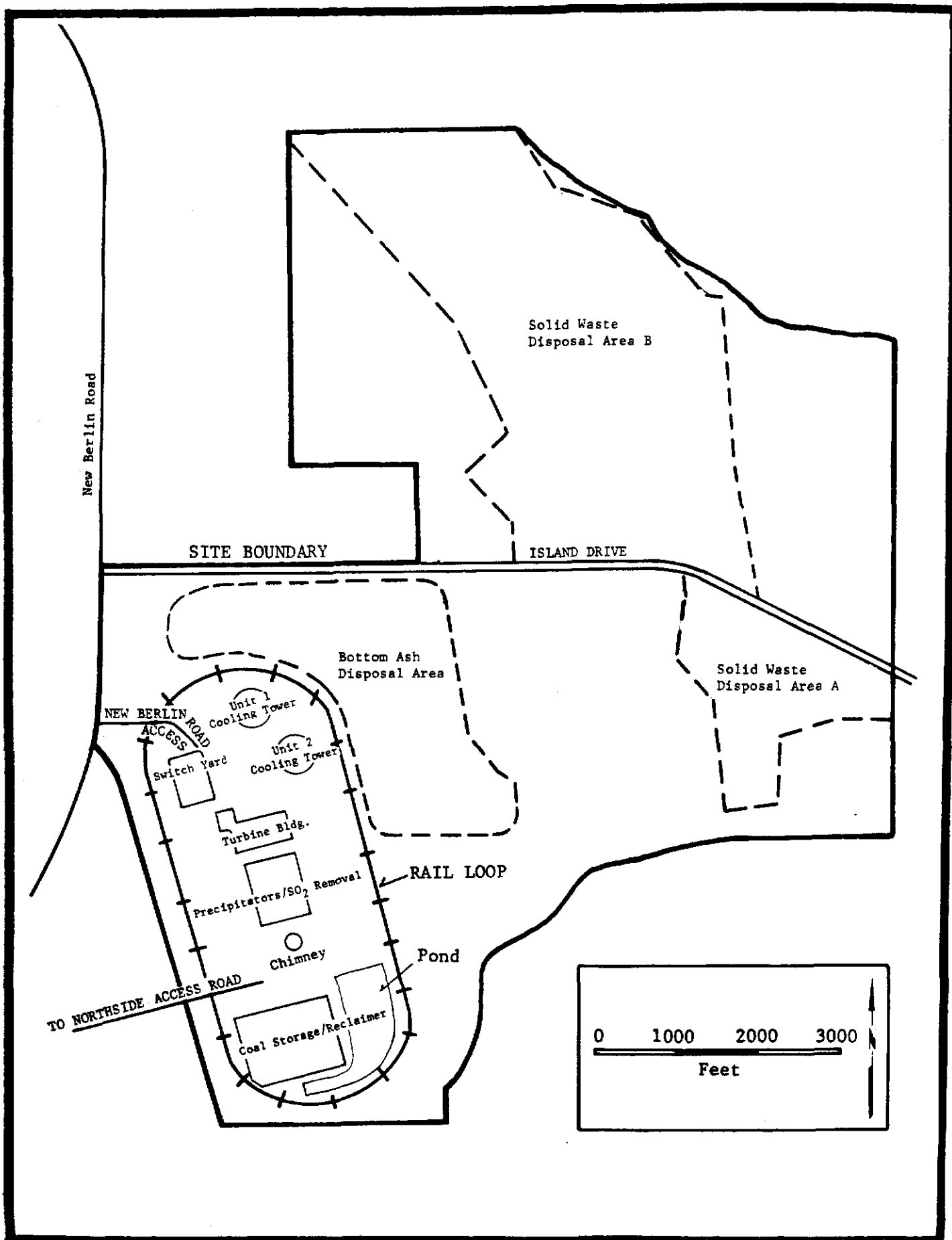


Figure 2.1-5 Layout of Plant and Other Facilities

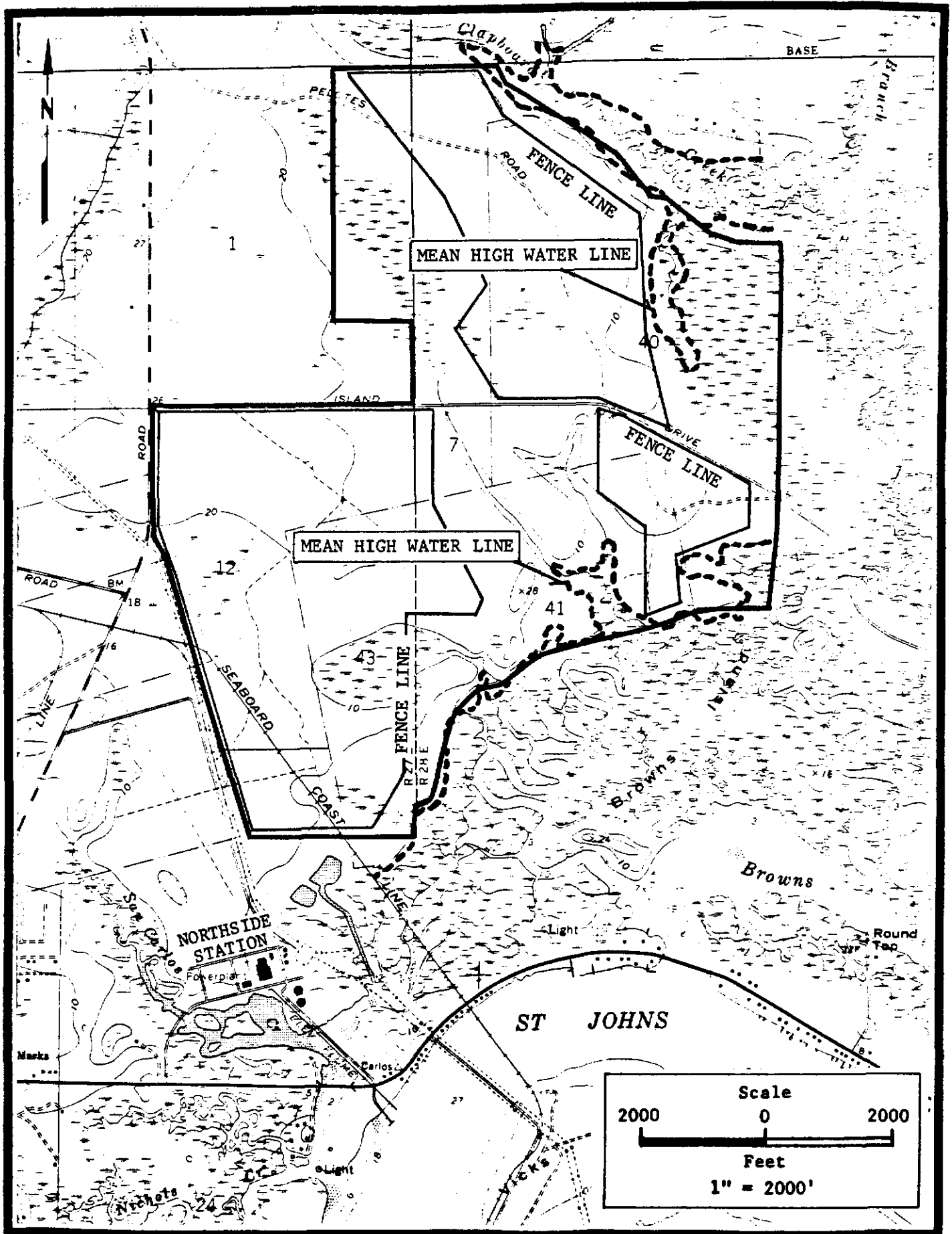


Figure 2.1-6 Approximate Mean High Water Line Adjacent to the Proposed Site

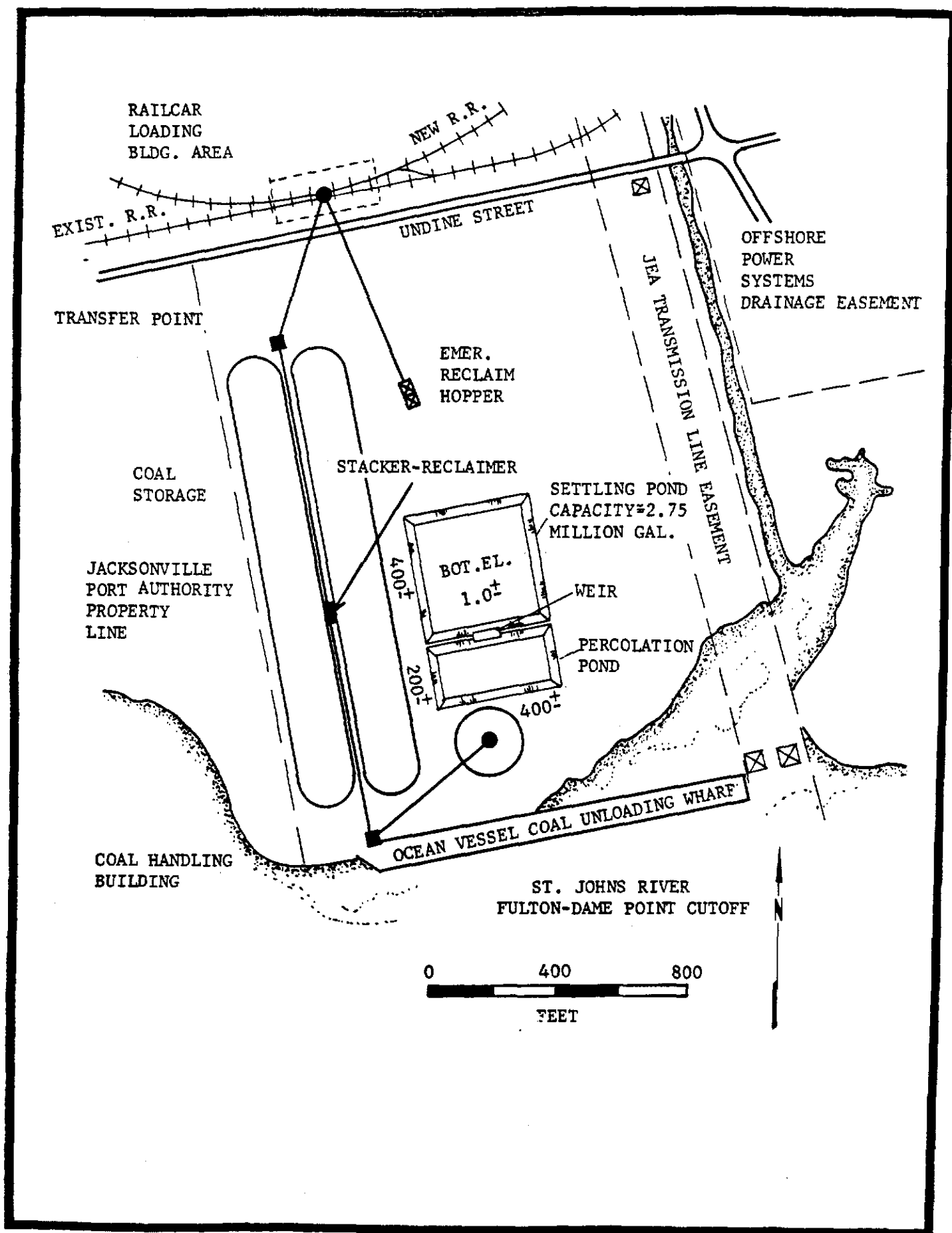


Figure 2.1-7 Coal Unloading Facility

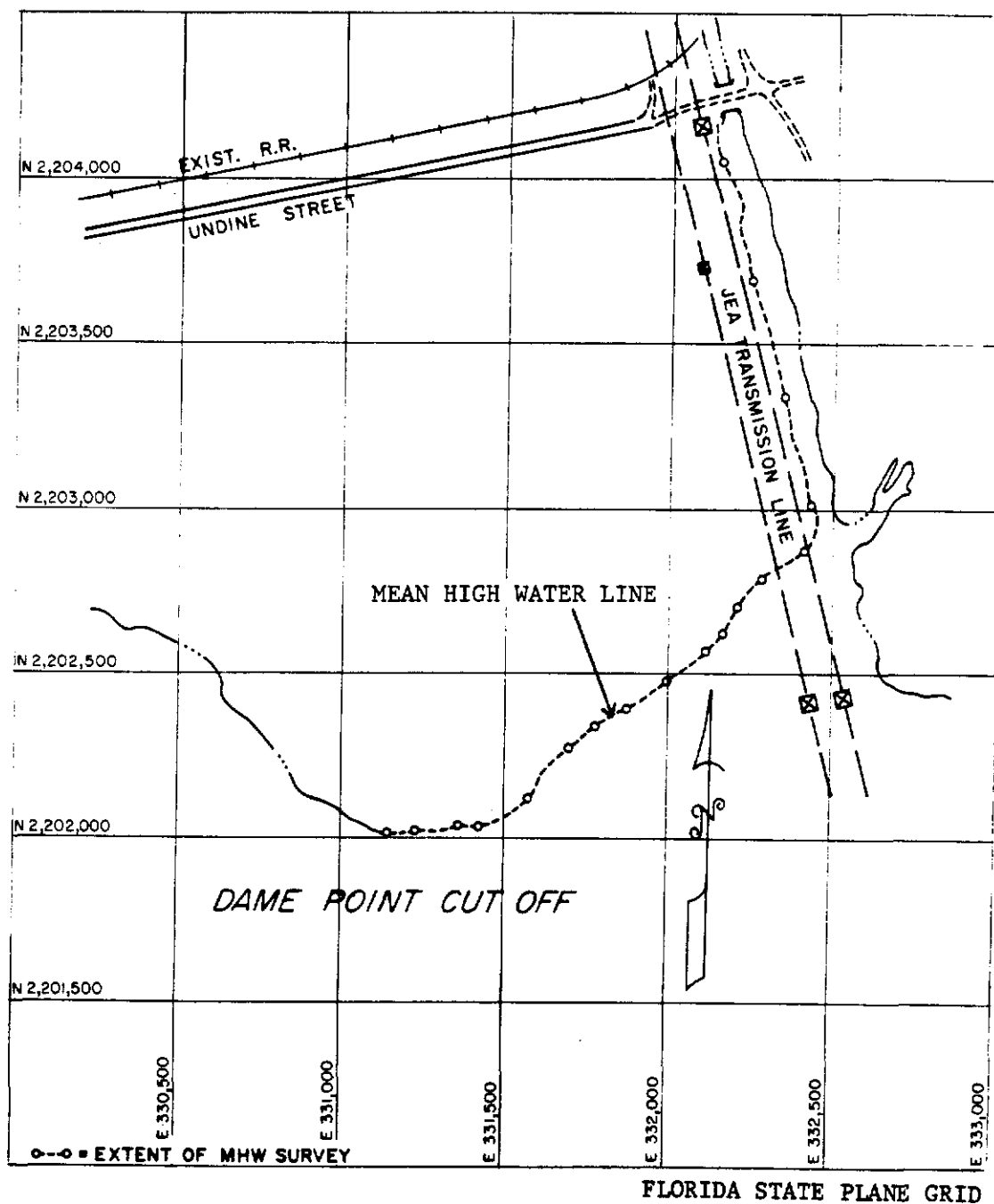


Figure 2.1-8

Surveyed Mean High Water (MHW) Line at Proposed Coal Unloading Facility on Blount Island

2.2 LAND AND WATER USE

2.2.1 Land Use

Land use patterns for the region focus on the seven counties that make up Region IV, the Northeast Florida Planning Region, including Baker, Clay, Duval, Flagler, Nassau, Putnam and St. Johns Counties. For the region, 11 types of land uses and cover are inventoried (Florida Resources Analysis Center, 1980). The 11 categories include: open and recreation; residential; industrial, commercial, and institutional; transportation and utility; agricultural; upland natural; wet natural; open water and coastal; marine; mixed urban and transitional; and strip mines and quarries. Regional information for present and future land uses is found in Appendix G.

The description of land use patterns within 5 miles of the proposed site contained in this chapter concentrates on an area in the northern half of Duval County located near the St. Johns River and Blount Island. In this area, 18 types of land uses are discussed including: cropland; pasture; wooded; wet wooded; wet natural; open water; coastal; marine; open; recreation; historical sites; institutional; industrial; commercial; utility; transportation; single family residential; and multifamily residential.

The 5-mile analysis employs four basic sources of information. Land cover data in Duval County was obtained from the Jacksonville Area Planning Board in their 1977 Land Cover and Selected Characteristics Study. Also, aerial photographs taken in January of 1980 as well as maps from the United States Geological Survey (USGS) were used. Field inspection supplemented and confirmed the above listed data. Land use figures were tabulated (using a polar planimeter) from a map compiled from the USGS maps, aerial photos, a Jacksonville Area Planning Board land cover map and field inspection notes. Information concerning future land use developments was taken primarily from the Jacksonville Area Planning Board 2005 Comprehensive Plan.

2.2.1.1 Land Use Characterizations

Present Land Cover and Use (5-Mile Radius)

Land cover within a 5-mile radius of the proposed plant location is shown in Figures 2.2-1 to 2.2-5. As indicated by Table 2.2-1, this 5-mile radius area is predominantly wooded forest. When including wet wooded areas, which are made up of hardwood swamps and cypress, the wooded land category comprises 16,680 acres or 33 percent of total land area. Primarily all of the wooded land in the 5-mile area is natural. There is some commercial forest in the western section of the 5-mile radius owned by St. Regis Paper Company. Commercial forest activity is on the decrease in Duval County due to urban expansion. However, Duval County does have the majority of wood using industries in the Northeast Region, the paper industry being the third largest industry in Duval County. Some of these industries are located within the 5-mile radius.

Open water constitutes the second largest land cover in the 5-mile radius (Figure 2.2-3). Approximately 10,570 acres, or 21 percent of the total area, fall within this category. The St. Johns River and Mill Cove make up most of this classification. The river is of vital importance to shipping and port activities in this area and influences land uses located along its shores. The shoreline is conducive to port related industry, as well as residential, commercial and recreational land uses and often finds competition among users. All four of these uses can be found in the 5-mile radius.

Coastal lands which are made up of tidal flats, beaches, dunes, salt marsh, mangroves and coastal hammocks comprise the third largest land cover category (Figure 2.2-3). This land cover, located primarily in the eastern half of the 5-mile area, comprises approximately 6,780 acres or 13.5 percent of the total land area. Tidal marshes make up the majority of this classification and serve as hurricane buffers, wildlife refuges, retention

areas for runoff and propagation grounds for marine life. Marshes also afford scenic and recreational benefits. The proposed site is located on the western boundary of the salt marshes.

Land use categories playing a large role within the 5-mile radius area are industry and single family residential. Existing industrial land use (Figure 2.2-4) is approximately 1,880 acres or 3.7 percent of the total land area. Industries are locating to the west of the proposed site due to the close proximity of interstate highways, ports, and the Jacksonville International Airport. Land to the south and west of the site is zoned for industrial uses.

Recreation facilities comprise a very small amount of the land use within the 5-mile radius. There are no regional parks in the 5-mile area. However, between 7 and 8 miles to the east from the proposed plant site there are two regional parks. Kingsley Plantation is a state historic site located on Fort George Island along with Rollins Bird and Plant Sanctuary (see Figure 2.2-1). Just to the east, on Little Talbot Island, is the 2,500 acre Little Talbot Island State Park. This park provides a portion of the beach recreation in Duval County with 35,000 annual visitors according to the Jacksonville Area Planning Board (1979a).

Inside the 5-mile radius and just across the river from the plant site is the Fort Caroline National Memorial. It is a 120 acre reconstruction of a French fort built in 1564. According to the Jacksonville Area Planning Board (1979a), visitations average 400,000 per year.

Located north of the St. Johns River near Dames Point just over 2 miles south of the site is Yellow Bluff Fort. This is an undeveloped state park preserving what is left of the Confederate Army's gun placements which were used in 1862 to protect Jacksonville from Union gunboats. The state has future plans to develop this park.

Within the 5-mile radius, there are a number of school playgrounds. There is one community park on Fort Caroline Road just over 4 miles from the site to the southeast which is comprised primarily of baseball fields. Two other ball fields to the west of the proposed site are owned and operated by St. Regis Paper Company.

Some other important spots being used for recreation are the bridges along Heckscher Drive which are popular spots for fishing. The marshes provide various types of recreation. The old bridge to Blount Island, just south of the site, is now closed to traffic but is heavily used as a fishing pier.

Residential land use makes up 11.2 percent of the total land area in the 5-mile radius (Table 2.2-1). There are two major residential districts in the 5-mile area. One is between 2 and 4 miles to the northwest of the site. Most of this residential area is a mixture of house trailers and houses of varying conditions and ages. This residential area is entering into a transitional period as businesses and industry start to move into the area. The other residential area is south of the river about 4 miles from the site. Most of the homes in this area are well maintained and are occupied by middle to upper middle income residents. The homes in this area are separated from the commercial districts.

Future Land Uses (5-Mile Radius)

Future land use within a 5-mile radius of the proposed plant will be related closely to the St. Johns River. Heavy demands are expected to be made on the shores of the river by industry, residential, commercial and recreational land uses. Reflecting this development potential, the Jacksonville Area Planning Board developed in its Comprehensive Plan for 2005, a plan for various land uses along the St. Johns River. Within the 5-mile radius of the proposed site, the plan calls for port and water related industry as well as protected wetlands and marshes. Port and water related industry are planned for those areas where there will be no adverse

effects on the environment. This includes Blount Island, most of the site area and a majority of the land west of the proposed site. The wetlands and marshes are located primarily to the east of the proposed site.

According to the Comprehensive Plan of the Jacksonville Area Planning Board (1979) water related industry can include the full range of industries, from light to heavy. Offices and supporting commercial uses as well as warehouses and storage facilities can also be included as water related industry. They should, however, be located so that those uses requiring port facilities are located closest to the river.

Development of industrial and storage facilities along Heckscher Drive from Interstate 95 east to just north of Blount Island is expected to continue, especially since Heckscher Drive (Figure 2.2-1) is the connecting link between trucking routes and shipping ports. Based on the Comprehensive Plan and current growth patterns, it appears reasonable to assume that by the year 2005 the study area will have experienced major industrial growth, even in the absence of the proposed plant.

Wetlands and tidal marshes to the east of the proposed site are to be protected according to the comprehensive plan. The tidal marshes, which are covered by grassy, salt tolerant vegetation, serve as a buffer to storms and floods and as settling basins for silt. Marshes also play a major role in the propagation of marine life.

Residential areas will experience future growth, with the largest amount occurring in neighborhoods on the south side of the St. Johns River. Other growth areas in Duval County are south of the city near the river and to the east between the city and the beaches.

The two most predominant land uses projected for the 5-mile radius are industrial in the western portion of the study area, and marshes in the eastern portion (Jacksonville Area Planning Board, 1979).

Zoning

The site is presently zoned by the City of Jacksonville as IH - Heavy Industry. Power plants are permissible uses by exception in IH zones (Jacksonville Area Planning Board, 1979b). A zoning exception or rezoning to GU - Government Use is required for the site. Such an exception or rezoning would be compatible with both present and planned future land uses. A variance will have to be obtained for the 640 foot stack height which would otherwise be limited to 519 feet by Jacksonville Ordinance 78-256-271 for land situated in the airspace zones or accident zones of nearby airports. The stack location is approximately 3,500 feet inside the boundary of this zone for Mayport Naval Air Station air space. The site will comply with all other zoning requirements.

Blount Island is presently zoned IW - Industrial Waterfront for which a coal unloading facility is a permitted use.

Transmission Lines

The transmission line corridor passes through predominantly open rural land. See Section 4.3.5 for more detail.

2.2.1.2 Cultural and Historical Resources

There are presently no areas on, nominated to, or declared eligible for the National Register of Historic Places or the National Registry of Natural Landmarks within the boundaries of the proposed plant site, the proposed Blount Island coal facilities, or the preferred transmission line corridor. These same locations contain neither lands specially designated under state programs, nor known areas valued as natural landmarks or for their historic (excluding archeological), scenic or cultural significance.

2.2.1.3 Archeological Sites

A cultural resources reconnaissance of the proposed plant site identified eleven archeological locations which have been tentatively dated from 700-1500 AD. Preliminary analysis suggests that some or all of these locations may be potentially eligible for the National Register, and that a portion of the plant site may meet the requirements for an archeological district. Most of these sites are located outside the proposed fenceline of the plant as shown in Figure 4.1-7.

An intensive archeological survey of the eleven locations was conducted to gather data necessary to assess site significance in terms of National Register criteria and to request a formal determination of National Register eligibility from the Secretary of the Interior. Detailed reports of the survey have been submitted to the Division of Archives History and Records Management (State Historic Preservation Officer) and a formal opinion on significance requested. Overall, the eleven archeological sites tested in the project area were disturbed to varying degrees. One large site has been severely disturbed. Four other large sites contain some mixture of cultural material but retain intact cultural levels and/or features. A detailed discussion of archeological locations on the site is contained in Appendix J.

2.2.1.4 Viewshed Descriptions

A ground and aerial survey was conducted within a 5-mile radius of the proposed site to identify areas and land uses which are normally considered sensitive to visual impacts. In general, the types of areas examined were residential developments, recreational areas, and highways. Figure 2.2-6 identifies ten major viewpoints in the vicinity of the proposed site. Table 2.2-2 presents a description of the existing view from each of these points in the general direction of the proposed site.

In general, the existing view toward the proposed site is characterized by the buildings, water tower and stacks of the NGS; transmission towers and lines associated with the NGS; the Offshore Power Systems crane and shipping cranes on Blount Island; and structures of the St. Regis paper mill. These existing structures are the dominant elements in the viewshed and are visible from most of the viewpoints, although the impact varies from insignificant to very significant. Section 2.10.2 presents a discussion of the aesthetic impacts on the viewshed (area from which proposed plant would be visible) due to the presence of these existing structures.

2.2.2 Water Use

Total freshwater use in the Lower St. Johns River Basin in 1975 was estimated to be 398.8 MGD (St. Johns River Water Management District, 1977). Of this, groundwater use was estimated at 213.2 MGD and surface water use was estimated at 185.6 MGD (Table 2.2-3). In 1975, nearly all freshwater consumption for rural water use, irrigation, and public drinking water supply was developed from groundwater sources, principally the Floridan Aquifer. A significant proportion of water use by industry and power generation was developed from surface water sources, principally the St. Johns River.

Estimates of total freshwater use (groundwater and surface water) for the period 1980 through 2020 are summarized in Table 2.2-3. The distribution of water use between surface water and groundwater sources is shown in Table 2.2-3.

Locations of major water uses in the 5-mile radial area surrounding the proposed site are indicated on Figure 2.2-7 and are described in Table 2.2-4. The NGS and the St. Regis Paper Company Eastport plant are the primary surface water (St. Johns River) users. Groundwater uses are substantially less than surface water uses within the 5-mile radius, although groundwater consumption provides a significant portion of total water use at the St. Regis plant.

There are actually no consumptive uses of either ground or surface water other than evaporation.

2.2.2.1 Groundwater

If the proportions of surface water and groundwater use remain the same as in 1975, total groundwater use in the Lower St. Johns River Basin is projected to double by the year 2020, increasing from approximately 213 MGD in 1975 to approximately 417 MGD in 2020 (St. Johns River Water Management District, 1977). Major increases in groundwater use are projected in public supply (up 225 percent), industrial supply (up 49 percent) and irrigation (up 50 percent). No significant increases in groundwater use are projected for power generation and rural water use through 2020. Rural water use includes livestock demands and rural domestic demands other than that of populations served by water utilities.

In the Jacksonville area, all public groundwater supplies are developed from the Floridan Aquifer, including municipal supplies, privately and corporately owned water utilities, and military water systems (Leve and Goolsby, 1969). In rural areas not served by water utilities, groundwater is developed from privately owned wells. Most of these wells are completed in shallow aquifers although some wells penetrate the Floridan Aquifer. Leve and Goolsby (1969) estimate that between 10 and 25 MGD is produced from the shallow aquifers (principally the limestone, shell and sand aquifer) and about 5 MGD is produced from the Floridan Aquifer for rural water use.

Industrial and commercial groundwater supplies are obtained primarily from the Floridan Aquifer, although some supplies are obtained from the shallow aquifers. High volume industrial and commercial supplies are generally obtained from the Floridan Aquifer (Leve and Goolsby, 1969).

2.2.2.2 Surface Water

Surface water in the vicinity of the proposed site is under the jurisdiction of the St. Johns River Water Management District. The St. Johns River Water Management District has formulated policies to ensure continued adequate supply of surface water for various uses including public, industrial and power generation, irrigation, rural, and recreation - (St. Johns River Water Management District, 1977).

Primary surface water uses in the site vicinity include recreation and navigation. Population growth in the region, as well as increased leisure time, has resulted in a high demand for recreational uses. The St. Johns River is a prime recreational resource. Boating, water skiing, and fishing are enjoyed by both residents and tourists in the area. The St. Johns River is also maintained for commercial navigation serving domestic and foreign cargo lines at the Port of Jacksonville including Blount Island, just south of the proposed site.

In the Lower St. Johns River Basin, groundwater accounted for all of the public water use in 1975 (Table 2.2-3). Only a portion of the total population in the Lower St. Johns River Basin as well as the Water Management District is served by public water utilities. No significant increase in surface freshwater use for public supply is expected through 2020.

The Lower St. Johns River Basin provided 98 percent of the total District surface freshwater demands for industrial use in 1975. The Lower St. Johns River Basin is the only basin in the District in which a significant amount of the freshwater used by industries is derived from surface water (29 percent). Most of this water used is by the pulp and paper industry. The Lower St. Johns River Basin total surface freshwater demands for industrial use are expected to increase from 25.3 MGD in 1980 to 38 MGD by the year 2020, an increase of approximately 50 percent (Table 2.2-3).

Withdrawals of water for cooling constitute the primary demands for surface water imposed by power generating utilities. Saline water accounted for approximately 80 percent of the Lower St. Johns River Basin surface waters required for cooling in 1975. Excluding water purchased from water utilities, power generation surface freshwater use in the Lower St. Johns Basin totaled 160 MGD in 1975 (Table 2.2-3). The 160 MGD constitutes approximately 29 percent of the total surface freshwater demand for power generation in the District. The St. Johns River Water Management District does not forecast an increased demand for surface freshwater for power generation by the year 2020 in the Lower St. Johns River Basin. This forecast assumes that there will be a balance between the gradual phasing out of the existing facilities which use a relatively large amount of withdrawn water and new plants which are expected to use water more efficiently.

Irrigation water is demanded mostly during the relatively dry spring and autumn seasons to supplement rainfall for crop production. The number of irrigation surface freshwater users in the District that are not metered make quantities withdrawn difficult to estimate accurately. Current estimates, however, indicate that less than 2 percent of all irrigation water withdrawn is from surface waters. Although the use of irrigation methods is expected to increase steadily in order to increase productivity, more efficient methods should result in a moderate increase in demand for irrigation surface water by the year 2020 (St Johns River Water Management District, 1977).

Rural water use includes livestock demands and rural domestic demands other than that of populations served by water utilities. Total rural surface freshwater use for the Lower St. Johns Basin in 1975 was only 0.3 MGD (Table 2.2-3), representing 19 percent of total rural surface water use in the District. Rural water demand in the Lower St. Johns River Basin is expected to increase gradually through the year 2000. After that year, the rural demand is expected to decline due to increased service by water

utilities. Projected total rural freshwater demand in the Lower St. Johns River Basin is therefore not expected to increase between the years 1980 and 2020 (Table 2.2-3).

2.2.3 References

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Table 2.2-1

PRESENT LAND USE ACREAGE WITHIN 5-MILE RADIUS
OF PROPOSED SITE

<u>Land Usage</u>	<u>Approximate Number of Acres</u>	<u>Percentage of Total Land Area</u>
Cropland	170	0.3
Pasture	1270	2.5
Agriculture Subtotal	1440	2.8
Wooded Lands	13580	27.0
Commercial	70	0.1
Industry	1880	3.7
Institutional	40	0.1
Single Family	5530	11.0
Multi-Family Residential	120	0.2
Residential Subtotal	5650	11.2
Utility	210	0.4
Transportation	130	0.3
Wetlands	2860	5.7
Open Water	10,570	21.0
Coastal	6780	13.5
Marine	610	1.2
Recreation	260	0.5
Historical Sites	120	0.2
Wet Wooded	3100	6.2
Other	2960	5.9
Total	50,260 ac.	99.8 ^a

^a Due to rounding, percentages do not total to 100 percent

Table 2.2-2

VIEWSHED OF PROPOSED PLANT VICINITY

<u>Direction</u>	<u>Key^a</u>	<u>Area</u>	<u>Distance From Site (miles)</u>	<u>Daily Average No. Viewers</u>	<u>Existing View of Structures in Proposed Site Vicinity</u>	
East	A	Heckscher Drive at Browns Creek	1.5	16,136 ^b		The Northside Station stands in the foreground as a dominant element. The transmission towers and OPS crane appear to the south of Northside and are also dominant elements.
	B	Heckscher Drive at Cedar Point Creek	4.5	16,136 ^b		The Northside Station is in the distant background on the horizon and is noticeable but not a dominant element.
	C	Kingsley Plantation	6.5	100 ^c		The Northside Station is mostly screened and blends in with sky haze. It is therefore insignificant.
South	D	St. Johns River	1-2			The Northside Station is partially screened and views are intermittent. The other structures in the area such as the OPS crane, transmission towers, dredging barges and shipping cranes are more dominant than the Northside Station.
	E	Residences along southern shores of Mills Cove and St. Johns River	4	d		The Northside Station is mostly screened. The St. Regis plant to the west has more of a visual impact on residences.
	F	Fort Caroline Road	5	d		The Northside Station is only visible for one interval at typical highway speeds and even then is not a dominant element since the OPS crane, transmission towers, water towers and shipping cranes on Blount Island are visible in the same view.
	G	Fort Caroline Memorial	5	1,100 ^c		The Northside Station is visible in the background, but in the middle and foreground are transmission towers, water towers, and the OPS crane which are more dominant elements.
	H	Residences on southern shores of St. Johns River and Dames Point Cutoff	3.5	d		The Northside Station is visible in the background, but the transmission towers and water towers are also visible and in the immediate foreground is the OPS crane.
	I	Heckscher Drive at Nichols Creek	0.5	16,136 ^b		The Northside Station is visible in the foreground and is a very dominant element in the view.

Table 2.2-2 (Continued)

VIEWSHED OF PROPOSED PLANT VICINITY

Direction	Key ^a	Area	Distance From Site (miles)	Daily Average No. Viewers	Existing View of Structures in Proposed Site Vicinity
West	J	Heckscher Drive at Dunn Creek	2.5	16,136 ^b	The Northside Station is intermittently visible along with the OPS crane and other structures on Blount Island. The view as a whole is significant.
North	K	Boney Road at Cedar Creek Road	2.5	d	The area is basically open and serves as a pasture. The Northside Station is only partially visible due to some screening by trees. Trees in the foreground as well as cattle become the dominant elements.

^a See Figure 2.2-6 for locations

^b Number at viewers based on projected 1985 average daily traffic

^c Based on park visitation according to the Jacksonville Area Planning Board, 1979

^d No information available on these points

Table 2.2-3

FRESHWATER USE AND PROJECTIONS FOR THE LOWER ST. JOHNS RIVER BASIN^a
1975-2020

Water Use Category	Groundwater Withdrawn (MGD)			Surface Water (MGD)		
	1975	1980	2000	1975	1980	2000
Public	65.9	82	145	-	-	-
Industrial	62.1	64	77	25.3	26	31
Irrigation	49.3	54	68	-	-	-
Power Generation	2.3	2	2	160.0	160	160
Rural	33.6	35	38	0.3	0.3	0.3
Basin Total	213.2	237	330	185.6	186.3	191.3
			417			198.3

Source: St. Johns River Water Management District, 1977

^a River mouth to Lake St. George

Table 2.2-4

MAJOR WATER USE WITHIN 5-MILE RADIUS OF PROPOSED SITE^a

<u>Location^b</u>	<u>Owner and Location</u>	<u>Water Source^c</u>	<u>No. of Wells</u>	<u>Average Daily Use (MGD)</u>
1	Jacksonville Electric Authority Northside Station ^d	Surface water Groundwater	- 6	216 1.1 ^e
2	City of Jacksonville North Landfill ^f	Groundwater	1	<0.1
3	Capitol Concrete- New Berlin Rd. ^g	Groundwater	1	<0.1 (inactive)
4	Southern Materials ^h	Groundwater	5	0.2
5	St. Regis Paper Co. ^h Eastport	Surface water Groundwater	- 7	60 19
6	Imeson Airport ^h	Groundwater	2	0.3
7	Duval County Schools ^h	Groundwater	1	<0.1 ⁱ
8	Offshore Power System ^j	Groundwater	5	<0.1
9	Jacksonville Port Authority ^j	Groundwater	3	<0.1
10	Liquid Carbonic ^h	Groundwater	3	1.5

- a Both fresh and non-fresh water use within 5-mile radius from location proposed for plant water supply wells
- b See Figure 2.2-7
- c All major groundwater use is from the Floridan Aquifer.
- d Jacksonville Electric Authority, 1980.
- e Estimate, 1982 projection.
- f Sheffield, 1980.
- g Hayes, 1980.
- h Leve and Goolsby, 1969.
- i Average daily water use calculated from data in Leve and Goolsby, 1969. Assumes total water use of 0.5 MGD equally apportioned among 25 wells owned by Duval County Schools.
- j Department of Health, Welfare, and Bio-Environmental Services, City of Jacksonville; Temporary Water Use Permits.





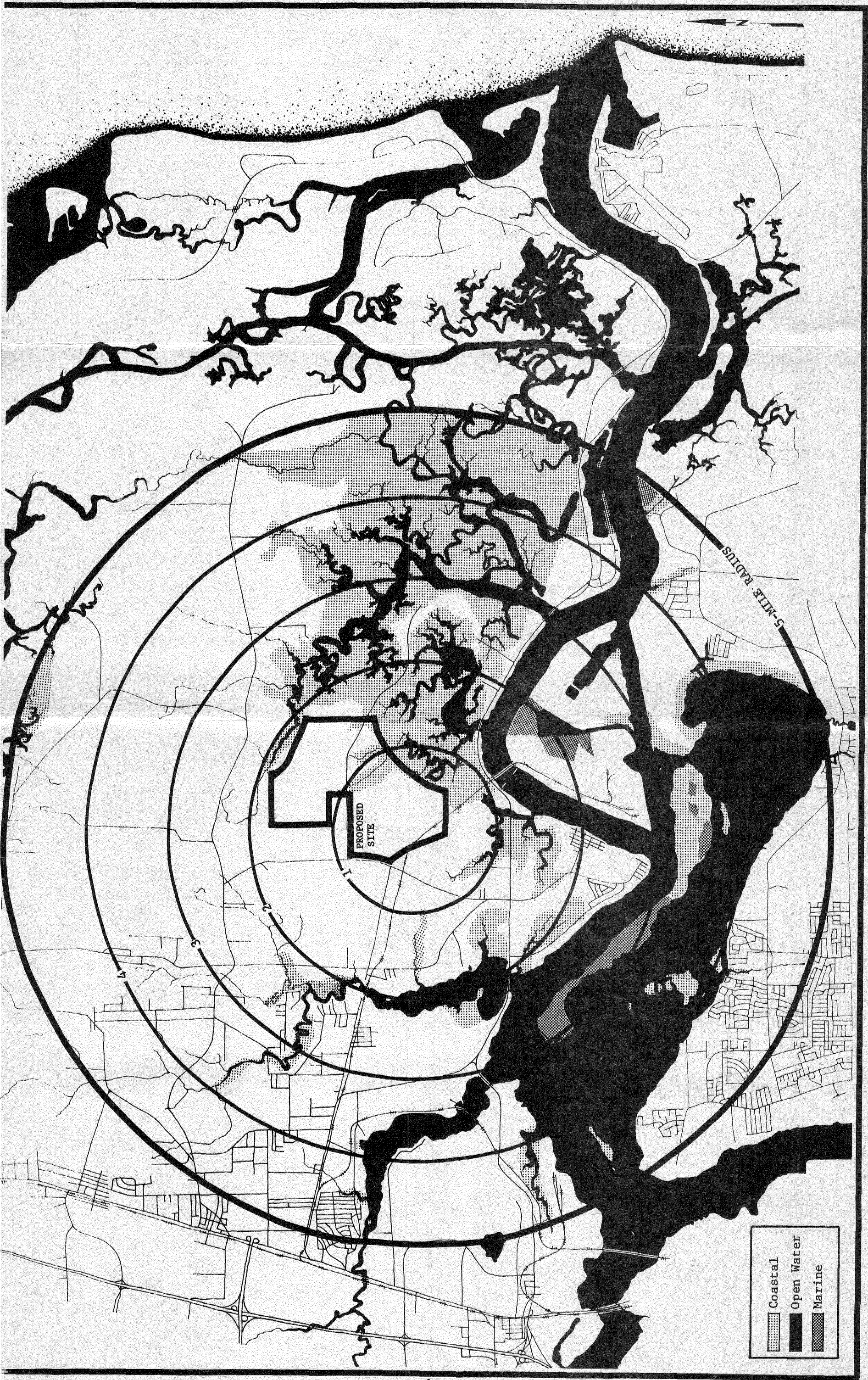


Figure 2.2-3 Land Use within 5-Mile Radius of Proposed Site - Coastal, Open Water, Marine



Figure 2.2-4 Land Use within 5-Mile Radius of Proposed Site - Industry, Institutional, Utility



Figure 2.2-5 Land Use within 5-Mile Radius of Proposed Site - Single Family, Commercial, Multi Family, Recreational

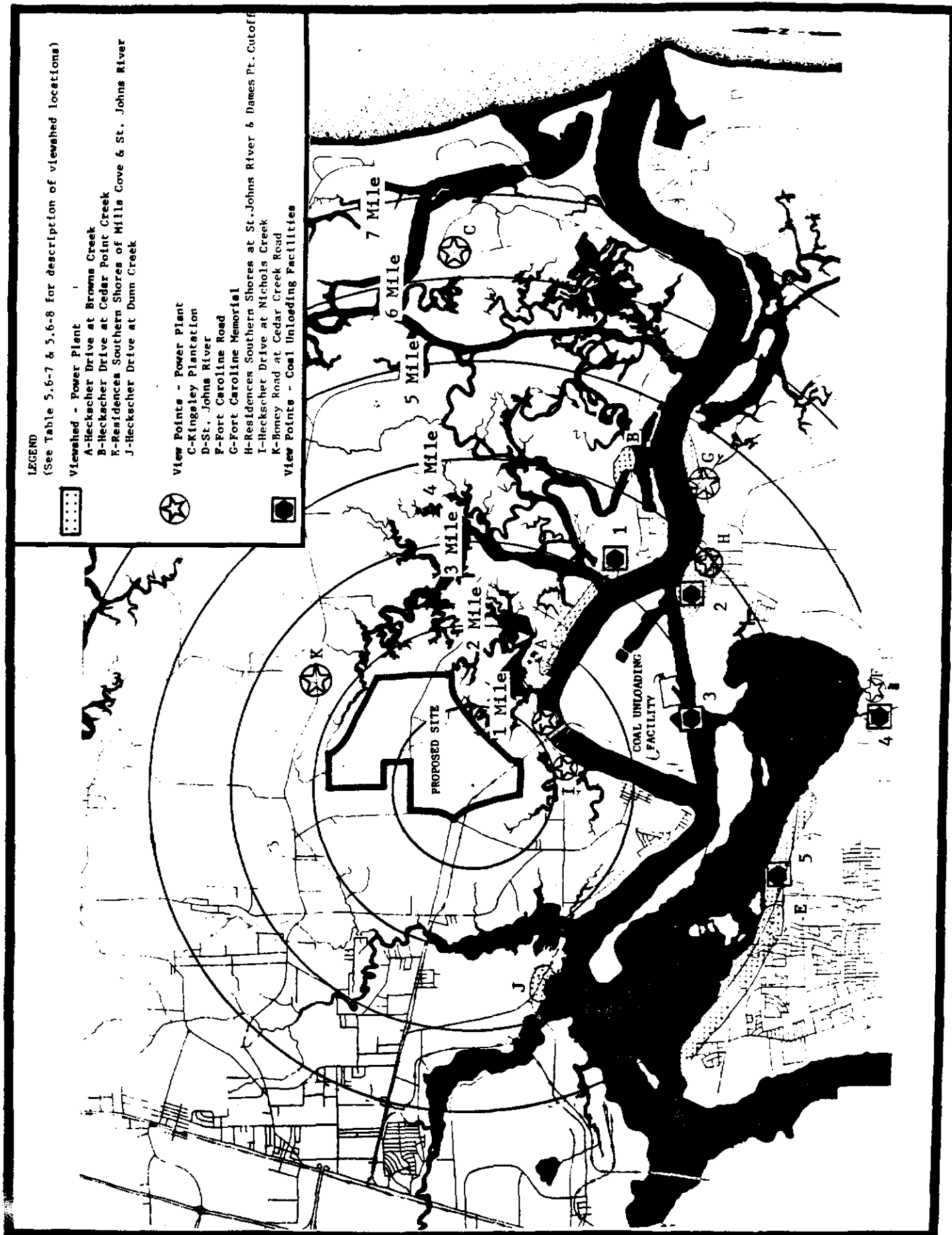


Figure 2.2-6 Viewshed and Point Locations

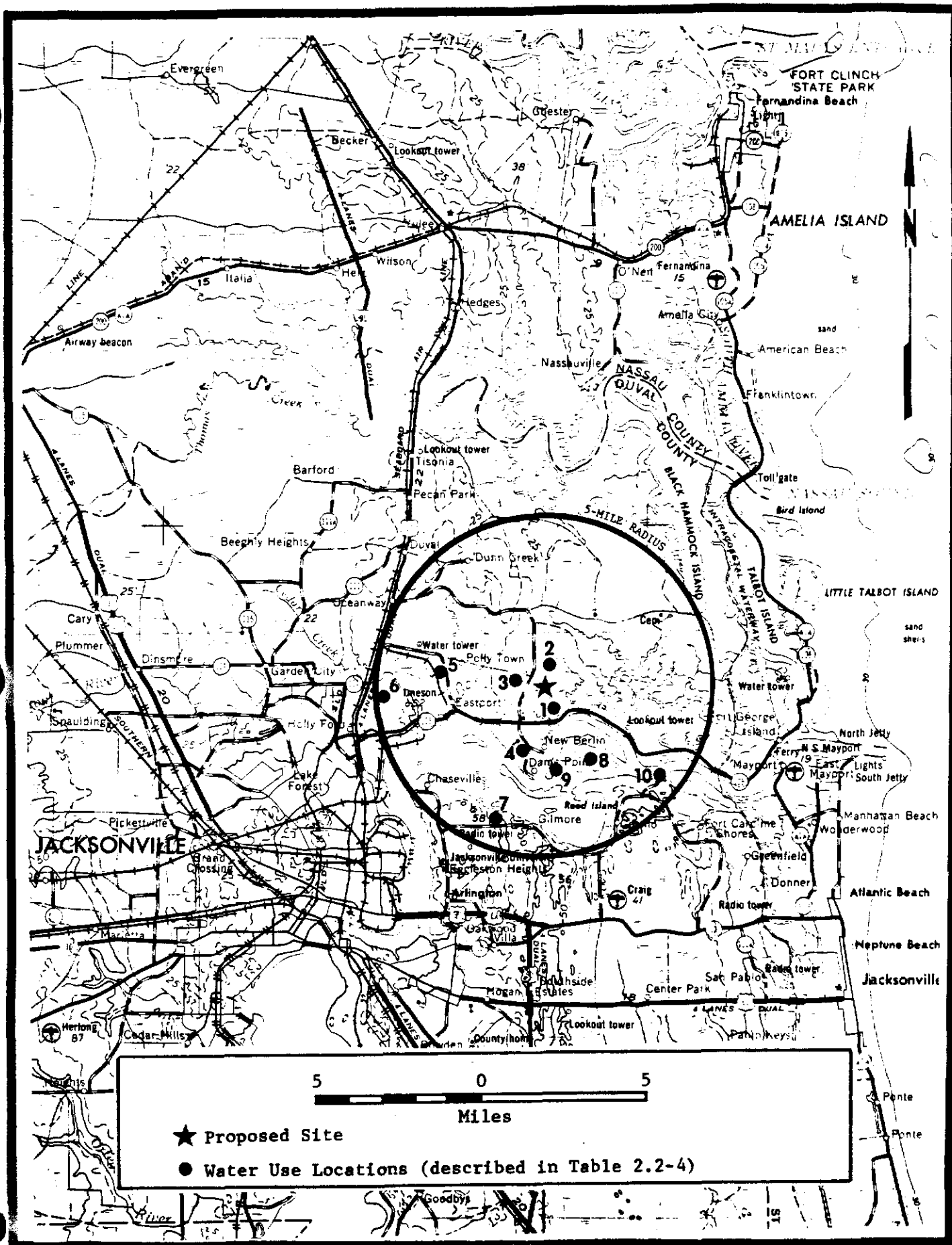


Figure 2.2-7 Major Water Use Within 5-Mile Radius of Proposed Site

2.3 SOCIOECONOMICS

This section summarizes the demography and economy of the seven county study region in northeast Florida. Due to the presence of activities involving construction and operation of the proposed plant, Duval County is considered as the primary impact area. The six surrounding counties of Baker, Clay, Flagler, Nassau, Putnam and St. Johns are considered a secondary impact area. Approximately 80-85 percent of the construction and operational work force is expected to come from Jacksonville/Duval County.

2.3.1 Demographic Profile

For the past three decades, Florida has been one of the fastest growing states in the nation. The primary source of this growth has been state-wide in-migration. Although the study region is expected to experience growth in population, the rate of change is not expected to be quite as rapid as that of the state (Northeast Florida Regional Planning Council, 1979).

A summary discussion of population, employment and income is presented in the following sections. Additional and supporting details and references are provided in Appendix H, Section H.1.

2.3.1.1 Population Description

As shown in Table 2.3-1, the seven counties which make up the study region had a total population of approximately 781,000 in 1978, an increase of about 18 percent from 1970. Regional population is expected to increase to approximately 1,175,000 residents by the year 2000. In 1978, the counties within the region varied in size from Duval County's population of about 584,000 to Flagler County's population of approximately 8,400. Although Duval County is by far the most densely populated county in the

region, Clay County experienced the most rapid growth between 1968 and 1978, attaining an annual growth rate of about 12 percent. During the same period, Duval County experienced an average annual growth rate of only approximately 1 percent (Northeast Florida Regional Planning Council, 1979).

The estimated total population within a 5-mile radius of the proposed site is 20,800. The estimated current population density within a 5-mile radius of the site is shown in Figure 2.3-1. The most densely populated areas within five miles of the proposed site are south of the St. Johns River. The majority of the area within the 5-mile radius is relatively sparsely populated and lies north of the St. Johns River, allowing the river (Figure 2.3-1) to serve as a buffer between the proposed plant and the more densely populated areas.

2.3.1.2 Employment and Income Statistics

As a whole, Florida has a relatively narrow economic base. The state is generally weak in manufacturing, but strong in tourism, trade and services, and construction. The agricultural sector is strong in certain regions of Florida, but is of limited importance to the study region. The construction sector has contributed a great deal of income to the state of Florida, but employment in this sector has fluctuated widely from year to year (Northeast Florida Regional Planning Council, 1979).

Employment

The study region had a total employment level of approximately 221,000 in 1970. By 1978, total employment had reached a level of about 273,000. For 1970 and 1978 (Tables 2.3-2 and 2.3-3), Duval County had the highest concentration of employment in the region. In 1970, employment in Duval County accounted for about 88 percent of total regional employment. By 1978, the level had increased in total numbers, but the county's overall share of regional employment declined to about 83 percent. During this period, every county in the region (excluding Duval) increased its

share of total regional employment by a small percentage with Clay County's share increasing the most. St. Johns and Putnam Counties had the second and third highest levels of employment in the region by 1978. Flagler County had the highest rate of change during the 1970-1978 period, but due to the relatively small employment base in this county, its share of total regional employment in 1978 was only 0.6 percent (Northeast Florida Regional Planning Council, 1979).

The size of the civilian labor force in the study region in 1970 varied from a high of 220,000 in Duval County to a low of about 1,500 in Flagler County. By 1978, the civilian labor force of Duval County had increased to an estimated 232,630. Although the civilian labor force of Flagler County more than doubled by 1978, it was still the lowest in the seven county region. Table 2.3-4 presents the current estimate and projected civilian labor force of the study region for the years 1970-2005 (Northeast Florida Regional Planning Council, 1979).

The national unemployment rate increased from 4.9 percent in 1973 to 8.5 percent in 1975 and dropped to 5.8 percent in 1979 (U.S. Department of Labor, 1980). With the exception of 1973, the unemployment rate for the state of Florida was consistently higher than the national rate during this period. However, the study region had unemployment rates below national levels for the same period (Florida Department of Commerce, 1980). Data presented in Table 2.3-5 indicate the unemployment rate of the study region is tied quite closely to the unemployment rate of Jacksonville/Duval County.

Sector Analysis

The overall economic base of the study region was evaluated based on an analysis of the employment levels within the major industrial and commercial sectors. The sector analysis entailed comparing employment levels of specific employment sectors within the study region to state and

national employment levels for those same employment sectors. In this way, a determination was made as to the importance of a specific employment sector within the overall economy of the study region.

The sectors which comprise the employment base of the study region are as follows: agriculture; construction; manufacturing; transportation, communications, and public utilities; wholesale and retail trade; finance, insurance and real estate; service; and government. Each of these sectors is briefly characterized below.

Agriculture

Agricultural employment does not constitute a large percentage of the study region's total employment. This sector's share of total regional employment only increased from 0.3 percent in 1970 to 1 percent in 1978. This increase was due primarily to fisheries and forestry. Employment in production agriculture (crops and livestock) has declined steadily from 1970 to 1978.

Construction

Construction's share of total employment declined within the study region, state and nation during the period 1970 to 1978, although a growth in total numbers was displayed during this period. In 1970, 6.7 percent of the regional employment was construction. This sector's share of regional employment declined to 5.5 percent by 1978.

Manufacturing

Although Florida is generally weak in manufacturing when compared to national levels, manufacturing is one of the more dominant employment sectors within the study region. This sector comprised 14.8 percent of

total regional employment in 1970 and 12.7 percent in 1978. Manufacturing in the study region is concentrated in four industries: food and kindred products, fabricated metal, paper and allied products, and printing and publishing.

Transportation, Communication, and Public Utilities

Transportation, communication and public utilities (TCPU) employment trends for the period 1970 to 1978 reflect those shown by the construction sector. The TCPU sector's share of total regional employment declined from 7.1 to 6.4 percent over the period 1970 to 1978.

Wholesale and Retail Trade

The wholesale and retail trade sector is the most dominant employment sector in the region. It comprised 27.1 percent of total regional employment in 1970. A slight decrease of 1 percent occurred over the period of 1970 to 1978, although this sector's share was still above the national level.

Finance, Insurance, and Real Estate

Finance, insurance, and real estate (FIRE) accounted for 9.9 percent of the total regional employment in 1978. This share is above the national level of 5.2 percent, which is indicative of the importance of the FIRE sector to the regional economy.

Services

The services sector accounted for 17.5 percent of the regional employment in 1978. This share reflects a 1.5 percent increase from 1970. The national service sector employment exhibited a very similar pattern over the same period.

Government

Regional government accounted for 20.9 percent of the total regional employment in 1978. This reflects a modest increase of 2.0 percent from 1970 to 1978.

Basic/Non-Basic Sector Analysis

The purpose of this analysis is to identify the basic and non-basic employment sectors within the regional economy, along with the multiplier effects which occur as a result of an increase in basic employment.

For purposes of this analysis, basic industries are defined as those industries having the potential for generating revenue from sources outside the study region as well as within the study region. That is, the particular employment sector is capable of producing more goods or providing more services than can be consumed within the study region. Therefore, the excess goods and/or services are marketed outside the study region. Non-basic industries are defined as those industries producing goods and/or services for local (within the study region) consumption only. There are also certain employment sectors, such as government (local, state and federal), which are not traditionally classified as basic. However, these employment sectors (i.e., government) often exhibit exogenous revenue generating properties (state and/or federal grants and assistance programs) and are therefore classified as basic employment.

Basic and non-basic employment levels were determined through the use of location quotients. A location quotient is the ratio of an industry's share of total local (study region) employment to the industry's share of total national employment. If the location quotient for an industry is greater than one, the industry is classified as basic. If the location quotient for an industry is less than one, the industry is classified as

non-basic. Table 2.3-6 illustrates the levels of basic and non-basic employment within the study region for 1978. These employment levels represent very broad employment divisions. In 1978, the region had a total employment base of approximately 273,000. Of this total, about 187,800 were engaged in basic employment and 85,700 were involved in non-basic employment.

For more refined analysis the multiplier effect involved in the study region is 1.879 based upon a detailed sector analysis (U.S. Army Corps of Engineers, 1980). This means for every one, new, basic job in the region, there will be approximately 1.879 additional non-basic (indirect and income induced) jobs generated, over a period of time, in support of that basic job.

Examination of the data presented in Table 2.3-6 reveals a basic employment sector quite different than might be expected. As mentioned earlier, Florida and the study region have a relatively narrow economic base when compared to national levels. In general, the state is weak in manufacturing, but strong in tourism and related services, trade, construction, and general service functions such as finance, insurance and real estate. Although the study region is represented by a diverse array of manufacturing firms, this employment sector does not exhibit as strong an influence in the overall economic base of the Jacksonville area as it does in many other cities of similar size. Employment in the study region is dominated by wholesale and retail trade and tourism and service oriented positions.

Income

The study region had a total personal income level of approximately \$1.9 billion in 1970 (Table 2.3-7). By 1978, total personal income had reached an estimated \$3.7 billion, as presented in Table 2.3-8. Duval County accounted for approximately 87 percent of regional personal income in 1970 and 86 percent in 1978. Government, wholesale and retail trade,

and services were the primary contributing sectors, accounting for about 67 percent and 61 percent of personal income in Duval County in 1970 and 1978, respectively. It is projected that the study region will have a total personal income level of approximately \$5.1 billion by 1985 (Northeast Florida Regional Planning Council, 1979).

Duval County also had the highest per capita income in the study region. County per capita income for 1970 was \$2,853 and increased to \$6,560 by 1978. Although per capita income increased in every county in the region from 1970 to 1978, each county was still below the national average by 1978 (see Appendix H).

2.3.2 Public Services, Housing and Infrastructure Profile

This section provides a summary discussion of the public service, housing and infrastructure profile within Jacksonville/Duval County. Chapter 7 and Appendix H, Section H.1 provide additional and supporting details and references.

2.3.2.1 Public Service

Results of the Ebasco/Envirosphere Construction Worker Model indicated that any major population increases caused by the proposed plant would be in Jacksonville/Duval County. Therefore, only the current (1980) public services and capabilities of specific public services provided by Jacksonville/Duval County are presented. Table 2.3-9 illustrates the service functions examined, the governmental jurisdiction of each service function and the desired service standard for each.

The general administrative service function for the City of Jacksonville needs an additional 122 employees to meet the demand for these services, based on U.S. Department of Commerce standards (U.S. Department of Commerce, 1978). The police and fire protection components of the public safety service function currently (1980) have adequate capacity to

meet public demand and are currently operating within the standards for a city the size of Jacksonville. All three components, sewage, water, and sanitation, of the public works service function for the City of Jacksonville are operating with excess capacity. The public health service function of Jacksonville/Duval County is deficient in number of personnel. Recreation, primarily city and community parks, is as with most metropolitan areas deficient. The library service function of Jacksonville/Duval County is currently operating at a deficit in terms of total book holdings. Other items such as audio visual aids, etc., are adequate to meet current demand. The public school system of Jacksonville/Duval County is currently able to accommodate an extra 4,400 pupils. Duval County also has approximately 60 private and parochial schools throughout the county. Five colleges and/or universities and four trade or technical schools are located within the Jacksonville area.

2.3.2.2 Private Services and Facilities

The current (1980) status of two non-public services, hospitals and housing, in Jacksonville/Duval County, was evaluated. At present (1980), both the hospitals facilities and number of housing units are capable of meeting resident demand. Hospitals in Jacksonville are currently operating at approximately 73 percent capacity (Health Systems Agency of Northeast Florida, 1980). Based on estimates by the Jacksonville Area Planning Board (1978), there are approximately 11,000 housing units currently vacant in Jacksonville.

2.3.2.3 Transportation Facilities

Transportation systems of importance to the study region are highways, airports and ship facilities. Major highways include Interstates 10 and 95, and U.S. Highways 1, 17, 23 and 90. Major airports include Jacksonville International Airport, Craig Airport, Herlong Airport, and the

Mayport Naval Air Field. Major port facilities include Blount Island and the Talleyrand Docks and Terminals. Locations of these facilities are identified on Figure 2.3-2.

Roads expected to provide access to the proposed site are Heckscher Drive, New Berlin Road, Eastport Road, and Main Street (Figure 2.3-3). Since current highway department traffic counts for these roads are not available, traffic counts were made during the pre-operational monitoring program. Manual turning movement counts were also performed at the intersections of Main Street - Heckscher Drive, Heckscher Drive - Eastport Road, and Eastport Road - Main Street. From this information, average daily traffic and peak hour traffic were calculated for those points and compared to the existing capacity.

Figure 2.3-3 indicates the locations at which the traffic counts were taken. These counts varied from several hours to several days in order to validate the turning movement counts and also to give a good estimate of the average daily traffic on these facilities. Table 2.3-10 shows an hourly tabulation of the average daily traffic for the four streets surveyed. Four hour manual counts were made at the intersections to determine the turning movements during the peak hours. Results of these counts are presented in Appendix H, Figures H-3, H-4, H-5 and H-6.

Traffic counts indicate that, under existing conditions, all signalized locations and roadways are operating at level of service C with additional capacity available. Level of service C is defined as stable traffic flow where most drivers are restricted in selecting their speed, but where all stopped traffic will clear a signalized intersection. The intersection of the I-95 spur to Heckscher Road and its intersection with Heckscher Drive going toward Main Street is, however, presently creating some congestion during peak periods.

2.3.3 References

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Table 2.3-1

REGIONAL POPULATION ESTIMATES AND PROJECTIONS, 1970-2020

County	1970	1978	1980	1985	1990	1995	2000	2010	2020
Baker	9,242	13,045	14,200	16,800	19,100	21,100	23,200	27,700	32,200
Clay	32,059	54,339	61,100	76,600	87,000	96,200	105,300	127,400	149,500
Duval	528,865	584,252	630,600	680,000	726,000	772,600	817,000	897,500	978,400
Flagler	4,454	8,405	9,600	12,400	14,000	15,500	17,000	20,700	24,400
Nassau	20,626	31,686	35,000	42,700	48,500	53,700	58,800	69,500	81,000
Putnam	36,424	45,045	47,700	53,700	60,900	67,400	73,800	86,850	99,900
St. Johns	31,035	44,550	48,700	58,100	65,900	72,900	79,800	95,350	110,900
Total	662,705	781,322	846,900	940,300	1,021,400	1,099,400	1,174,900	1,325,000	1,476,300

Source: Northeast Florida Regional Planning Council, 1979; Ebasco/Envirosphere Company

Table 2.3-2

REGIONAL EMPLOYMENT BY PLACE OF EMPLOYMENT, 1970

Sector	County							Total
	Baker	Clay	Duval	Flagler	Nassau	Putnam	St. Johns	
Agriculture	49	14	592	I	54	33	I	742 (.003)
Mining	-	-	-	-	-	-	-	-
Construction	I	153	13,219	16	683	282	378	14,731 (.067)
Manufacturing	138	625	25,036	124	2,273	3,231	1,148	32,575 (.148)
TCPU	37	I	15,008	I	78	309	267	15,699 (.071)
W/R Trade	337	830	54,369	108	997	1,625	1,710	59,976 (.271)
FIRE	I	172	19,402	22	68	198	232	20,094 (.091)
Services	28	672	31,575	149	308	679	1,980	35,391 (.160)
Government	1,120	1,360	34,200	200	1,440	1,700	1,700	41,720 (.189)
Total	1,709 (.008)	3,826 (.017)	193,401 (.875)	619 (.003)	5,901 (.027)	8,057 (.036)	7,415 (.034)	220,928 (1.000)

Notes: 1. Numbers in parenthesis represent proportions of the total and may not total 1.000 due to rounding.

2. Definitions - TCPU is for Transportation, Communication and Public Utilities

- W/R Trade is for Wholesale and Retail Trade

- FIRE is for Finance, Insurance and Real Estate

- "I" signifies no data available

Source: Northeast Florida Regional Planning Council, 1979

Table 2.3-3
REGIONAL EMPLOYMENT BY PLACE OF EMPLOYMENT, 1978

Sector	County						Total
	Baker	Clay	Duval	Flagler	Nassau	Putnam	
Agriculture	182	I	1,890	I	194	273	288 (.010)
Mining	-	-	-	-	-	-	-
Construction	34	610	12,607	96	224	969	515 (.055)
Manufacturing	174	696	26,260	164	2,505	3,234	1,893 (.127)
TCPU	50	534	16,087	90	123	277	205 (.064)
W/R Trade	330	3,226	60,541	271	1,310	2,310	3,262 (.261)
FIRE	56	524	25,222	131	319	321	445 (.099)
Services	70	1,985	40,374	502	515	1,178	3,272 (.175)
Government	1,780	2,676	44,136	464	2,321	2,978	2,743 (.209)
Total	2,676 (.010)	10,251 (.037)	227,117 (.831)	1,718 (.006)	7,511 (.028)	11,540 (.042)	12,623 (.046)
							273,436 (1.000)

Notes: 1. Numbers in parenthesis represent proportions of the total and may not total 1.000 due to rounding.

2. Definitions - TCPU is for Transportation, Communication and Public Utilities
 - W/R Trade is for Wholesale and Retail Trade
 - FIRE is for Finance, Insurance and Real Estate
 - "I" signifies no data available

Source: Northeast Florida Regional Planning Council, 1979

Table 2.3-4
REGIONAL CIVILIAN LABOR FORCE: BY PLACE OF RESIDENCE, 1970-2005

Year	Baker	Clay	Duval	County				St. Johns	Total
				Flagler	Nassau	Putnam			
1970	3,092	9,531	220,070	1,470	7,143	13,091	11,058	265,455	
1978	5,220	21,540	232,630	3,450	12,500	16,590	15,620	307,550	
1980	5,950	25,520	254,060	4,290	14,050	17,260	18,120	339,250	
1985	7,590	34,030	275,910	6,020	17,640	19,930	22,450	383,570	
1990	9,050	39,700	296,250	7,010	20,550	23,130	26,390	422,080	
1995	10,300	44,750	316,880	7,910	22,770	25,955	29,310	457,875	
2000	11,630	49,740	336,530	8,840	25,150	28,820	32,490	493,200	
2005	12,660	53,850	356,753	9,580	27,090	31,210	35,120	526,263	

Source: Northeast Florida Regional Planning Council, 1979.

Table 2.3-5
REGIONAL, STATE AND NATIONAL UNEMPLOYMENT TRENDS, 1973-1979

<u>Area</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>
National	4.9	5.6	8.5	7.7	7.0	6.0	5.8
Florida	4.3	6.2	10.7	9.0	8.2	6.6	6.0
Region - 7 Counties	4.8	5.1	6.7	6.3	6.8	6.1	5.7
Baker	3.0	3.9	6.3	5.7	5.4	5.1	3.7
Clay	3.7	3.6	5.1	4.4	4.2	4.7	4.3
Duval	4.9	5.0	6.6	6.4	6.9	6.1	5.6
Flagler	2.0	5.9	8.8	9.1	7.9	5.8	5.5
Nassau	3.9	3.6	5.9	5.4	6.0	5.6	5.3
Putnam	3.3	6.2	8.1	6.7	8.4	7.1	7.6
St. Johns	6.9	8.1	9.6	7.0	8.8	7.7	7.4

Source: U.S. Department of Labor, 1980

Table 2.3-6
BASIC AND NON-BASIC EMPLOYMENT IN THE STUDY REGION^a, 1978

<u>Employment Division</u>	<u>Basic Employment</u>	<u>Non-Basic Employment</u>
Agriculture	-	2827
Mining	-	-
Construction	15,055	-
Manufacturing		34,926
TCPU	17,366	-
W/R Trade	71,250	-
FIRE	27,017	-
Services	-	47,896
Government	<u>57,098</u>	<u> </u>
Total	187,787	85,649

^a Baker, Clay, Duval, Flagler, Nassau, Putnam and St. Johns Counties

- Notes: 1. The identification of basic/non-basic employment was done with the use of location quotients.
2. Definitions - TCPU is for Transportation, Communication and Public Utilities
 - W/R Trade is for Wholesale and Retail Trade
 - FIRE is for Finance, Insurance and Real Estate

Source: Northeast Florida Regional Planning Council, 1979.

Table 2.3-7
TOTAL PERSONAL INCOME (\$000) EARNED BY INDUSTRY IN THE STUDY REGION, 1970-1985
CURRENT 5

Year	Industry						Agriculture	Government	Total
	Manufacturing	Construction	W/R Trade	FIRE	TCPU	Services			
1970	264,480 (.141)	16,647 ^b (.009)	398,773 (.213)	170,485 ^a (.091)	174,940 (.093)	276,219 (.147)	21,750 (.012)	553,433 (.295)	1,876,727 (1.000)
1978	451,500 (.122)	291,200 (.078)	711,100 (.192)	349,200 (.094)	331,700 (.089)	602,700 (.162)	54,600 (.015)	920,300 (.248)	3,712,300 (1.000)
1980	493,400 (.120)	325,100 (.079)	781,300 (.190)	388,300 (.094)	366,200 (.089)	674,400 (.164)	60,800 (.015)	1,032,500 (.250)	4,122,000 (1.000)
1985	598,000 (.116)	409,600 (.080)	952,900 (.185)	486,300 (.095)	452,300 (.088)	853,600 (.166)	76,400 (.015)	1,313,300 (.255)	5,142,400 (1.000)

^a signifies no data were disclosed for this sector in Duval County for this year.

^b signifies no data were disclosed for this sector in Clay County for this year

Notes: 1. Numbers in parenthesis represent proportions of the total and may not equal totals exactly due to rounding.

2. Definitions - TCPU is for Transportation, Communication and Public Utilities

- W/R Trade is for Wholesale and Retail Trade

- FIRE is for Finance, Insurance and Real Estate

Source: Northeast Florida Regional Planning Council, 1979

Table 2.3-8

TOTAL PERSONAL INCOME IN THE STUDY REGION, 1970-1978

CURRENT \$

County	Total Personal Income 1970 (\$000)	% Total	Total Personal Income 1978 (\$000)	% Total	% Change 1970-1978
Baker	\$ 11,410	.61	\$ 35,300	.95	+209
Clay	40,022	2.31	92,300	2.49	+130
Duval	1,626,849	86.69	3,199,300	86.18	+ 97
Flagler	7,685	.41	20,100	.54	+162
Nassau	56,615	3.02	108,600	2.93	+ 92
Putnam	71,035	3.79	122,900	3.31	+ 73
St. Johns	63,111	3.36	133,800	3.60	+112

Source: Northeast Florida Regional Planning Council, 1979

Table 2.3-9
SERVICE STANDARDS UTILIZED TO DETERMINE THE IMMIGRANT
INDUCED DEMAND FOR PUBLIC SERVICES

<u>Service Function</u>	<u>Jurisdiction</u>	<u>Standard Utilized</u>	<u>Source</u>
<u>General Administration</u>			
Financial Administration	City/County	.0005 Full Time Employees/Person	U.S. Dept. of Commerce, 1978
General Control	City/County	.0013 Full Time Employees/Person	U.S. Dept. of Commerce, 1979
<u>Public Safety</u>			
Police	City/County	.0021 Full Time Employees/Person	U.S. Dept. of Commerce, 1978
Fire	City/County	1 Engine - 2 Mile Service Radius 1 Ladder - 4 Mile Service Radius 500-1500 gpm Pumping Capacity	Insurance Service Office, 1974 American Insurance Association, 1975
<u>Public Works</u>			
Sewage	City/County	Resident Demand - 80.44 Gallons/Person/Day Includes Residential, Commercial and Industrial Usage	Jacksonville/Duval County Dept. of Public Works, 1979
		Immigrant Demand - 1975-1984; 23.91 Gallons/Person/Day 1985-1999; 24.96 Gallons/Person/Day 2000+; 26.02 Gallons/Person/Day Includes Residential Usage Only	Water Resources Council, 1978
<u>Water</u>			
	City/County	Resident Demand - 90.62 Gallons/Person/Day Includes Residential, Commercial and Industrial Usage	Jacksonville/Duval County Dept. of Public Works, 1979
		Immigrant Demand - 1975-1984; 33.63 Gallons/Person/Day 1985-1999; 35.11 Gallons/Person/Day 2000+; 36.59 Gallons/Person/Day Includes Residential Usage Only	U.S. Water Resources Council, 1978

Table 2.3-9 (Continued)
SERVICE STANDARDS UTILIZED TO DETERMINE THE IMMIGRANT
INDUCED DEMAND FOR PUBLIC SERVICES

<u>Service Function</u>	<u>Jurisdiction</u>	<u>Standard Utilized</u>	<u>Source</u>
<u>Sanitation</u>	City/County	Resident Demand - 1.37 Pounds/Person/Day	Jacksonville/Duval County Dept. of Public Works, 1979
		Immigrant Demand - 2.44 Pounds/Person/Day	U.S. Environmental Protection Agency, 1980
<u>Health and Welfare</u>			
<u>Public Health</u>	City/County	.0012 Health Personnel/Person	U.S. Dept. of Commerce, 1978
<u>Recreation/Library</u>			
<u>Parks</u>	City/County	2.5 Acre/1,000 Population	Jacksonville Area Planning Board, 1979
<u>Library</u>	City/County	2.5 Books/Person 1 Film/1,000 Population 1 Record/50 Population 1 Periodical/250 Population under 250,000 and 1 Periodical/500 Population over 250,000	Florida Library Association, 1974
<u>Education</u>			
Elementary (Grades K-6)	City/County	22.4:1 Student/Teacher Ratio	Jacksonville/Duval County
Middle (Grades 7-9)	City/County	24.1:1 Student/Teacher Ratio	School Board, 1980
High (Grades 10-12)	City/County	18.4:1 Student/Teacher Ratio	

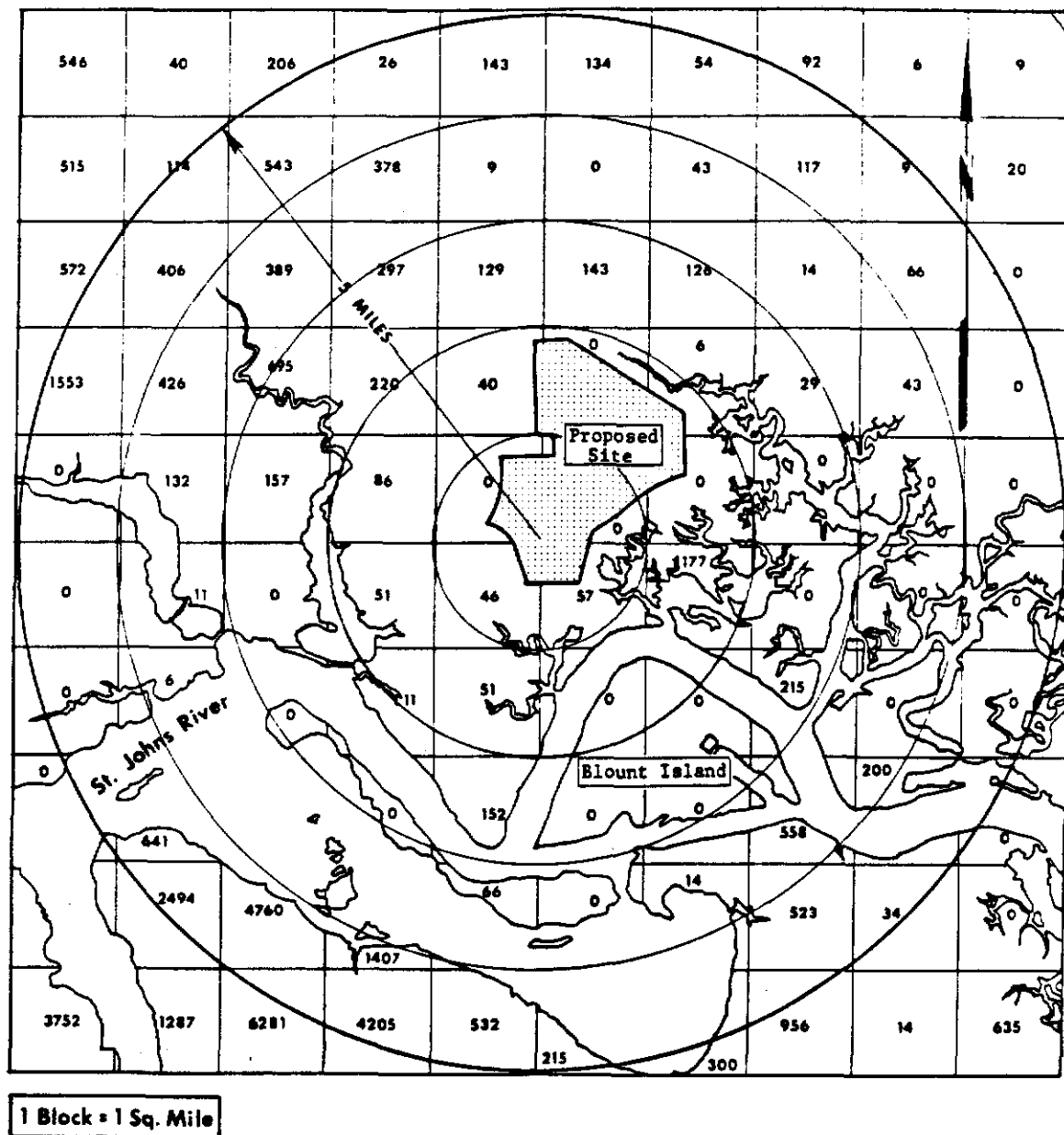
Note: Resident demand reflects current local conditions. Immigrant demand reflects national averages and projections.

Table 2.3-10

1980 AVERAGE DAILY TRAFFIC, BY HOUR, ON ROADS PROVIDING
ACCESS TO THE PROPOSED SITE

	<u>Heckscher Drive</u>	<u>New Berlin Road</u>	<u>Eastport Road</u>	<u>Main Street</u>
6-7 a.m.	602	61	615	1,041
7-8	825	119	567	1,386
8-9	544	63	405	839
9-10	591	85	403	813
10-11	665	127	369	856
11-12	642	112	412	827
12-1 p.m.	633	91	394	909
1-2	626	100	416	950
2-3	791	102	495	1,059
3-4	741	120	528	1,261
4-5	810	159	565	1,292
5-6	708	130	515	1,228
6-7	451	89	400	868
7-8	271	69	282	696
8-9	267	51	266	542
9-10	243	47	216	519
10-11	278	38	228	244
11-12	168	15	136	318
12-1 a.m.	120	16	115	234
1-2	60	4	63	99
2-3	44	7	36	98
3-4	55	6	41	59
4-5	46	10	47	81
5-6	<u>84</u>	<u>15</u>	<u>77</u>	<u>227</u>
TOTAL (ADT)	10,265	1,636	7,591	16,446

Source: Harland Bartholomew and Associates, 1980



NOTE: 5-Mile radius centered on proposed plant stack location

SOURCE: Aerial Photography 1980
Jacksonville Area Planning Board, 1978

Figure 2.3-1 Estimated Population Density Within 5 Miles of the Proposed Site

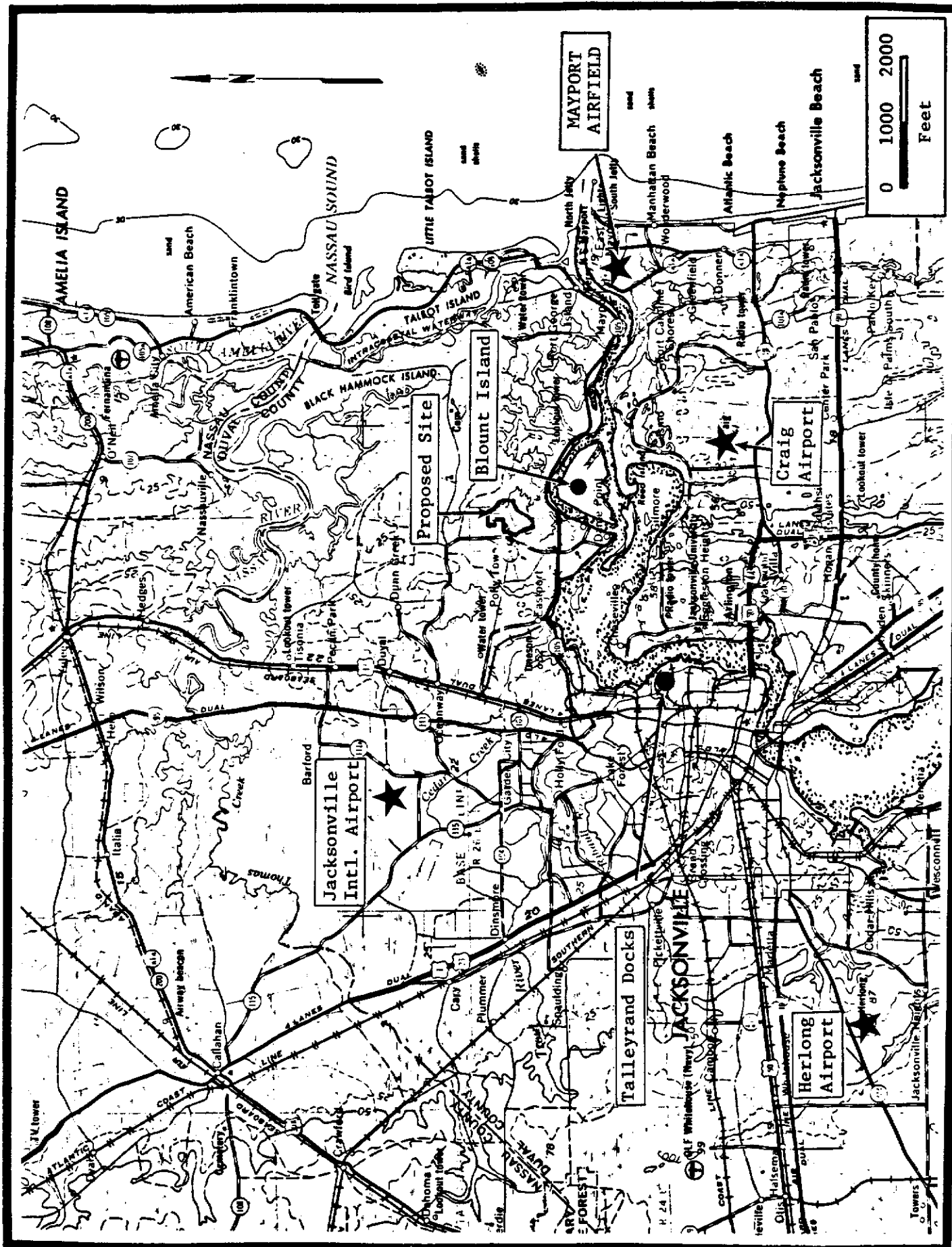


Figure 2.3-2 Major Transportation Facilities in the Jacksonville Area

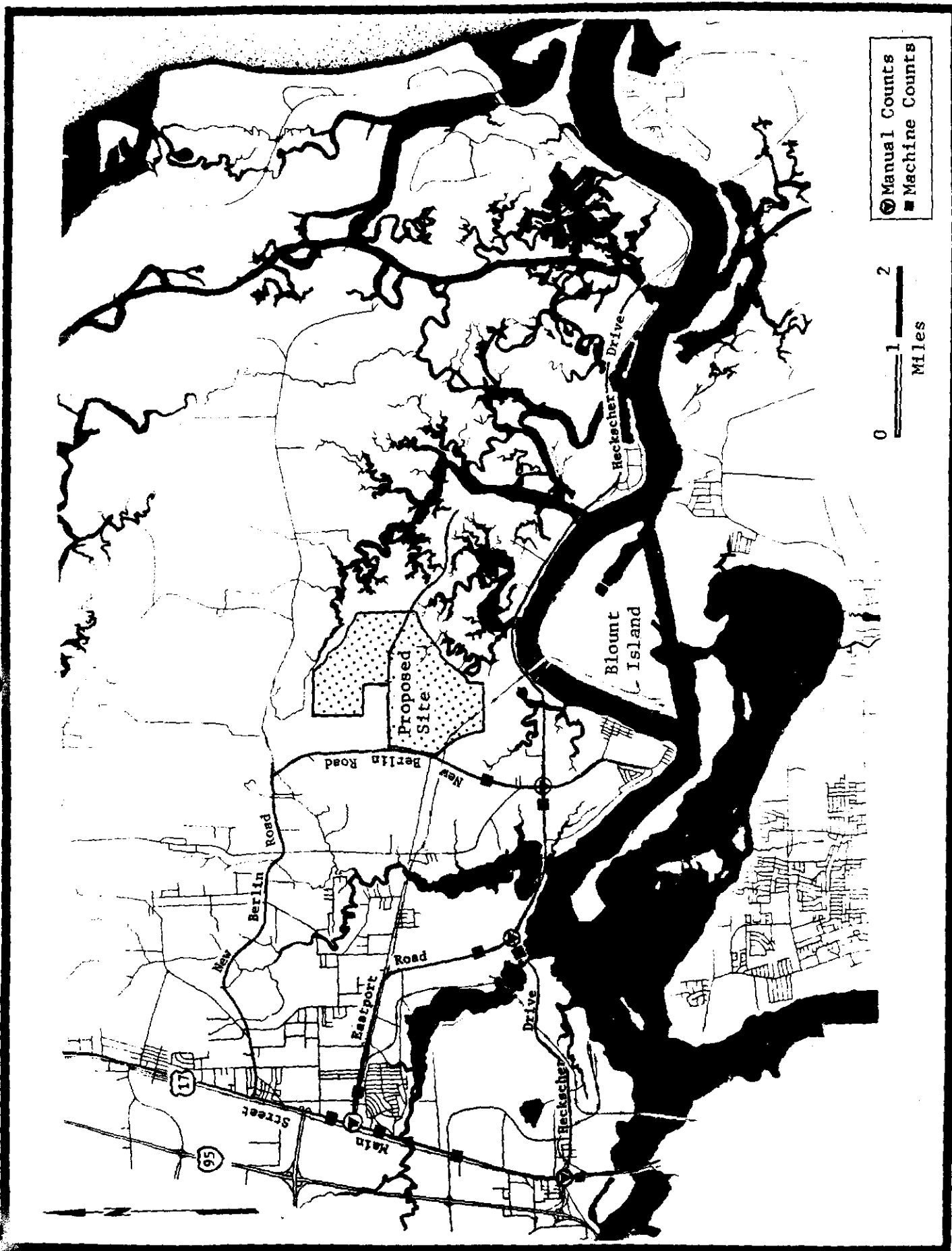


Figure 2.3-3

Primary Access Routes to the Proposed Site and Traffic Count Survey Locations

2.4 GEOLOGY AND SOILS

2.4.1 Physiography

Florida can be divided into three major transpeninsular physiographic zones: the Northern or Proximal Zone, the Central or Mid-Peninsular Zone, and the Southern or Distal Zone (Appendix E, Figure E-1). The proposed site is located within the Northern or Proximal Zone, an area typified by continuous high ground.

Major physiographic divisions within the St. Johns River watershed are shown in Figure 2.4-1. The proposed site lies within this region, in a transitional zone between the northern end of the Eastern Valley and the southern edge of the St. Mary's meander plain. The St. Johns River, which occupies the entire length of the valley, flows eastward along the southern boundary of the site area toward the Atlantic Ocean. The St. Johns River, where it passes the proposed site, is a broad estuary subject to tidal fluctuations.

The topography of the area is controlled by a series of marine terraces which have been modified by fluvial processes. The extent of the marine terrace deposits in the site vicinity is illustrated in Figure 2.4-2. The proposed site ranges in elevation from 5 to 28 feet above mean sea level (MSL). The northwestern part of the property, lying at elevations generally greater than 10 feet above MSL, is underlain by the Pamlico Marine Terrace. Those portions of the property lying at elevations less than about 10 feet MSL are underlain by the Silver Bluff Marine Terrace (Figure 2.4-2). Most of the area below the 10-foot contour along the southeastern edge of the site property is wetlands bordering the St. Johns River. Another large wet area occurs in the northwestern corner of the site. An elliptical hill, rising to a height of 28 feet above MSL, occurs adjacent to the river in the southeastern part of the site. This may be a remnant of an ancient beach ridge or sand dune.

Additional discussion of regional and site physiography may be found in Appendix E.

2.4.2 Regional Geology

Peninsular Florida is part of the Eastern Gulf Coast sedimentary basin. The dominant structural feature of Florida is the Peninsular Arch which is underlain by Paleozoic sandstones and shales in northern peninsular Florida and igneous, metamorphic and metavolcanic rocks to the south (Applin, 1951). Figure 2.4-3 is a generalized regional geological map of northeast Florida.

A sedimentary province of primarily non-clastic deposition persisted from the end of the Mesozoic Era through the Tertiary. The resultant sedimentary sequence of limestones, dolomites and evaporites ranges in depth from 8,000 feet in northern Florida to 18,000 feet in the south Florida Basin.

The present day land surface is covered with unconsolidated sediments of Pliocene to Recent age. Much of the region's geomorphology is influenced by Pleistocene to Recent marine terraces. A more complete discussion of the regional geologic framework may be found in Appendix E, Geology and Appendix D, Groundwater.

2.4.2.1 Stratigraphy

This study focuses on the Eocene and younger material as they comprise all of the rocks which are encountered at the surface and are penetrated by water wells within the site region. The pre-Eocene stratigraphy is summarized in Appendix E. A summary of Cenozoic stratigraphy is presented in Table 2.4-1.

The shallow marine carbonate deposition, which began in the Cretaceous, continued throughout the Cenozoic Era. Occasional periods of restricted circulation caused precipitation of anhydrite, especially during the Paleocene. Periods of uplift (resulting in regression) caused mud deposition in near-shore environments. Uplift during middle Miocene time caused an influx of terrigenous sediment throughout Florida. Deltaic and lagoonal units were deposited along a southward prograding shoreline. Marine transgression and carbonate deposition resumed in late Miocene time, followed by renewed uplift and erosion in the Pliocene (Rainwater, 1970).

The following discussion of Eocene and younger stratigraphy refers specifically to the area around the site in Duval County.

Eocene

The oldest Eocene formation is the Oldsmar Limestone, a fragmental marine, dolomitic limestone. It underlies all of Duval County and is penetrated by a few water wells in the area. It is overlain by the Lake City Limestone.

The Lake City Limestone of early middle Eocene age is lithologically similar to the Oldsmar Limestone. It consists of alternating beds of limestone and porous dolomite. The Lake City varies in thickness from 425 to greater than 500 feet and lies approximately 800-1000 feet below the surface at Jacksonville (Leve, 1966).

The Lake City Limestone is unconformably overlain by the Avon Park Limestone of late middle Eocene age. The Avon Park Limestone is a predominately cream-colored, chalky, porous limestone interbedded with hard, impermeable dolomitic limestone and dolomite. It ranges in thickness from 50 to 260 feet (Fairchild, 1972) and lies 600 to 800 feet below sea level in northeastern Florida (Chen, 1965).

The Ocala Group of late Eocene age has been subdivided into three formations: the Inglis, Williston and Crystal River (Table 2.4-1). The three formations have similar lithologies and will be treated as a single unit in this report. The Ocala Group is exposed at the surface in the western part of northern Florida. In Duval County, the Ocala Group lies 350 to 600 feet below the surface (Figure 2.4-4). The Ocala Group is characterized by interbedded tan to brown, hard crystalline limestone, dolomitic limestone and soft, white to cream colored, chalky coquina limestone. The upper surface is highly irregular, and sinks, cavities and solution pipes are common in some parts of the Ocala Group. At the proposed site, the top of the Ocala Group is approximately 450 feet below MSL.

Oligocene

Deposits of Oligocene age are absent in the site region although they are present as a relatively thin unit in the western Florida panhandle and in the southern one-half of the peninsula (Applin and Applin, 1944).

Miocene

The Hawthorn Formation, of middle Miocene age, unconformably overlies the Ocala Group. In Duval County, the formation ranges in thickness from 250 to 500 feet with irregular upper and lower surfaces. It lies at depths ranging from 50 to 200 feet below the surface (Fairchild, 1972). At the proposed site, the top of the Hawthorn lies about 90 feet below the surface.

The Hawthorn Formation is characterized by phosphate-bearing dark gray and green sandy to silty clay, clayey sand, clay and sandy limestone. Puri and Vernon (1964) consider the Hawthorn Formation to be a deltaic deposit.

2.4.2.2 Structure

The Peninsular Arch and Ocala Uplift are dominant regional features trending south-southeast from southeastern Georgia into central Florida. Movements associated with the Ocala Uplift led to regional fracturing and the formation of normal dip-slip shear faults such as those shown in Figure 2.4-5. These faults are of interest because they apparently control, in part, the course of the St. Johns River (Pirkle, 1971).

A pair of faults at and next to the proposed site are postulated by Leve (1966 and 1978) to explain large vertical (50 to 200 feet) variations in the surface of the Ocala Limestone of Eocene Age. The vertical anomalies are inferred from geological and geophysical logs of area water wells. The fault traces trend in a general north-south direction, one crossing the site, the other several miles to the west. These two postulated faults are blanketed by about 250 to 600 feet of post Eocene deposits and do not extend to the surface (Figure 2.4-6).

No evidence of faulting was found in the subsurface boring program. In fact, the elevation of the top of the Hawthorn Formation of Miocene age did not vary more than 20 feet vertically in any of the bore holes at the proposed site.

2.4.3 Regional Seismic History

The proposed site is in one of the most seismically stable areas in the United States (see seismic risk map in Figure 2.4-7). All of the earthquakes that have occurred in Florida and Georgia have had a Modified Mercalli (MM) intensity of VI or less and have caused very minor damage. (The Modified Mercalli damage scale is presented as Appendix E, Table E-3.) The closest earthquake to the site was an MM V event near Jacksonville, October 31, 1900 (Appendix E, Figure E-11). An earthquake such as this would be felt at the site. However, damage would be minor and confined to old, unrepaired, poorly built structures. Recent earthquakes

include an intensity MM III to IV near Daytona Beach, on December 4, 1975, and an MM V event near Orlando on October 27, 1973 (Appendix E, Figure E-11). The former had an extremely localized "felt" area and the latter would have had an intensity of MM I at the site area as illustrated in Appendix E, Figure E-12. The strongest earthquake noted to date in Florida occurred near Gainesville in 1879 with MM VI intensity. The "felt" area of this earthquake included Tallahassee; Savannah, Georgia; and Daytona Beach. However, the only damage reported was plaster falls in a few older houses in St. Augustine.

The strongest earthquakes to affect the site region were the 1886 Charleston, South Carolina series of MM intensity IX-X, and the 1811-1812 New Madrid, Missouri series of magnitude XII which are 200 and 650 miles from the site, respectively. Although they each had a felt area of 2 million square miles, the effect of their projected shock waves on the site area was slight. Appendix E, Figure E-13, presents an isoseismal map of the Charleston 1886 earthquake, projects an MM VI shock into the site area. Recent earthquakes in Georgia include an MM VI event northwest of Augusta on August 2, 1974, and an MM V event near Swainsboro, 250 and 150 miles, respectively, from the proposed site.

Another potential source of seismic activity is the Caribbean seismic belt. The strongest earthquakes from this region were located in Cuba, +1000 miles from the site with a maximum intensity of MM VIII, and would not be a threat to the proposed site. 650

In conclusion, the potential for seismic damage at the proposed site is minimal. Within historically recorded times, the Florida peninsula has been a seismically stable area. All of the earthquakes originating within Florida have been minor, and the major earthquakes outside of Florida have been too distant to induce significant ground motions.

2.4.4 Site Geology

As discussed in Chapter 6, Section 6.2.7, a two phase boring investigation of the proposed site was conducted. Boring locations and results as well as a detailed geologic site characterization are presented in Appendix E.

2.4.4.1 Surficial Deposits

The sediments that overlie the Ocala Group in Duval County range in age from Miocene to Holocene. The Hawthorn Formation of Miocene age lies unconformably upon the Ocala Group. Overlying the Hawthorn Formation are unnamed upper Miocene or Pliocene deposits which are in turn overlain by Pleistocene and Holocene deposits (Leve, 1966). In the site area, the thickness of the sediments overlying the Ocala Group is approximately 470 feet.

The Hawthorn Formation consists mainly of light to medium green-gray sandy silty clay and clayey sand which contain a trace to moderate amounts of black phosphate sand and gravel. In most places, the upper surface of the Hawthorn is marked by the presence of phosphate.

The Hawthorn Formation ranges in thickness from about 250 to 500 feet in Duval County (Leve, 1966). Although the formation generally thickens to the northeast, it varies in thickness locally due to irregular upper and lower surfaces (Fairchild, 1972). Although many of the site borings did penetrate the upper surface of the Hawthorn Formation, no borings were deep enough to penetrate its lower surface at the site. A contour map of the depth of the Hawthorn Formation from MSL (Appendix E, Figure E-15B) shows that the upper surface of the Hawthorn is only slightly irregular. In the site area, the Hawthorn generally occurs at depths of about 85 to 95 feet from the ground surface.

In the site area, the Hawthorn Formation is overlain by about 30 to 45 feet of upper Miocene or Pliocene deposits. These deposits occur at depths of 40 to 65 feet below the ground surface and consist from top to bottom of

an upper tan-gray sandy fossiliferous limestone, a partially cemented sand and shell layer, or sand with some shell, a light gray slightly to partially cemented fine sand with traces of silt, and a lower tan-gray fossiliferous limestone, or partially cemented sand and shell. All of the upper Miocene or Pliocene deposits can be distinguished from the Hawthorn Formation by their tan-gray (limestone) or light gray (cemented sand) color, by their lack of phosphate, and by their high blow counts.

Overlying the upper Miocene or Pliocene site deposits are 40 to 65 feet of uncemented sediments of Pleistocene and Holocene age. According to Fairchild (1972), these sediments were deposited during the formation of marine terraces and beach ridges. The Pleistocene and Holocene deposits in the site area (from top to bottom) consist primarily of yellow-tan or tan-gray very fine to fine-grained quartz sand locally containing thin green-gray silty clay seams or pockets and traces of silt. These deposits have been reworked on Blount Island, resulting in a northward prograding sequence of sand, silt and clay. The finer grained sediments, particularly silts, predominate.

2.4.4.2 Bedrock

The rock formations that immediately underlie the surficial deposits are described in Section 2.4.2.1. These formations are Eocene in age and include from oldest to youngest the Oldsmar Limestone, the Lake City Limestone, the Avon Park Limestone, and the Inglis, Williston, and Crystal River Formations of the Ocala Group (Leve, 1966).

2.4.4.3 Subsurface Soils and Rock Conditions

The subsurface soil conditions at the proposed site were investigated to a depth of 150 feet below the ground surface. Lithified rock was encountered at a depth of approximately 500 feet while drilling a deep water well at the site. The condition of the rock was not evaluated since the depth was considered beyond the influence of the proposed plant construction.

From the ground surface to a depth of approximately 15 to 30 feet, the soil is a very loose to loose fine sand. This sequence is poorly defined on Blount Island where lateral gradational changes are more common. From approximately 15 to 55 feet, the soil is generally a medium dense to dense fine to medium sand. A very dense fine sand layer exists from approximately 55 to 90 feet. The sand in this stratum varies from slightly to totally cemented. Some limestone was also logged in this cemented stratum. Weakly cemented calcareous sands and sandy limestones were encountered between 40 and 70 feet in depth on Blount Island. At approximately 90 feet (both inland and on Blount Island) there is a gradual transition into a strata of fine sand, clay and silt. These soils have been identified as the upper portion of the Hawthorn Formation. Engineering and other properties of soils are discussed in Appendix E.

2.4.5 References

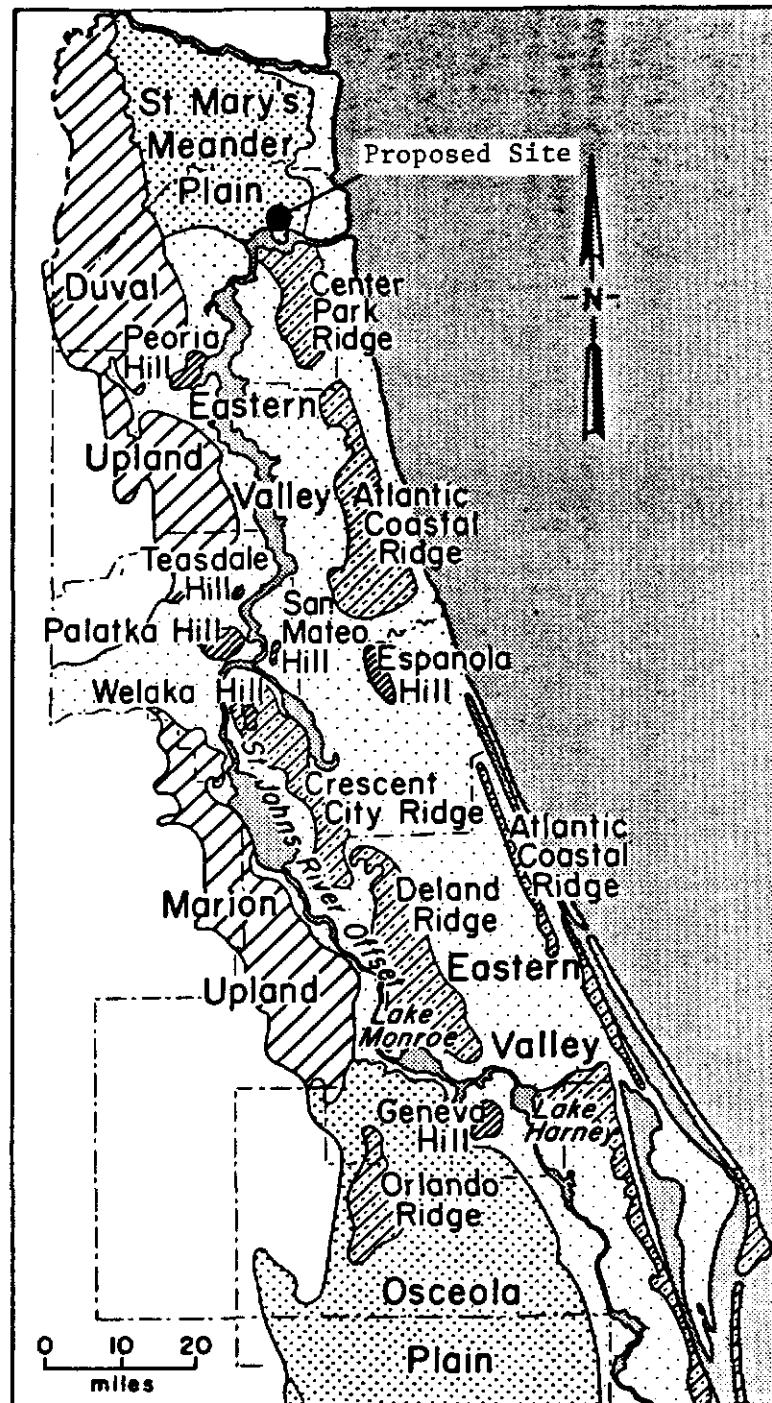
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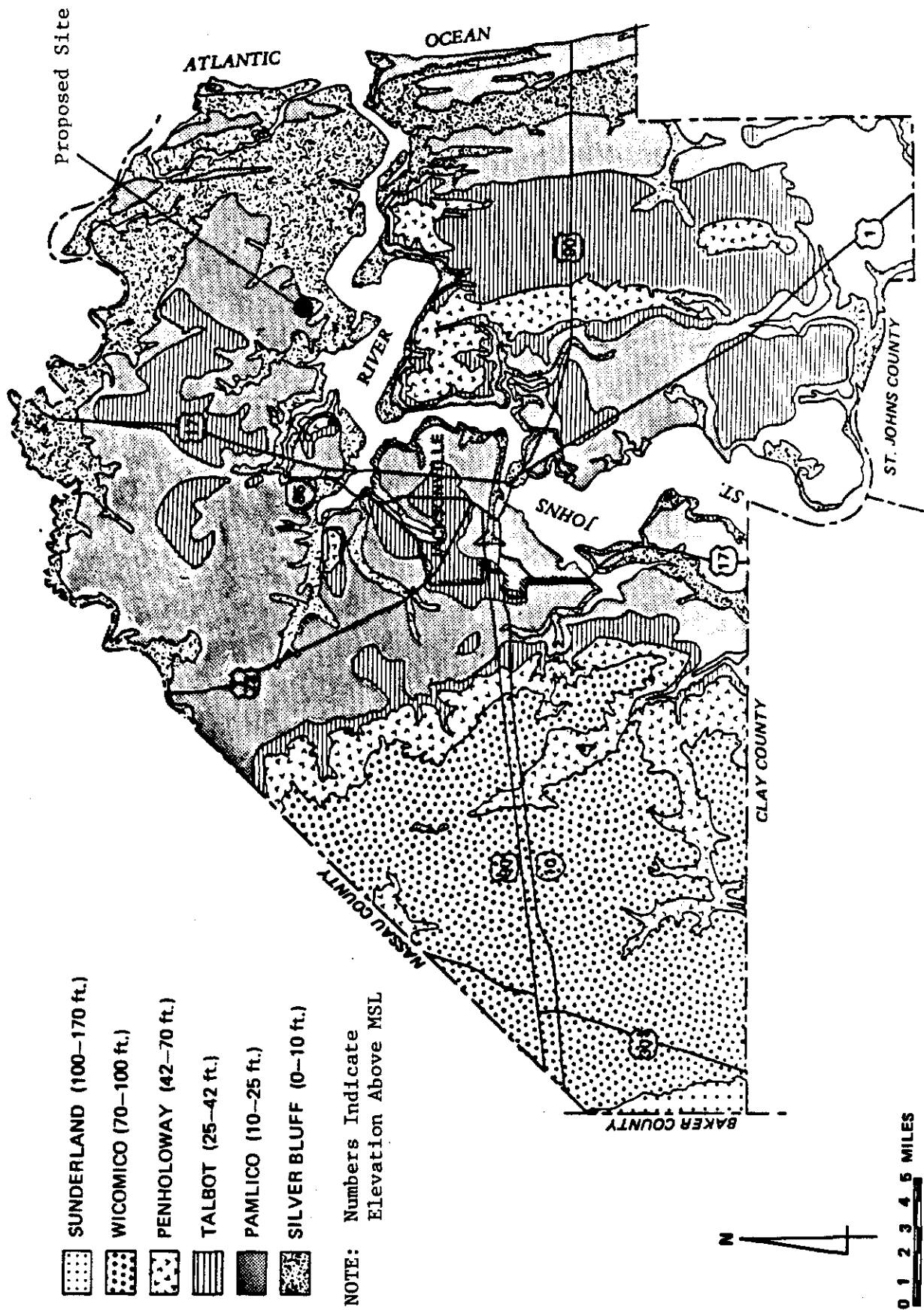
Table 2.4-1
STRATIGRAPHY OF THE CENOZOIC FORMATIONS
OF DUVAL COUNTY

<u>Geologic Age</u>	<u>Stratigraphic Unit</u>	<u>Approximate Thickness (feet)</u>	<u>Lithologic Character</u>	
Recent and Pleistocene	Recent and Pleistocene deposits	0-150	Soil, muck, coarse to fine sand, shell, and some clayey sand	
Pliocene?	Pliocene or Upper Miocene deposits	20-110	Gray-green calcareous, silty clay and clayey sand; contains shell beds and white soft, friable limestone beds	
Miocene	Hawthorn Formation	260-490	Gray to blue-green calcareous phosphatic, sandy clays and clayey sands; contains fine to medium phosphatic sand lenses and limestone and dolomite beds, particularly near the base of the formation	
	Ocala Group	Crystal River River Formation	50-300	White to cream chalk, massive fossiliferous marine limestone
		Williston Formation	20-100	Tan to buff granular, marine limestone
		Inglis Formation	40-100	Tan to buff granular, calcitic, marine limestone; contains thin dolomite lenses and zones of Miliolidae foraminiferal coquina
Eocene	Avon Park Limestone	50-250	Alternating beds of brown to tan hard, massive dolomite, brown finely crystalline dolomite, and granular calcitic limestone	
	Lake City Limestone	425-500+	White to brown, purple-tinted lignitic, granular limestone and gray hard, massive dolomite; contains lignite beds and zones of Valvulinidae foraminiferal coquina	
	Oldsmar Limestone	846	Cream to brown massive to chalky granular limestone and tan to brown massive to finely crystalline dolomite	



after Pirkle, 1971

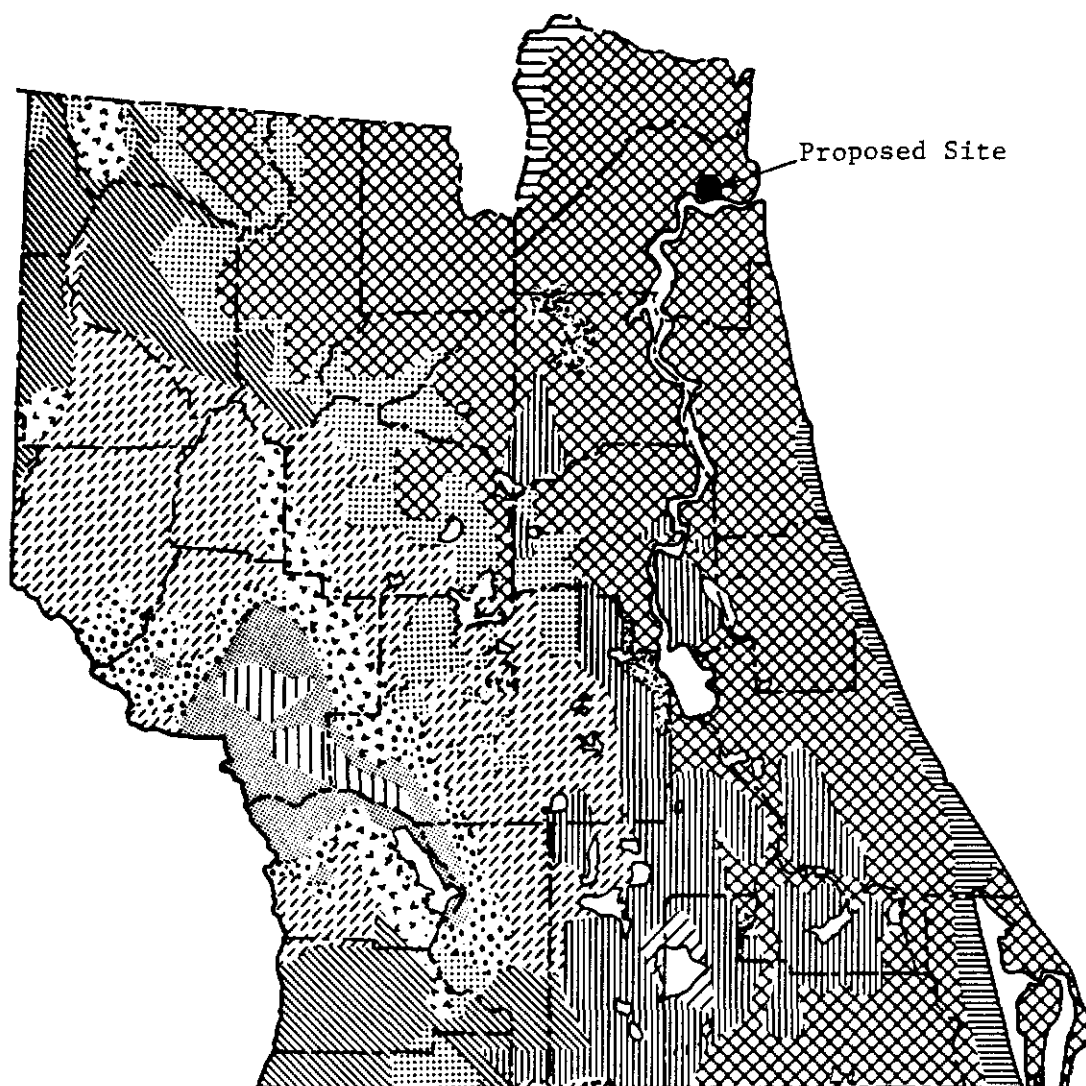
Figure 2.4-1 Major Physiographic Features Within the St. Johns Water Management District



from Leve, 1966

Figure 2.4-2

Pleistocene Marine Terraces



0 10 20 30 40 50 MILES

SERIES	STAGE	FORMATION & MEMBER	
RECENT AND PLEISTOCENE		SEVERAL LOWER MARINE AND ESTUARINE TERRACE DEPOSITS	
		LAKE FLIRT MARL	
PLEISTOCENE		ANASTASIA FORMATION	
		FORT THOMPSON FORMATION	
		"CHARLTON" FORMATION	
MIOCENE	CHOCTA-WHATCHEE	JACKSON BLUFF FORMATION	
		ALACHUA FORMATION	
		FORT PRESTON FORMATION	
		HAWTHORN FORMATION	
		SUWANNEE LIMESTONE	
EOCENE	JACKSON	CRYSTAL RIVER FM.	
		WILLISTON FM.	
		INGLIS FM.	
	CLAIBORNE	AVON PARK LIMESTONE	

after Puri & Vernon, 1964

Figure 2.4-3 Generalized Regional Geologic Map

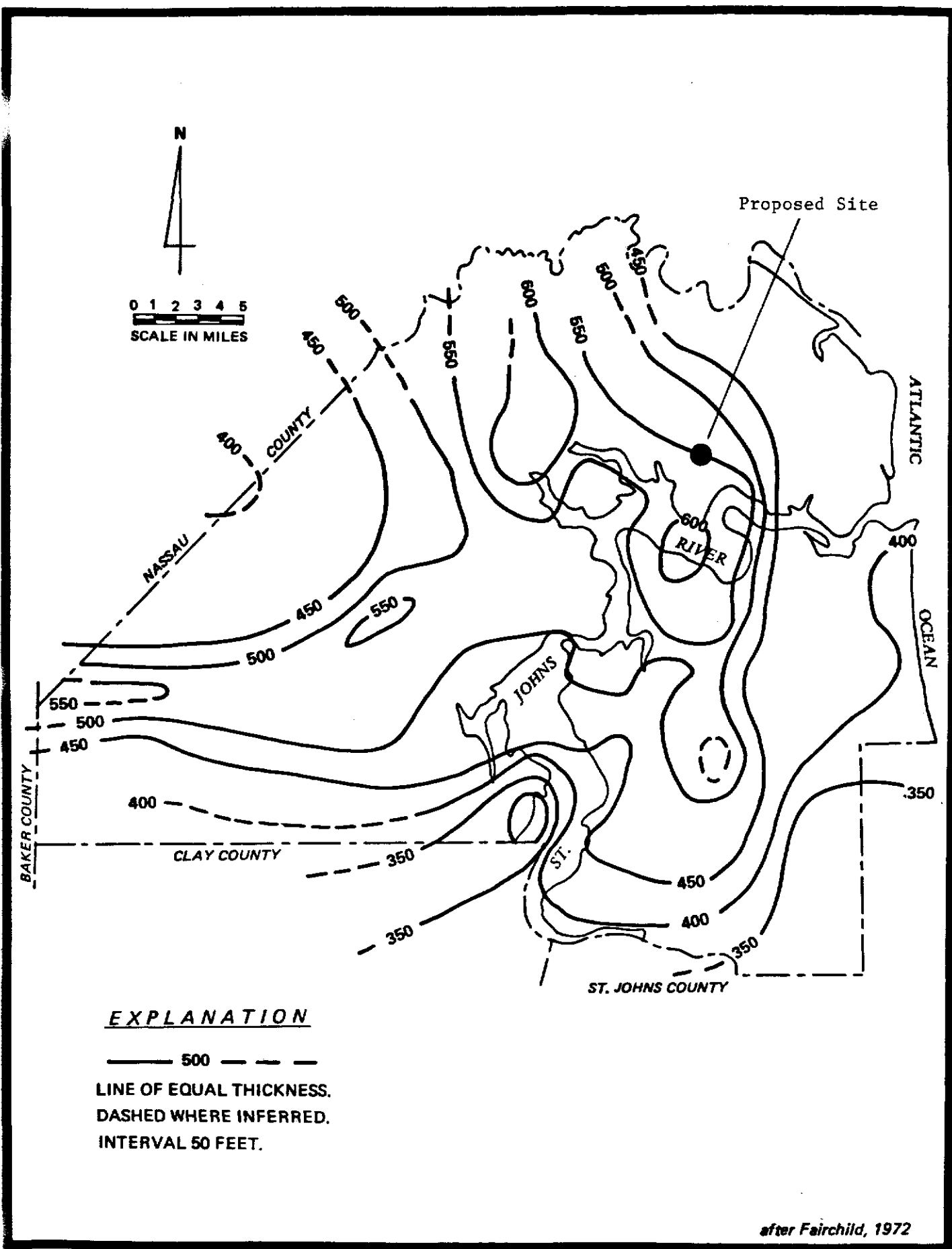
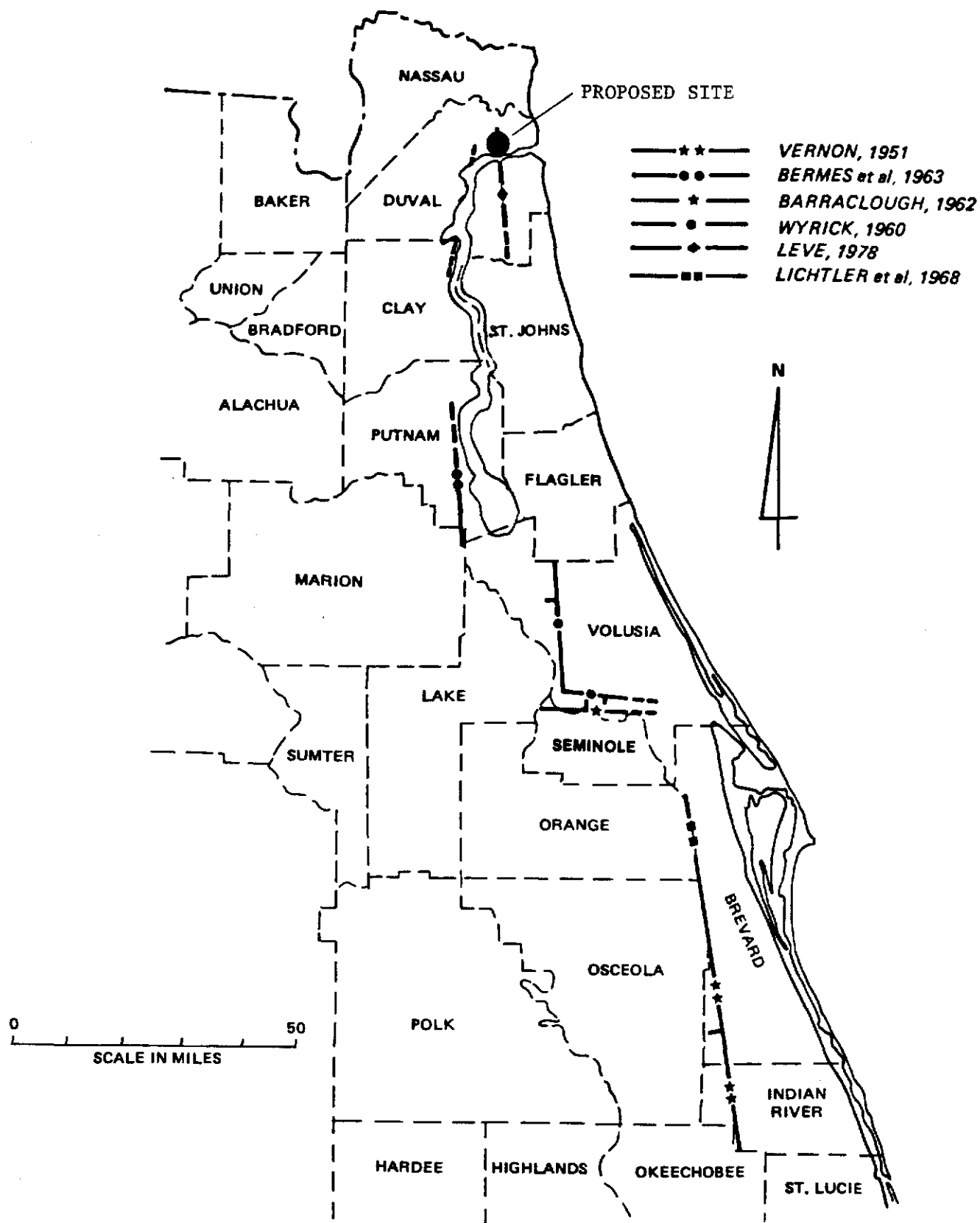
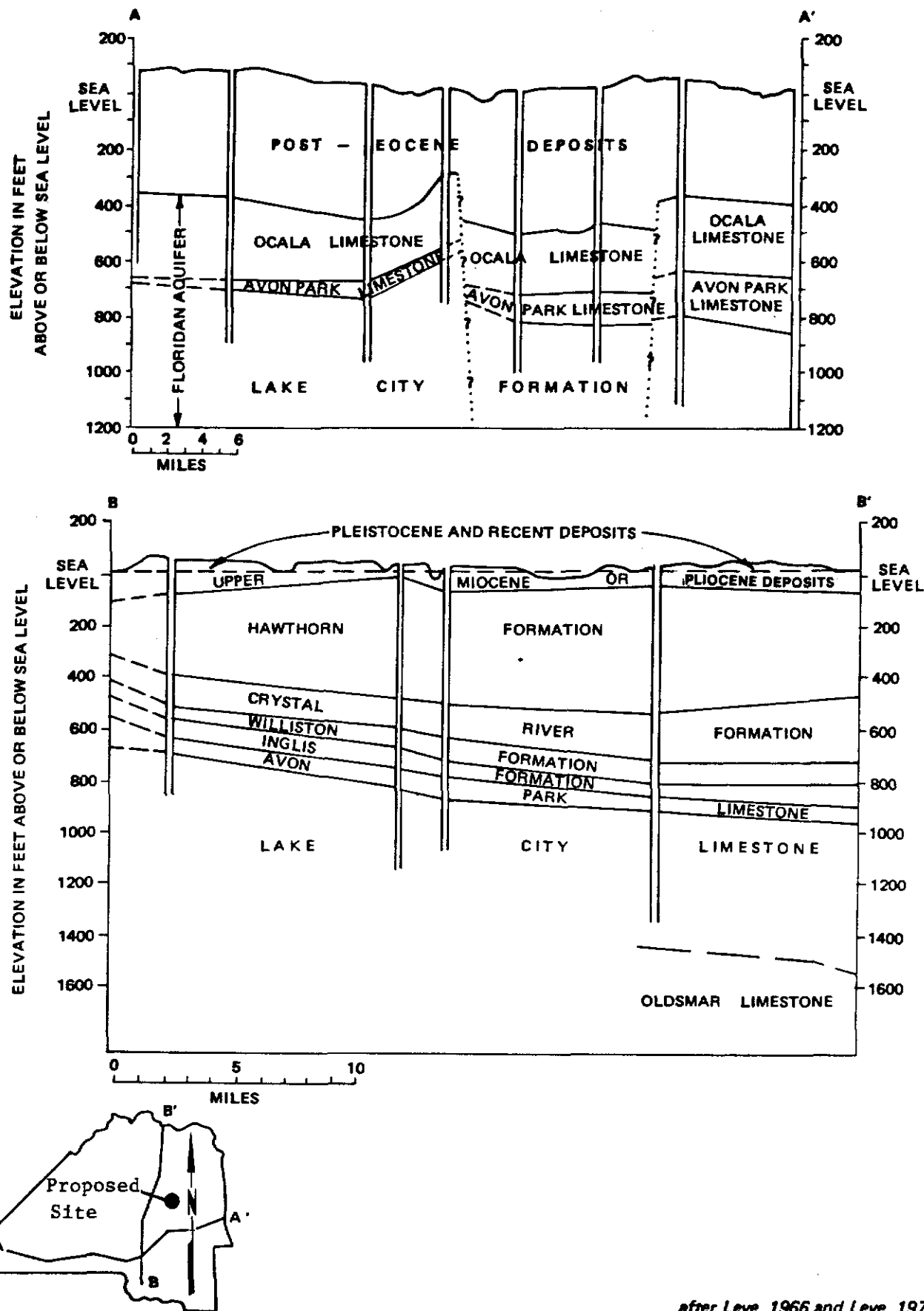


Figure 2.4-4 Map of Duval County Showing the Thickness of the Sediments Overlying the Ocala Group



after Vernon, 1951; Bermes et al, 1963; Barracclough, 1962;
Wyrick, 1960; Lichtler et al, 1968; Leve, 1978

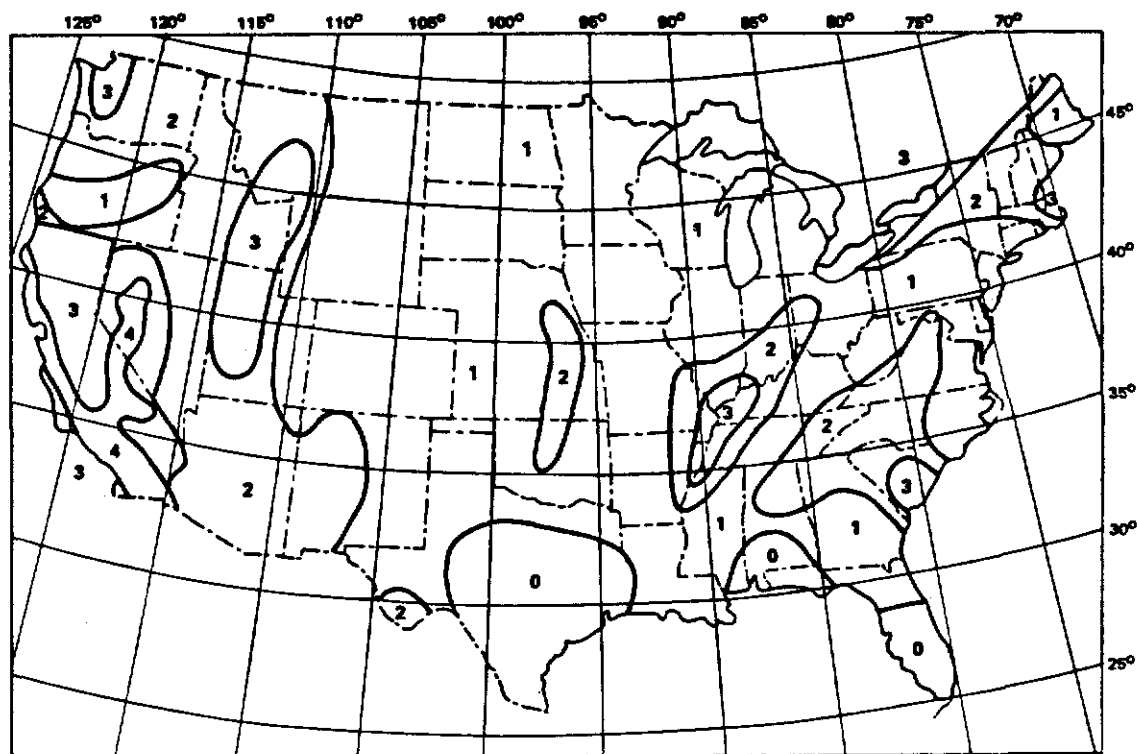
Figure 2.4-5 Faults along the St. Johns River



after Leve, 1966 and Leve, 1978

Figure 2.4-6

Geologic Cross-Sections, Duval County



- ZONE 0 No damage.
- ZONE 1 Minor damage; distant earthquakes may cause damage to structures with fundamental periods greater than 1.0 second; corresponds to intensities V and VI of the M.M. Scale.
- ZONE 2 Moderate damage; corresponds to intensity VII of the M.M. Scale.
- ZONE 3 Major damage; corresponds to intensity VIII and higher of the M.M. Scale.
- ZONE 4 Those areas within Zone No. 3 determined by the proximity to certain major fault systems.

Modified Mercalli Intensity Scale of 1931

after Algermissen, 1969

2.5 HYDROLOGY AND WATER QUALITY

2.5.1 Surface Water

2.5.1.1 General Description

The proposed plant site is located within the estuarine portion of the St. Johns River basin, about 10 miles upstream of the mouth of the River. The surface waters in this vicinity are classified as Class III waters, to be used for recreation and fish and wildlife propagation and management, in Chapter 17-3 of the Florida Administrative Code (FAC). In addition, these waters are considered "predominantly marine", as defined in Section 17-3.021(19), F.A.C, because the specific conductance of the water at the surface is greater than 5,000 micromhos per centimeter. Also, data presented in Appendix C, Section C.5 demonstrate the presence of salt water in that segment of the St. Johns River adjacent to the proposed site, with the concentration of chlorides increasing from 5,114 mg/l at river mile 13.0 to 13,678 mg/l at river mile 4.0. Water quality standards applicable to Class III, predominately marine waters are presented in Table 2.5-1.

The majority of the site is drained by two unnamed creeks which flow southeast into Browns Creek (Figure 2.5-1). The northern portion of the site is adjacent to the headwaters of Clapboard Creek. Most of the western edge of the site ranges from about 2,000 to 4,000 feet from Terrapin Creek, which lies west of the site and drains into Dunn Creek. The southwestern and southern edges of the proposed site are about 1,000 to 2,000 feet from San Carlos Creek. Clapboard Creek, Browns Creek, and San Carlos Creek are all tidally affected and enter the St. Johns River in the old channel (Blount Island Channel) of the River which passes to the north of Blount Island. Dunn Creek is also tidally affected, and enters the main channel of the St. Johns River about two miles west of Blount Island. The Fulton-Dame Point Cutoff, passing to the south of Blount Island, presently contains the main channel of the St. Johns River.

2.5.1.2 Bathymetry and Tidal Stages

In 1980, bathymetric surveys were performed in the Blount Island Channel, in the vicinity of the NGS thermal plume, and in the Fulton-Dame Point Cutoff, in the vicinity of the proposed coal unloading facility. Contour maps indicating elevations below mean sea level are presented in Figures 2.5-2 and 2.5-3 for these areas. Comparison of the 1980 survey with a bathymetric survey performed in 1973 (Appendix C, Section C.9) indicates there was little change in bathymetry in the vicinity of the predicted NGS thermal plume during that seven year time period.

The nearest stage and flow recording station is maintained by the USGS in Jacksonville, approximately 23 miles upstream of the mouth of the River, or about 13 miles upstream of the site area. There are no other published records of stage and/or flow in the site vicinity. The period of record for water levels at this station is from February, 1954, to the present. The maximum gage height over the period of record is 5.21 feet above mean sea level (MSL), and the minimum gage height over the period of record is -1.97 feet (MSL).

Tidal stages were recorded at a location near the mouth of San Carlos Creek near monitoring site SCC (Figure 2.5-4). Analysis of the data collected from November 8, 1979 until November 8, 1980, was performed with respect to mean high water, mean low water, and mean tidal level. These mean levels for the period of record were calculated to be 2.24, -1.28, and 0.00 feet (MSL), respectively. Plots of heights recorded at the proposed site versus time are presented as Figure 2.5-5.

Reasonable predictions for the tidal stage at the proposed site can be made based on the Department of Commerce tide predictions for Mayport, Florida. The time of occurrence of low tide at the site follows that at Mayport by an average of 1 hour 18 minutes, with a range between 52 minutes and 2 hours 13 minutes. Similarly, high tide at the site follows that at Mayport by an average of 45 minutes, with a range between 24 minutes and 1 hour 13 minutes.

2.5.1.3 Currents and Flow

Continuous current speed and direction data were recorded from September, 1979 to October, 1980, at the station locations shown on Figure 2.5-4. Appendix C, Section C.7 contains a sample of the detailed analysis of these data.

Figure 2.5-6 shows the difference in speed during flood and ebb periods for monthly mean and maximum currents. Current speed was greater during the period of flood tide than during the period of ebb tide at stations PKL, PKU and SCC (Figure 2.5-4). On an average, the current speed was about 60 percent greater during flood period than during ebb period. On the other hand, at stations NBL and NBU, the current speed during ebb period was almost equal to or slightly greater than that during flood period. The maximum speed recorded in the River from September, 1979, through September, 1980, was 4.1 ft/sec, occurring at station NBL during March, 1980.

Current profiles were measured in the NGS thermal plume area on October 16 and 17, 1980. These measurements indicate a fairly uniform current velocity across the River on flood tide, with an average of 1.69 ft/sec, a maximum of 1.76 ft/sec, and a minimum of 1.40 ft/sec. The higher velocities were recorded on the western side of the channel and the lower velocities on the eastern side. These compare with in situ recordings of 0.45 ft/sec and 1.18 ft/sec at stations PKU and PKL, respectively, at that time.

During ebb tide, a greater range was observed. The average velocity was 1.31 ft/sec, with a maximum of 1.79 ft/sec and a minimum of 0.43 ft/sec. These compare with in situ recordings of 0.46 ft/sec and 0.65 ft/sec at stations PKU and PKL, respectively, at that time.

Similarly, velocity measurements were taken near shore and in the navigation channel of the Fulton-Dame Point Cutoff. These measurements indicate a flood current of about 1.0 ft/sec (ranging from 0.9 to 1.2 ft/sec) and an ebb current of about 1.5 ft/sec (ranging from 1.0 to 1.75 ft/sec) in the channel. Readings near shore were somewhat lower. These readings were taken primarily in the area of the proposed coal unloading facility.

Calculated flow values, based on the recorded velocities and tidal stages, were 40,000 cfs on the flood and 29,000 cfs on the ebb. The results of the profiling indicate that about 50 percent of the total River flow passes through the Fulton-Dame Point Cutoff during flood, and about 66 percent during ebb, while the remainder passes through the Blount Island Channel.

2.5.1.4 Temperature

Continuous water temperature data were recorded from September, 1979, to October, 1980, at the station locations shown on Figure 2.5-4. Figure 2.5-7 shows the monthly mean water temperature and the range of extremes for each station. Months with a data recovery rate of less than 50 percent are excluded from analysis. There is no significant difference in temperature among the different stations except at station DIS, which recorded temperature at the discharge location of the NGS. On the average, the temperature at the discharge location was 10-15°F higher than other areas. The month with the coldest recorded water temperatures was February, 1980. The average February water temperature in the Blount Island Channel near the NGS was 55°F, while the discharge water temperature ranged from 82°F to 61°F with a mean value of 68°F.

Figure 2.5-8 shows the frequency of occurrence of specific temperature groups, in terms of the ratio of hours of occurrence to the total hours of the corresponding month, in percent. For example, from Figure 2.5-8(a), it

is seen that in October, 1979, at station SCC, temperatures greater than 75°F occurred during 20 percent of the month, or 6.2 days. A sample of the detailed temperature data analysis is presented in Appendix C, Section C.8.

The NGS thermal mixing zone is defined by a National Pollution Discharge Elimination System (NPDES) permit (Appendix C, Section C.3) with respect to the 2°F and 4°F above ambient isotherms, measured at a depth of one meter. Thermal mapping surveys were performed on September 3 and 4, 1980, to document the existing NGS thermal plume. Figure 2.5-9 displays the maximum extent of the plume, during the survey period, for flood tide conditions. The maximum flood tide velocity coincident with this survey was 0.93 ft/sec., as measured at station NB. Similarly, Figure 2.5-10 displays the maximum extent of the plume, during the survey period, for ebb tide conditions. The maximum ebb tide velocity coincident with this survey was 0.68 ft/sec., as measured at station PK. Figure 2.5-11 illustrates a plume of intermediate extent, during start of flood conditions with tidal velocity of 0.19 ft/sec. These three figures portray the isotherms in increments of 1°F above ambient, at a depth of one meter. The areas enclosed by the 2°F isotherm for each of these three surveys, as well as the permitted areas, are shown in Table 2.5-2. Also shown in Table 2.5-2 are the measured and permitted width and length of the 2°F and 4°F isotherms for each survey.

Discussion of the utilization of temperature data for mathematical modelling of the NGS discharge is presented in Section 2.5.1.6.

2.5.1.5 Water Quality

Table 2.5-3 and Tables C-30 through C-32 (in Appendix C, Section C.5) are summaries of results obtained during the pre-application water quality monitoring program conducted on the St. Johns River (November, 1979 - October, 1980). Locations of stations indicated in these tables are shown in Figure 2.5-12.

Table 2.5-3 and Appendix C, Table C-30 show that variations in tide composite concentrations do exist in the river segment studied. Tide composites (average of high and low stage values), at both the surface and the bottom, show this variation, indicating the degree of interaction between fresh and salt water as well as identifying a vertical saline gradient. For example, chloride concentrations at transect G show a 60 percent increase from the mean to the maximum values observed at the surface. An approximate 5 percent gradient is observed in the mean chloride concentration from the surface to the bottom. In terms of generic classification, the data show conditions typical of a partially mixed, as opposed to a highly stratified, estuary.

Appendix C, Table C-30 also shows that a saline gradient is present along the River in the area studied. Downstream stations had an increased percentage of salt water at both the surface and bottom sample locations in comparison to upstream stations. Using 19.8 parts per thousand (ppt) chloride for standard sea water, approximate contents of salt water present at stations F-2, G and H-2 were 58, 64 and 66 percent for mean values, respectively. With station H-2 nearly 3 miles closer to the mouth of the St. Johns River than station F-2, this longitudinal gradient appears reasonable.

Data collected during the pre-application survey were compared to the Florida water quality standards presented in Table 2.5-1. In this comparison, ambient concentrations of aluminum, total residual chlorine, copper, total coliform, cyanide, iron, mercury, oil and grease, and silver were found to exceed the standards for predominantly marine Class III waters. A comparison between observed values for these parameters and water quality standards is presented in Table 2.5-3 for transect G and stations F-2 and H-2. With respect to minimum values, neither pH nor dissolved oxygen had minimum values below the Class III standards. For pH and dissolved oxygen, the minimum values at Transects F, G, and H were 7.0, 7.6, and 7.4, and 4.0, 4.1, and 4.2, respectively. Transect G is located at the NGS point of discharge. Water quality for this transect

approximates the characteristics of the makeup to the proposed plant. Both stations F-2 and H-2 are located beyond the present permitted mixing zone for NGS (NPDES Permit, Appendix C, Section C.3). Thus, these two stations, which are outside of the chemical influence of NGS operation, represent background ambient conditions. Also, these two stations are predicted to remain beyond the influence of the proposed plant impacts (Chapter 5, Section 5.1.3.1).

At transect G, mean values of total residual chlorine, copper, cyanide, iron, mercury, and silver were found to exceed Class III water quality standards. On several occurrences, aluminum, total coliform, and oil and grease concentrations at transect G were found to exceed Class III standards. However, the mean concentrations of these parameters were within standards. Of these same nine parameters, all exceeded standards at station H-2, and all but total residual chlorine and silver exceeded standards at station F-2. Of the total sample population, the number of occurrences where these nine parameters exceeded standards were as follows: 3 of 186 for total residual chlorine; 174 of 175 for copper; 6 of 181 for total coliform; 28 of 76 for cyanide; 171 of 175 for iron; 49 of 136 for mercury; 2 of 136 for silver; 25 of 175 for aluminum; and, 8 of 175 for oil and grease.

A limited amount of historical water quality data is available for the main channel of the St. Johns River immediately upstream and downstream of the proposed site, from river mile 4.0 to river mile 13.3 (see Figure 2.5-13 and Appendix C, Section C.4). These data were collected and tabulated from 1972 through 1979, at eleven different points on the river, by the U.S. Environmental Protection Agency (USEPA), the U.S. Army Corps of Engineers (COE), and two private consulting engineering companies. Although eleven sites were covered in these programs, no consistency in the parameters measured by the different agencies and private firms is evident. Also, no historical trends are observed since the sampling frequency is neither continuous nor periodic.

An analysis of these historical water quality data showed ambient conditions above water quality standards for copper, mercury, lead, iron, cadmium and chromium (COE, 1973; Reynolds, Smith and Hill, Inc., 1974; and USEPA, 1980). Measurements of the ambient levels of copper ranged from twice the standard value of 0.015 mg/l at river mile 10.7 to seven times the standard at river mile 7.1. Mercury levels were high and ranged from fourteen times the standard of 0.1 ug/l at river mile 7.7 to fifty times the standard at river mile 10.8. Lead was measured at twelve times the standard of 0.05 mg/l at river mile 7.1. Measurements of iron concentration ranged from one and a half times the standard of 0.3 mg/l at river mile 10.7 to about twenty times the standard at river mile 7.1. Cadmium was measured at eighteen times the standard of 5 ug/l at river mile 7.1, and chromium exceeded its standard of 0.05 mg/l by a factor of seven at river mile 7.1.

In addition to the historical water quality data available on the main channel of the St. Johns River, data are also available on the Blount Island Channel and several of its tributaries in the vicinity of the proposed site. These data are also tabulated and discussed in Appendix C, Section C.4. In summary, a total of nine parameters were observed in ambient concentrations above their water quality standard. Locations of these sampling sites are shown in Figure 2.5-14.

Other historical water quality data, as reported for USEPA STORET monitoring stations over a longer upstream and downstream reach of the St. Johns River from the NGS, indicate several water quality parameters at levels in excess of the Class III standards. These parameters are the same as for those historical data noted above except that nickel was also found to exceed its water quality standard. The extent of this longer reach is from Plummers Point (STORET Station No. 20030037) upstream of Jacksonville, to Buoy No. 11 (STORET Station No. 20030053) downstream at the mouth of the St. Johns River (river mile 0.0). Copies of the tabulated STORET data for those stations reporting parameters in excess of their standard are included in Appendix C, Section C.4.

2.5.1.6 Northside Station Effects

The Blount Island Channel is presently affected by the once-through cooling system of the NGS, which consists of three units with the following design conditions at full load:

<u>Unit</u>	<u>Flow (gpm)</u>	<u>Temperature Rise (deg.F)</u>	<u>Heat Rejection Rate - 10⁹ Btu/hr</u>
1	140,000	19	1.3
2	140,000	19	1.3
3	280,000	19	2.7
All	560,000	19	5.3

The NGS operates in one of the following five modes with the annual frequency based on plant records from November, 1978, through October, 1979:

<u>Mode</u>	<u>Units Operating</u>	<u>Annual Frequency (%)</u>
1	(1, 2 and 3)	21.4
2	(1 and 3) or (2 and 3)	35.8
3	(1 and 2) or (3)	23.7
4	(1) or (2)	18.8
5	None	0.3

Figure 2.5-15 graphically presents NGS flow rates plotted against frequency of occurrence, associated with the five operating modes. Since the circulating water pumps may be throttled to 70 percent of rated capacity, Figure 2.5-15 presents both design flow rates (maximum) and flow rates with 70 percent pump throttling (minimum).

A site plan of the NGS is shown on Figure 2.5-16, including a profile of the subsurface discharge point. Circulating water enters the intake flume between elevations (-)9.3 and (-)20.0 feet MSL, and is conveyed by

the 25 feet wide and approximately 16 feet deep flume to the intake basin. The circulating water pumps for each unit take suction from this basin, pump the water through each unit's condenser, and discharge it to the discharge channel. The heated water flows from the discharge channel by gravity, through the 196-inch diameter discharge pipe, from which it branches to the two 120-inch diameter discharge openings in the Blount Island Channel.

The NGS NPDES Permit limits both the maximum centerline length and area enclosed within the 2 degree F (above ambient) isotherm of the thermal plume at a depth of one meter. These limits are 5,400 feet and 102 acres, respectively. The extent of the thermal plume was predicted using a mathematical model (discussed in detail in Appendix C, Section C.1). The results of this modelling are that the actual extent of the plume, as defined by the 2 degree F (above ambient) isotherm, is much smaller than that allowed by the NPDES Permit.

The model was run for two sets of conditions of meteorology, ambient water temperatures, and NGS circulating water temperature rise. The first case, average conditions, was based on meteorology and Northside Station intake and discharge temperatures as presented in Chapter 3, Table 3.4-2. The maximum length of the 2 degree F (above ambient) isotherm for each month, for each of the station operating modes (assuming throttled pumps), is presented in Figure 2.5-17. Similarly, the area enclosed within that isotherm is presented, on a monthly basis, in Figure 2.5-18. The maximum length and area under average conditions are predicted to occur in September and are about 2,100 feet and 8.3 acres, respectively.

The second case, extreme conditions, is based on parameters presented in Chapter 3, Table 3.4-4. These are the conditions under which the proposed plant operating in conjunction with the NGS, can be expected to have the maximum impact on the Blount Island Channel. They do not, as such, represent extreme impact conditions for NGS operating alone. The maximum extent and area of the 2 degree F (above ambient) isotherm for each

month under each of the station operating modes (assuming throttled pumps), are presented in Figures 2.5-19 and 2.5-20. The maximum length and area under extreme conditions are also predicted to occur in September, and are about 1,700 feet and 5 acres, respectively.

The modelling results, indicating a thermal plume well within NPDES Permit limits, are supported by the ambient temperature analyses shown in Figures 2.5-7 and 2.5-8. Comparing ambient temperatures at monitoring locations PK and NB (Figure 2.5-4), which are within the limits of the permitted mixing zone, with monitoring location BCB, outside the mixing zone, there is no significant difference in temperature between the three locations. This indicates that the thermal plume does not significantly influence temperatures at locations PK and NB.

2.5.1.7 On-Site Water Bodies

Figure 2.5-21 shows the locations of the waterbodies in the area of the proposed site that were sampled during the pre-application monitoring program. The two unnamed on-site streams were monitored for flow (locations BB and CC) and for water quality (locations E-2, F-3, 4 and C-5). In addition, water quality samples were taken at location B-1, in a waterbody draining to San Carlos Creek, and at location D-6, the drainage ditch from the City of Jacksonville's North Landfill that drains to on-site streams. Water, soil and sediment samples were taken at the locations indicated in Figure 2.5-21 for polychlorinated biphenyls (PCB) analyses (see Chapter 6, Section 6.2.4). Results of the sampling program conducted in the proposed site area are tabulated in Appendix C, Tables C-33 and C-34.

At location BB, flow rates for the period February to September, 1980, ranged from zero to 4.28 cfs. Flow rates at location CC for the period February to November, 1980 ranged from zero to 2.53 cfs.

All of the on-site waterbodies sampled met the "predominately freshwater" classification contained in Section 17-3.021(18), F.A.C. Data in Appendix C, Table C-33 show that the conductivity at all on-site sampling stations was less than 5000 umhos. In addition, chloride concentrations were about 20 mg/l, suggesting no salt water influence on water quality.

At sampling location D-6, some impacts on water quality from another source were observed. Increases in ammonia (e.g., 0.03 mg/l at location B-1 versus 2.3 mg/l at location D-6) and total dissolved solids show a possible influence on water quality at D-6 by drainage from the North Landfill. With regard to coliform bacteria, levels observed at location D-6 were similar to those at the other five monitoring locations, all of which had ambient fecal and total coliform levels near or above Florida Class III water quality standards.

As shown in Table C-34, concentrations in all water samples analyzed for PCBs were less than 0.001 ppm as Aroclor 1016. The soil samples were found to have pH values of 4.6 to 5.4 and PCB concentrations less than 0.01 parts per million (ppm) as Aroclor 1016. The sediment samples had similar concentration levels for PCBs and pH values of 6.5 to 7.9.

2.5.2 Groundwater

2.5.2.1 Regional Hydrogeologic Framework

The proposed site is situated in the Atlantic Coastal Plain physiographic province, and is underlain to depths of 2100 feet and greater by rocks and sediments ranging in age from Eocene to Recent. General stratigraphic and hydrologic conditions in Duval County are shown in Table 2.5-4.

Floridan Aquifer

Groundwater in the Floridan Aquifer occurs under artesian conditions. The aquifer comprises a 1,600 foot sequence of alternating layers of soft, highly permeable limestones, and hard crystalline limestones and dolomites of Eocene age (Franks and Phelps, 1979). Franks and Phelps subdivide the aquifer into an upper and lower permeable zone. The upper permeable zone includes limestones of the Ocala Group, the Avon Park Limestone, and the Lake City Limestone, and averages approximately 1,000 feet in thickness. Within the upper permeable zone, at least two water bearing intervals can be recognized. Limestones of the Ocala group constitute the first water-bearing interval and generally comprise the upper 200-400 feet of the Floridan Aquifer. These are separated from a second, deeper water-bearing interval by dense, relatively impermeable dolomites of the Avon Park Limestone. The second water-bearing interval occurs primarily in a 400-500 foot thick interval of the Lake City Limestone, but may also include permeable limestones of the overlying Avon Park Limestone and underlying Oldsmar Limestone (Franks and Phelps, 1979).

The upper permeable zone is the principal source of groundwater for municipal, industrial and domestic supplies in Duval County. Yields of wells completed in the upper permeable zone vary as a function of well construction, depth of penetration, water transmitting properties of the rock penetrated by the well bore, and piezometric head. Wells penetrating the full thickness of the upper permeable zone typically yield in excess of 1,000-2,000 gallons per minute (gpm) by artesian flow (Leve, 1966).

The lower permeable zone of the Floridan Aquifer includes porous limestones and dolomites in the lower portion of the Oldsmar Limestone (Franks and Phelps, 1979). Very little hydrologic data is available for the lower permeable zone. Since adequate well yields are usually obtained by wells penetrating the upper permeable zone, development of the lower permeable zone for water supply in the Duval County area has been limited. A water-exploration well drilled in the Jacksonville area in 1966

penetrated the full thickness of the lower permeable zone (Leve and Goolsby, 1967). Fluid velocity logging indicated a highly permeable zone between depths of 1,900 and 2,050 feet below land surface. This interval was estimated to be contributing in excess of 400 gpm to the well's free-flow discharge of 1,000 gpm. Well-head pressures were measured during the construction of the well and increased abruptly when the lower permeable zone was penetrated (Leve and Goolsby, 1967).

The potentiometric surface for the Floridan Aquifer in the Jacksonville area is illustrated in Figure 2.5-22. Increasing water use from the Floridan Aquifer has resulted in declines in the potentiometric surface averaging 0.5 to 2.0 feet per year over a period of 20-25 years ending in 1962 (Leve, 1966). In addition, high volume pumping in areas such as Eastport and Jacksonville has resulted in local depressions in the potentiometric surface.

Water from the Floridan Aquifer in the Duval County area is suitable for domestic and most industrial uses (Leve, 1966). The quality of water varies primarily as a function of sampling location, sampling depth, and date of sampling. Results of water analyses of 43 wells penetrating the Floridan Aquifer in Duval County (Leve, 1966) yielded an average total dissolved solids content of 355 milligrams per liter (mg/l), and an average conductivity of 446 micromhos per centimeter. Carbonate hardness averaged 242 mg/l, indicating very hard water. Dissolved iron averaged 0.21 mg/l. Hydrogen sulfide gas is frequently reported in wells in the Floridan Aquifer, and ranged from 1.0 to 3.0 mg/l in analyses of samples from 60 wells in Duval County (Leve and Goolsby, 1969).

Chloride content of water from the Floridan Aquifer is generally less than 30 mg/l (Leve, 1966). Increases in salinity have been documented in a number of wells in the Duval County area, where these increases in chloride content have been correlated with a decline in artesian pressure. The correlation is most apparent in areas of excessively high water use, e.g. Jacksonville and Eastport, where high rates of pumping from the aquifer

have caused the formation of distinct cones of depression. In general, the incidence of high chlorides appears greatest for wells penetrating permeable zones deeper than the Ocala, where there is less hydrologic separation from the inferior quality water within the Cedar Keys limestone and underlying formations (Leve, 1966).

The progressive increase in salinity in several wells in the area appears to be the result of an excessive lowering of potentiometric levels in fresh water zones, allowing invasion of saline water from deeper sources. Lateral intrusion of saline waters is apparently not significant in the Jacksonville area. Confining beds separating the lower permeable zone from the deeper, saline sources, and the semi-confining bed separating the lower and upper permeable zones, appear to have retarded the upward migration of inferior quality water in many areas. Increased production from the Floridan Aquifer, particularly in those areas where production has already caused a significant lowering of the potentiometric surface, is likely to be accompanied by further increases in salinity (Franks and Phelps, 1979).

Structural anomalies, such as faulting and solution phenomena (sinkholes), may provide a natural mechanism for upward migration of saline waters by allowing hydraulic communication between permeable zones within the Floridan Aquifer or between permeable zones of the Floridan and underlying zones containing mineralized water. At present, however, there is no known evidence establishing this as a significant factor in the increase of chlorides observed in Duval County. Additional discussion of water quality in the Floridan Aquifer may be found in Appendix D.

The Floridan Aquifer serves as the principal supply of fresh water in the Jacksonville/northeast Duval County area. In 1966, an estimated total of 162 million gallons per day (MGD) was being withdrawn from the aquifer (Leve and Goolsby, 1969).

Shallow Aquifers

Several shallow aquifers underlie the Duval County area to depths of 150 to 200 feet, and are an important source of water for domestic supply, heat exchange, and industrial and agricultural uses (Fairchild, 1972).

The shallow aquifer system consists of limestone and sand aquifers in the upper part of the Hawthorn Formation; shell, limestone, and sand aquifers in Pliocene or upper Miocene deposits; and sand and shell aquifers in the Pleistocene and Holocene deposits. In many areas, the shallow aquifer system may consist of a single, relatively thick aquifer extending downward from the water table to the Hawthorn Formation. In central and eastern Duval County, the system consists of a series of relatively thin permeable zones separated locally by a number of thin confining beds (Leve, 1966). General stratigraphic and hydrologic relationships of the shallow aquifer system are indicated in Table 2.5-5.

Most wells in the Jacksonville area producing water from the shallow aquifer system have been completed in an interval referred to as the "shallow-rock zone", consisting of porous, sandy limestone in the Upper Miocene or Pliocene deposits, lying at depths of between 40 and 100 feet below land surface (Fairchild, 1972). Several wells have been drilled to penetrate deeper sands and limestones within the Hawthorn. The Hawthorn is not considered to be a good source of water due to an abundance of clay and silt, and the restricted geometry of the water bearing sands and limestone.

A second, although less important, aquifer, referred to as the shallow water table aquifer, is formed by the loose, unconsolidated sands and shell beds of Pleistocene and Holocene age, overlying the shallow-rock zone. These surface sediments form an aquifer ranging up to 90 feet in thickness and are typically developed with shallow, sand point type wells. Where saturated, the shallow sediments frequently require dewatering in cases where they are to be exposed by excavations.

The shallow rock aquifer occurs in conditions ranging from full artesian to water table, whereas water in the shallow, surficial sands occurs under water table (phreatic) conditions. Water in the shallow aquifers generally is acceptable for most domestic, commercial and industrial uses (Causey and Phelps, 1978).

2.5.2.2 Site Hydrogeologic Framework

Floridan Aquifer

Historical water level records for selected wells in the vicinity of the proposed site are summarized in Appendix D. A comparison of water levels in selected Floridan wells versus time (Appendix D, Figure D-6) suggests an average decline of approximately 0.4-0.5 feet per year in potentiometric levels of the Floridan Aquifer in the vicinity of the proposed site.

Water quality data for selected wells in the vicinity of the site are reproduced in Appendix D, Table D-7. The data indicate the water is generally of the calcium bicarbonate type where calcium is the major cation and bicarbonate is the major anion when expressed in millequivalents per liter. Average concentrations of major cations and anions are shown in Table 2.5-6. With the exception of anomalous chloride concentrations (approximately 210 mg/l) reported for well D-360, there is no indication of chloride contamination in the Floridan Aquifer in the area of investigation. Well D-1908 on Blount Island had a chloride concentration of 71 mg/l in 1980. While this chloride concentration is about 2.5 times the average for all wells in the study area, the water from this well appears to be generally of the same quality as that from most other wells in the area.

On the basis of test drilling results (Section 6.2.5), the top of the Floridan Aquifer lies at a depth of 450 feet on the site. The top of the Ocala limestone, identified by a sudden abundance of the microfossil

On the basis of test drilling results (Section 6.2.5), the top of the Floridan Aquifer lies at a depth of 450 feet on the site. The top of the Ocala limestone, identified by a sudden abundance of the microfossil Lepidocyclina ocalana, was placed at a depth of 470 feet by U.S. Geological Survey personnel. The test well penetrated friable, white to gray colored limestone and shell in the interval 450 to 738 feet. Alternating layers of limestone and hard, light to dark brown dolomite were encountered at 738 feet, and dense, dark brown colored dolomite was penetrated at approximately 750 feet. The top of the Avon Park Formation is placed at 738 feet.

Pumping test results indicate a transmissivity of approximately 1.0×10^5 gallons per day per foot and a storage coefficient of 2.8×10^{-4} . Applying non-steady state, leaky artesian type curves to time-drawdown and time recovery data from the observation well yielded a value of 4×10^{-4} per day for leakance, where leakance is expressed as the ratio of vertical hydraulic conductivity to vertical thickness of the confining bed. Results of these analyses are presented in Appendix D, Table D-9. Franks and Phelps (1979) estimate a leakance value of 2.5×10^{-6} per day for the "Upper Confining Unit" or Hawthorn formation, approximately 100 times lower than that determined in testing of F-1. It is likely that the major component of leakage to the Ocala aquifer during the test was derived from permeable zones within and underlying the dolomite of the Avon Park Formation, rather than leakage through the Hawthorn Formation.

Static water levels measured in wells F-1 and D-1255 (see Figure 2.5-23) were 19.7 and 20.1 feet above land surface, respectively. These water level elevations (approximately 36 feet above mean sea level) are consistent with those reported by the U.S. Geological Survey for this area in 1979.

Water quality samples were collected from well F-1 in August and November of 1980, and April and July of 1981. Results of the analyses are reported in Appendix D, Table D-10, and are summarized in Table 2.5-7. Water quality of the Floridan Aquifer at the site compares favorably with

Florida water quality criteria for Class I-B waters and U.S. Environmental Protection Agency Primary and Secondary Drinking Water Standards (Appendix D, Table D-11). In general, the groundwater is suitable for most uses with minimum treatment. Chloride concentrations for the four samples ranged from 10.8 to 21 mg/l, and averaged 15 mg/l. These concentrations are generally consistent with, and generally slightly lower than chloride concentrations in surrounding Floridan wells.

Shallow Aquifers

The proposed site is underlain to a depth of approximately 100 feet by unconsolidated to partially consolidated sands, silts, clays, and limestones. These sediments are saturated to within a few feet of land surface. Phosphatic silts and clays with occasional lenses of sand and limestone belonging to the Hawthorn Formation extend from a depth of approximately 100 feet to about 470 feet, the top of the Ocala Formation.

Two aquifers are recognized in the sediments extending to a depth of approximately 100 feet. The sands, shell, and limestone deposits lying between depths of about 60 feet and 90 feet constitute an aquifer referred to locally as the "shallow-rock" aquifer. Water in this aquifer occurs under confined conditions. Permeability is afforded by a combination of interconnected pore spaces within the unconsolidated sands (primary permeability) and solutioning of the more calcareous zones in the limestones, shell beds and cemented sands (secondary permeability). Unconsolidated sands extending from the surface to a depth of 20 to 30 feet form a second aquifer, locally referred to as the "water table" aquifer. Water in these sands occurs under water table conditions.

The shallow-rock aquifer is confined below by phosphatic silts and clays tentatively assigned to the Hawthorn Formation. The water table aquifer appears to have a lower boundary in the interval of 20-30 feet. Increasing proportions of clay, silt, and silty sand in this interval may restrict hydrologic communication with underlying sands, although there is

little evidence for lateral continuity of these lower-permeability deposits. Sediments in the interval separating the water-table aquifer from the shallow-rock aquifer include permeable sands and occasional silts and clays. Hydrologic testing indicates that these "intermediate sands" are in direct hydrologic communication with the shallow rock aquifer.

The results of the aquifer testing indicate that the shallow water - table aquifer is unconfined, behaves as a phreatic aquifer, and readily responds to infiltration of water discharged at the surface. The shallow-rock aquifer and overlying intermediate-zone sands are both artesian, and are in direct hydraulic communication with each other. The intermediate-zone sands appear to be hydraulically separated from the water-table aquifer, probably by finer-grained sediments which may be limited in areal extent and only locally effective as a confining unit for the intermediate-zone sands.

The hydrologic properties of the three tested aquifer zones are summarized on Table 2.5-8. Note that all three zones have essentially the same hydraulic conductivity. The water-table and intermediate zones have essentially the same storage coefficient, while the storage coefficient of the shallow-rock aquifer is an order of magnitude smaller. The apparent specific yield of the water-table aquifer is low, but consistent with specific yield values generally determined for water-table aquifers.

A potentiometric surface map has been constructed for the shallow aquifers from water levels measured in November, 1980 (Appendix D, Figure D-17). Water levels in wells and piezometers completed in the intermediate sands and the shallow-rock aquifer were included in measurements used to construct the potentiometric surface for the shallow-rock aquifer, on the basis that the two intervals are in hydrologic communication. As shown in Appendix D, Figure D-17, prevailing groundwater gradients in both the shallow-rock aquifer and the water table aquifer are to the southeast, toward the inland tidal areas of the St. Johns River.

Selected wells/piezometers were sampled for water quality analyses. The results of these analyses are summarized in Appendix D, Table D-20. In general, water quality compares favorably with both state criteria for Class I-B waters and with U.S. Environmental Protection Agency Primary Drinking Water Standards (Appendix D, Table D-11). The State of Florida Class I-B standard for lead of 0.05 mg/l was exceeded in one instance: a concentration of 0.196 mg/l of lead was detected in well DA-41 in August of 1980. Environmental Protection Agency secondary standards for iron, manganese, pH, and color are exceeded in several wells (see Appendix D, Tables D-11 and D-20).

Adjacent Facilities

Existing facilities adjacent to the proposed site include the North Landfill located north of Island Drive and east of New Berlin Road (Figure 2.5-24); the NGS which adjoins the southern and western boundaries of the proposed site (Figure 2.5-24); and the Offshore Power Systems and Jacksonville Port Authority facilities on Blount Island. The relationship of these facilities to the site groundwater regime are discussed in Appendix D, Section D.4.2.3.

2.5.3 References

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- Reynolds, Smith and Hills, Inc., 1974. Thermal Energy Release Studies, Interim Reports No. 1, 2 and 3.
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Table 2.5-1 (Revision 1)

FLORIDA WATER QUALITY CRITERIA FOR CLASS III,
PREDOMINANTLY MARINE WATERS

Parameter	Allowable Level
Aluminum	1.5 mg/l
Antimony	0.2 mg/l
Arsenic	0.05 mg/l
BOD	Appropriate D.O. must be maintained
Bromine (molecular)	0.1 mg/l
Bromates (as bromides)	100 mg/l
Cadmium	5.0 ug/l
Chlorine (total residual)	0.01 mg/l
Chlorides	10% increase above background levels
Chromium, hexavalent:	0.5 mg/l in effluent
total:	1.0 mg/l in effluent
	0.05 mg/l after mixing
Coliform, fecal	200 MPN/100 ml (monthly avg.)
	800 MPN/100 ml (daily max.)
Coliform, total	1000/100 ml (monthly avg.)
	2400/100 ml (max.)
Copper	0.015 mg/l
Cyanide	5.0 ug/l
Detergents	0.5 mg/l
Dissolved gases	110% of saturation value at the existing atmospheric and hydrostatic pressures

Table 2.5-1 (Revision 1) (Continued)

FLORIDA WATER QUALITY CRITERIA FOR CLASS III,
PREDOMINANTLY MARINE WATERS

Parameter	Allowable Level
Dissolved oxygen	minimum, 4 mg/l; 24 hr. avg., 5 mg/l
Fluorides	5.0 mg/l
Iron	0.3 mg/l
Lead	0.05 mg/l
Mercury	0.1 ug/l
Nickel	0.1 mg/l
Nutrients	Nutrient concentrations shall not be altered so as to cause an imbalance in natural populations of aquatic flora and fauna
Oil and grease (dissolved)	5.0 mg/l
Pesticides and herbicides	Detailed in 17-3.121(21), FAC
pH	6.5 - 8.5, st'd units ^a
Phosphorus (elemental)	0.1 ug/l
Polychlorinated biphenyls	0.001 ug/l
Radioactive substances	
radium 226 and 228: gross alpha particle activity (including Ra 226, but excluding radon and uranium):	5 picocuries/l 15 picocuries
Selenium	0.025 mg/l
Silver	0.05 ug/l

Table 2.5-1 (Continued)

FLORIDA WATER QUALITY CRITERIA FOR CLASS III,
PREDOMINANTLY MARINE WATERS

<u>Parameter</u>	<u>Allowable Level</u>
Turbidity	50 Jackson units above background levels
Transparency	Depth of compensation point for photosynthetic activity shall not be reduced by more than 10% of natural background value
Zinc	1 mg/l

a Not to be caused to vary by more than one (1.0) unit above or below normal pH, within the stated range.

Source: Florida Administrative Code, 17-3, 1979

Table 2.5-2

MEASURED^a AND ALLOWED^b EXTENT OF NORTHSIDE STATION THERMAL DISCHARGE

Isotherm	Surveys		
	1 ^c	2 ^d	3 ^e
20F Area - Allowed	102.27	102.27	102.27
(Acres) - Measured	1.9 acres	6.9 acres	5.4 acres
20F Width - Allowed	825	825	825
(feet) - Measured	400	300	240
20F Length - Allowed	5400	5400	5400
(feet) - Measured	640	2250	2300
40F Width - Allowed	399	399	399
(feet) - Measured	50	24	190
40F Length - Allowed	3900	3900	3900
(feet) - Measured	300	440	530

a Measured during thermal surveys of September 3-4, 1980

b Allowed by existing Northside Station NPDES permit

c Flood tide

d Ebb tide

e Start of flood tide

Table 2.5-3 (Revision 1)

TIDE COMPOSITE VALUES FOR PARAMETERS
EXCEEDING CLASS III STANDARDS - ST. JOHNS RIVER AT THE PROPOSED SITE

Parameter, Units	Transect and Station ^a						Water Quality Standard
	F-2		H-2		G		
	Mean	Maximum	Mean	Maximum	Mean	Maximum	
Aluminum, mg/l	0.61	3.34	0.47	3.85	0.49	3.6	1.5
Chlorine, Total Residual, mg/l	0.034	0.09	0.038	0.1	0.039	0.20	0.01
Coliform, Total (MPN)	572	3000	450	2650	755	6750	2400/100 ml (max)
Copper, mg/l	0.075	0.270	0.074	0.245	0.069	0.275	0.015
Cyanide, mg/l	0.007	0.031	0.008	0.026	0.011	0.09	0.005
Iron, mg/l	0.77	2.20	0.576	1.61	0.801	2.7	0.3
Mercury, ug/l	0.22	0.4	0.22	0.4	0.24	0.60	0.1
Oil and Grease, mg/l	1.7	3.2	2.6	11.3	2.0	9.0	5.0
Silver, ug/l	0.16	0.25	0.15	0.6	0.16	0.35	0.05

^a See Figure 2.5-12

^b See Table 2.5-1

Source: 1979-80 Pre-operational Monitoring Program

Table 2.5-4 (Revision 1)
GENERALIZED GEOLOGIC UNITS IN DUVAL COUNTY AND THEIR HYDROLOGIC PROPERTIES

Geologic Age	Stratigraphy	Approximate Thickness (ft)	Lithology	Hydrogeologic Unit	Hydrologic Properties
Holocene to Pliocene	Surficial Deposits	100	Discontinuous sand, clay, and shell beds	Surficial aquifer	Sand and shell deposits provide local limited water supplies
Miocene	Hawthorn Formation	400	Interbedded phosphatic sand, clay, marl, and limestone	Upper confining unit	Sand, shell, and limestone deposits provide local limited water supplies, both artesian and non-artesian. Low permeability clays serve as the principal confining beds for the Floridan Aquifer below
Eocene	Ocala Limestone	500	Massive fossiliferous chalky to granular marine limestone sequence	Upper permeable zone of Floridan Aquifer (pumping zone)	Principal source of groundwater in Duval County. High permeability overall
	Avon Park Limestone				Water bearing layers separated by low permeability limestone and dolomite
	Lake City Limestone	500	Alternating beds of massive granular and chalky limestone, and dense dolomites	Semiconfining zone of Floridan Aquifer	Low permeability limestone and dolomite
	Upper Unit of Oldsmar Limestone	450			
	Lower Unit of Oldsmar Limestone	150		Lower permeable zone of Floridan Aquifer	Highly permeable, increases in salinity noted
Paleocene	Cedar Keys Limestone	?	Uppermost appearance of evaporites; dense limestones	Lower confining unit	Highly mineralized water, very low permeability

Source: Franks and Phelps, 1979.

Table 2.5-7 (Revision 1)

SUMMARY OF FLORIDAN AQUIFER WATER QUALITY,
TEST WELL F-1a

Parameter ^b	Sampling Date		
	<u>August, 1980</u>	<u>November, 1980</u>	<u>April, 1980</u>
Specific Conductance (umhos/cm)	521	430	378
Hardness (as CaCO ₃) (mg/l)	243	216	236
Calcium (mg/l)	55.5	40.7	54.4
Magnesium (mg/l)	22.8	25.4	22.9
Sodium (mg/l)	13.1	11.8	14.7
Bicarbonate (mg/l) ^c	190	153	188
Sulfate (mg/l)	125	77.92	64.07
Chloride (mg/l)	21.0	10.8	13.7
			193
			38.6
			14.3

a See Figure 2.5-23

b Complete analyses in Appendix D

c Reported as Alkalinity, in mg/l HCO₃

Table 2.5-8

SUMMARY OF SHALLOW AQUIFER TESTING IN
WELLS GW-1, GW-2, AND GW-3

Well ^a	Pumping Rate (gallons per minute)	Duration of Pumping (minutes)	Hydraulic Conductivity ^{b,c} (gpd/ft ²)	Aquifer Thickness (ft.)	Storage Coefficient ^c	Specific Yield ^c
GW-1	79	360	4×10^2	40	6.5×10^{-5}	--
GW-2	12	267	3×10^2	30	5.8×10^{-4}	--
GW-3	12/20 ^d	60/78 ^d	3×10^2	20	5.3×10^{-4}	2×10^{-2}

^a See Figure 2.5-23^b Hydraulic conductivity obtained by dividing calculated values of transmissivity by aquifer thickness^c Average values for time-drawdown and time-recovery solutions^d Discharge was adjusted from 12 gallons per minute (gpm) to 20 gpm after 60 minutes because of early stabilization of pumping water levels. The discharge rate of 20 gpm was maintained for an additional 78 minutes.

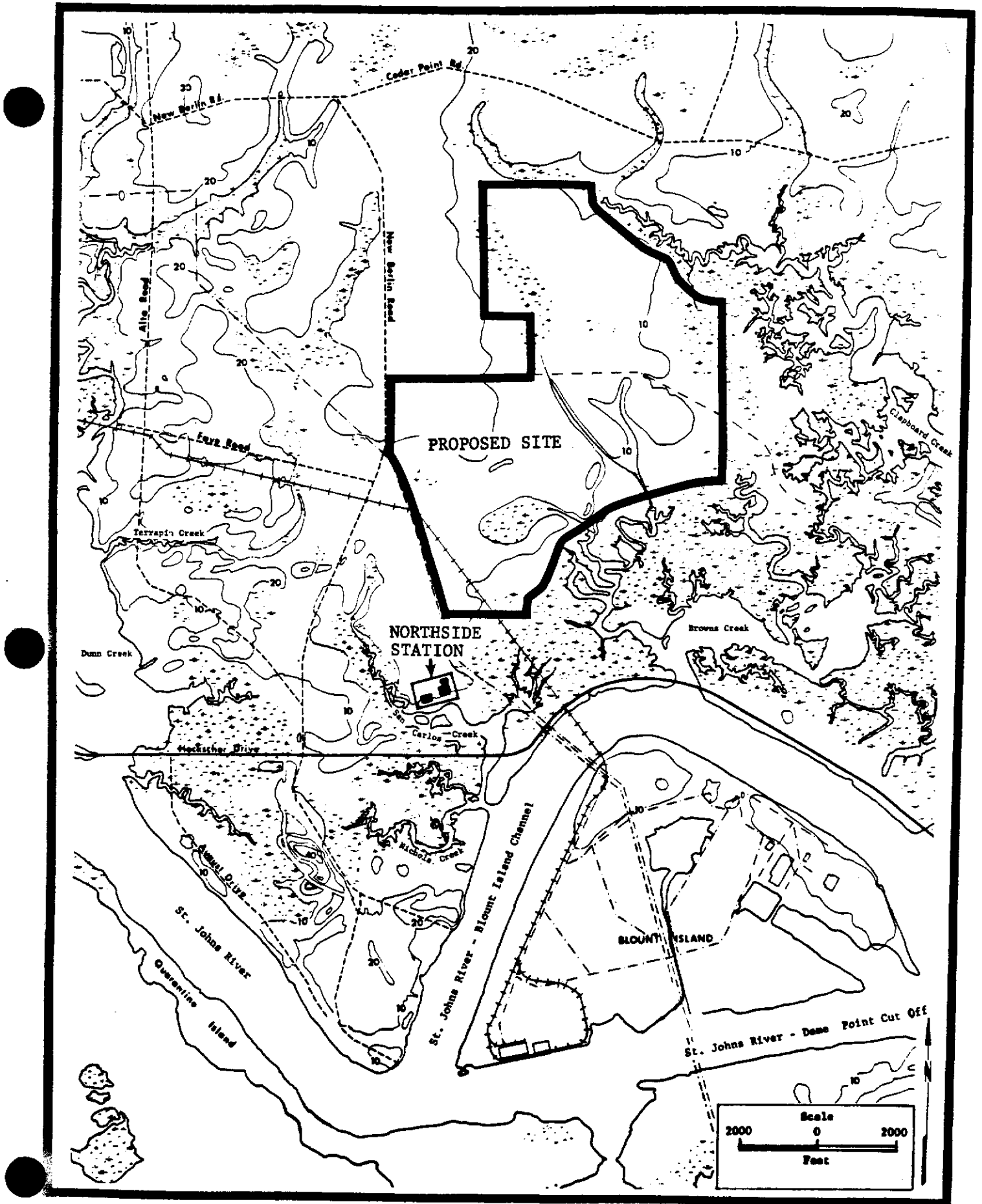
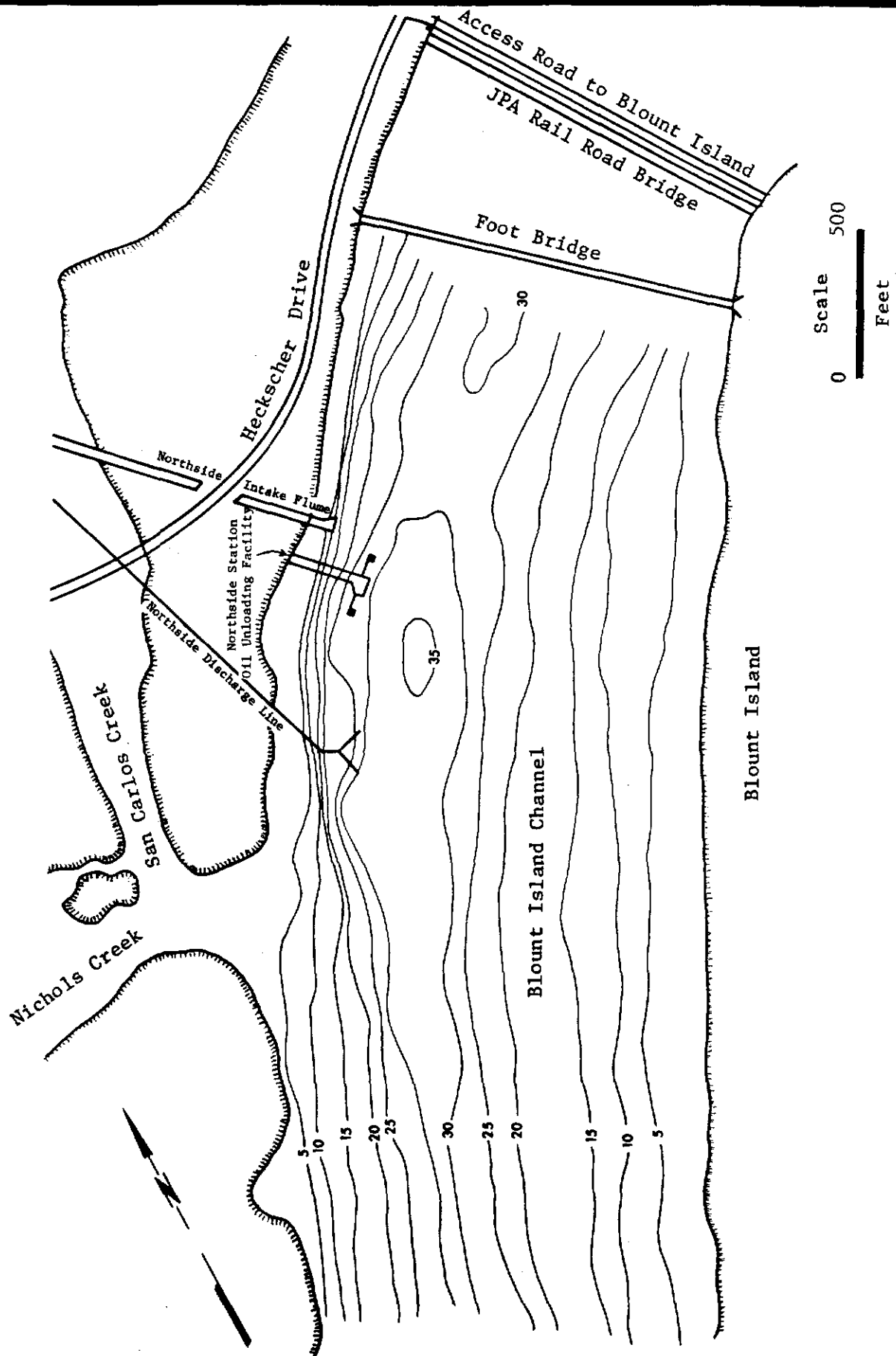


Figure 2.5-1 Surface Waters in the Proposed Site Vicinity



Note: Contour lines represent feet below mean sea level (MSL)

Source: 1979-80 Pre-Operational Monitoring Program

Figure 2.5-2

Bathymetry in Northside Station Discharge Area, July, 1980

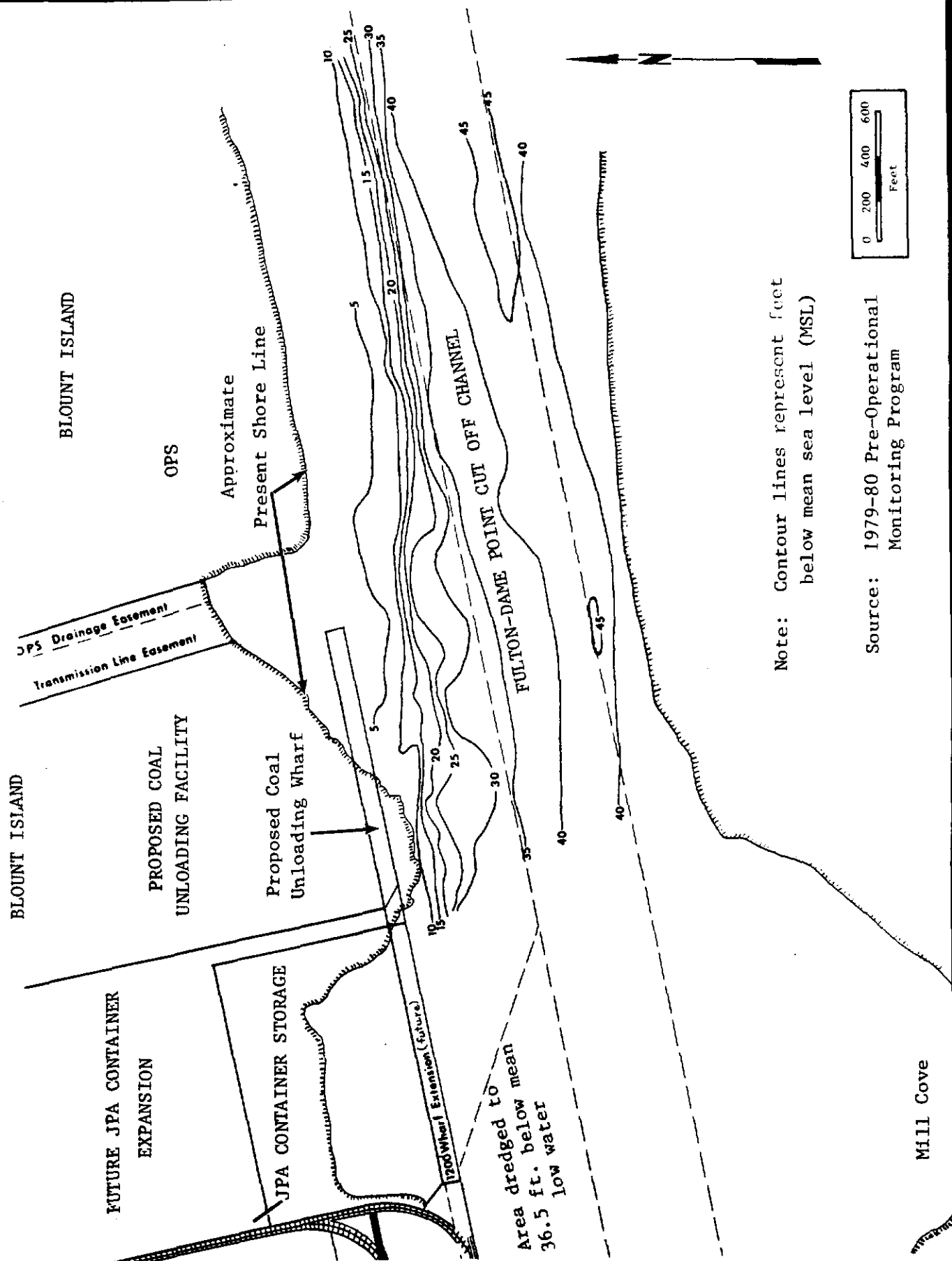


Figure 2.5-3 Bathymetry in Proposed Coal Unloading Facility Area, July 1980

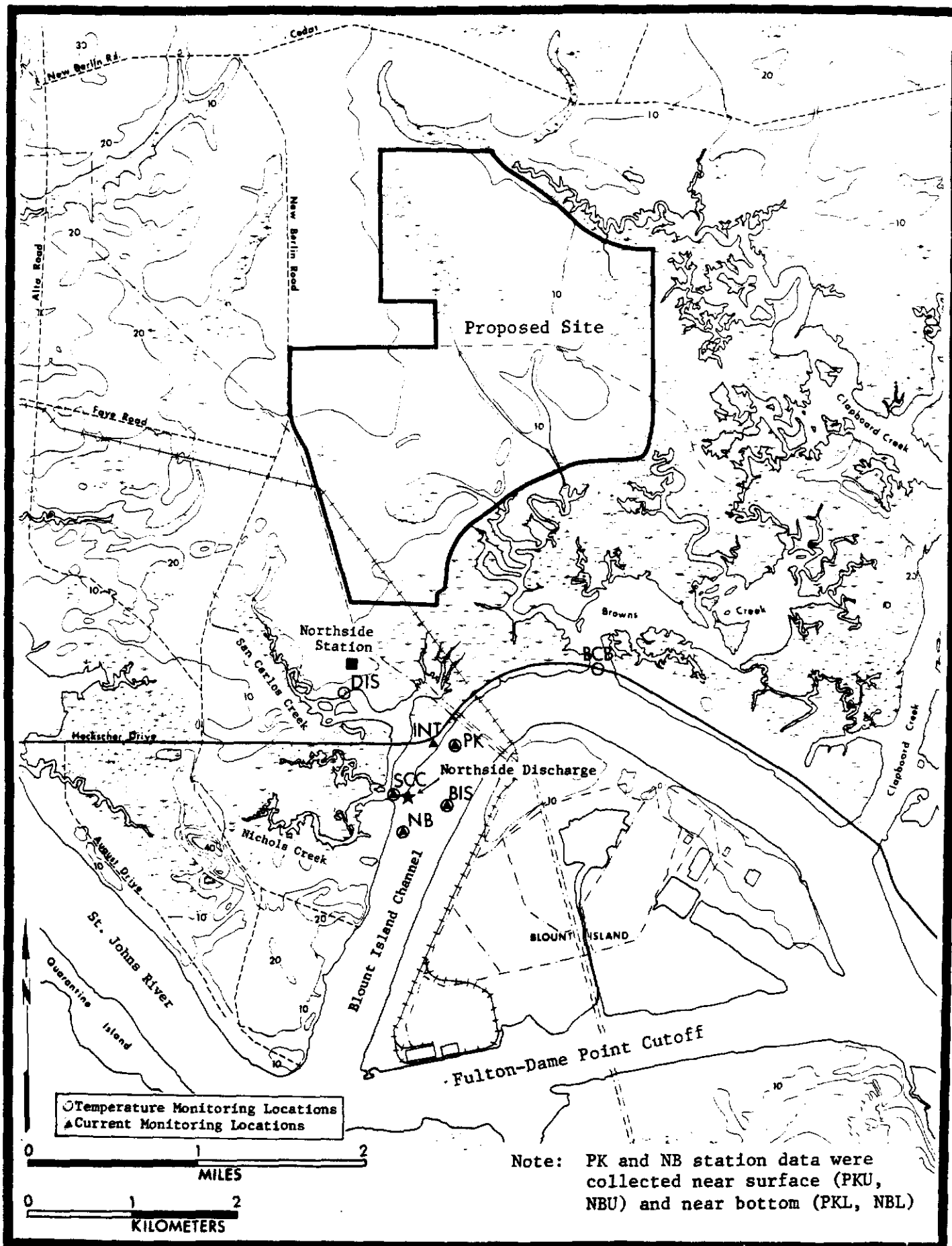
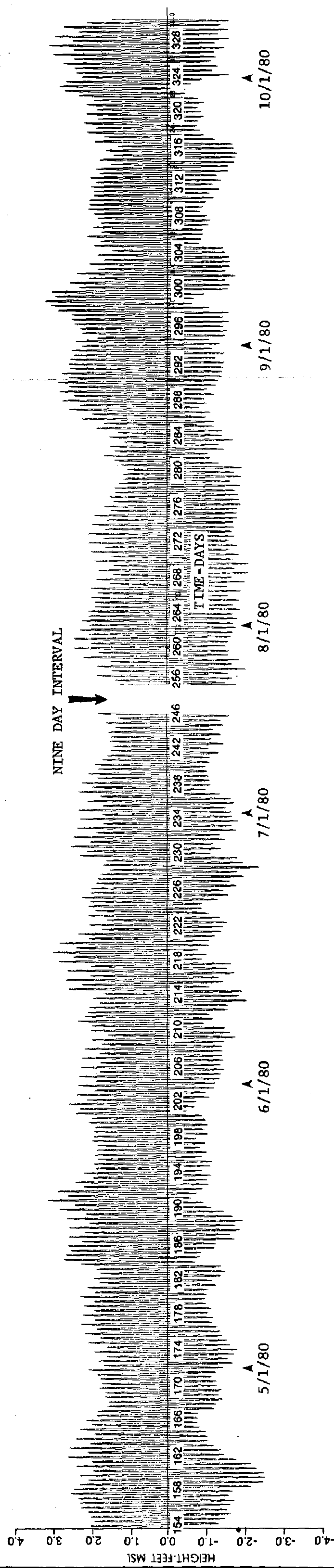
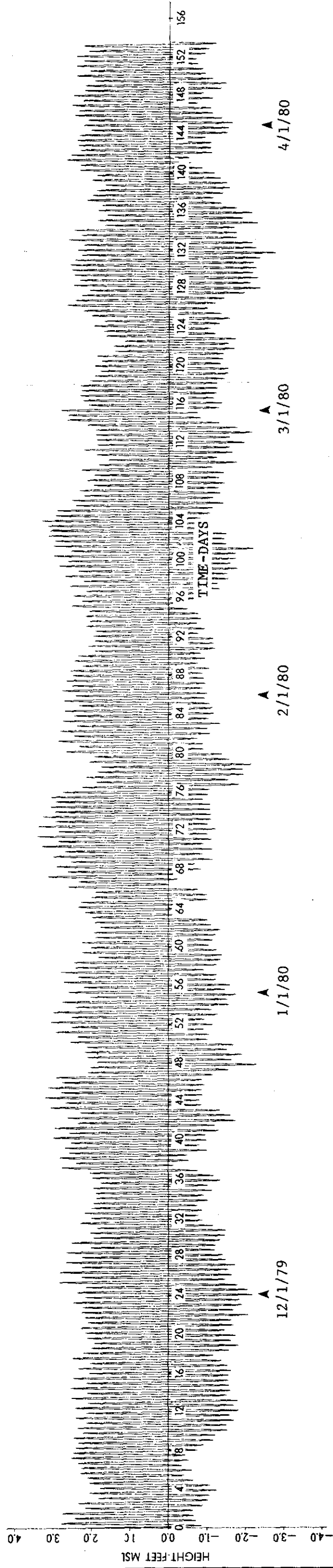


Figure 2.5-4 Hydrological Monitoring Sites in the St. Johns River



Source: 1979-80 Pre-Operational Monitoring Program

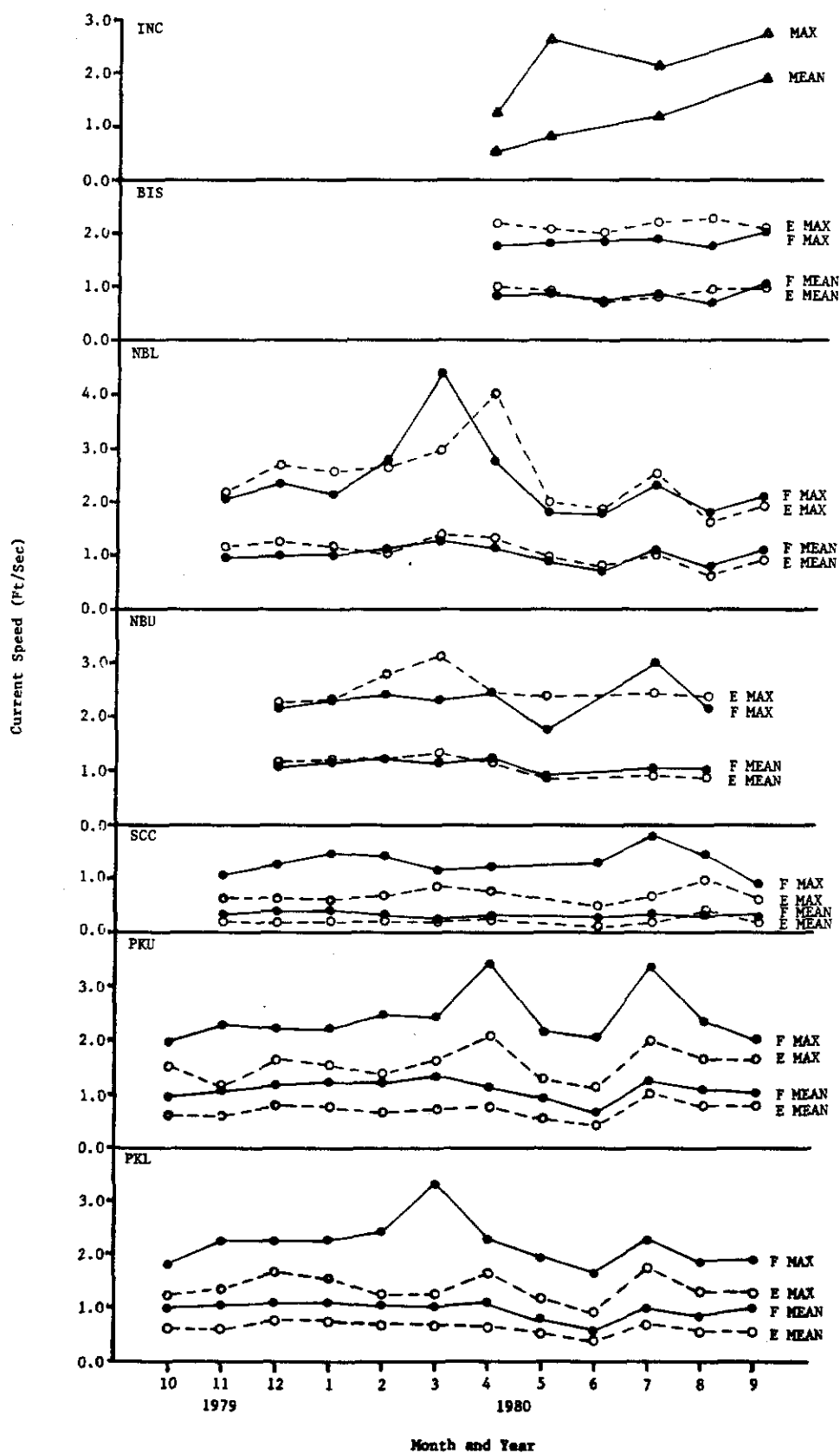
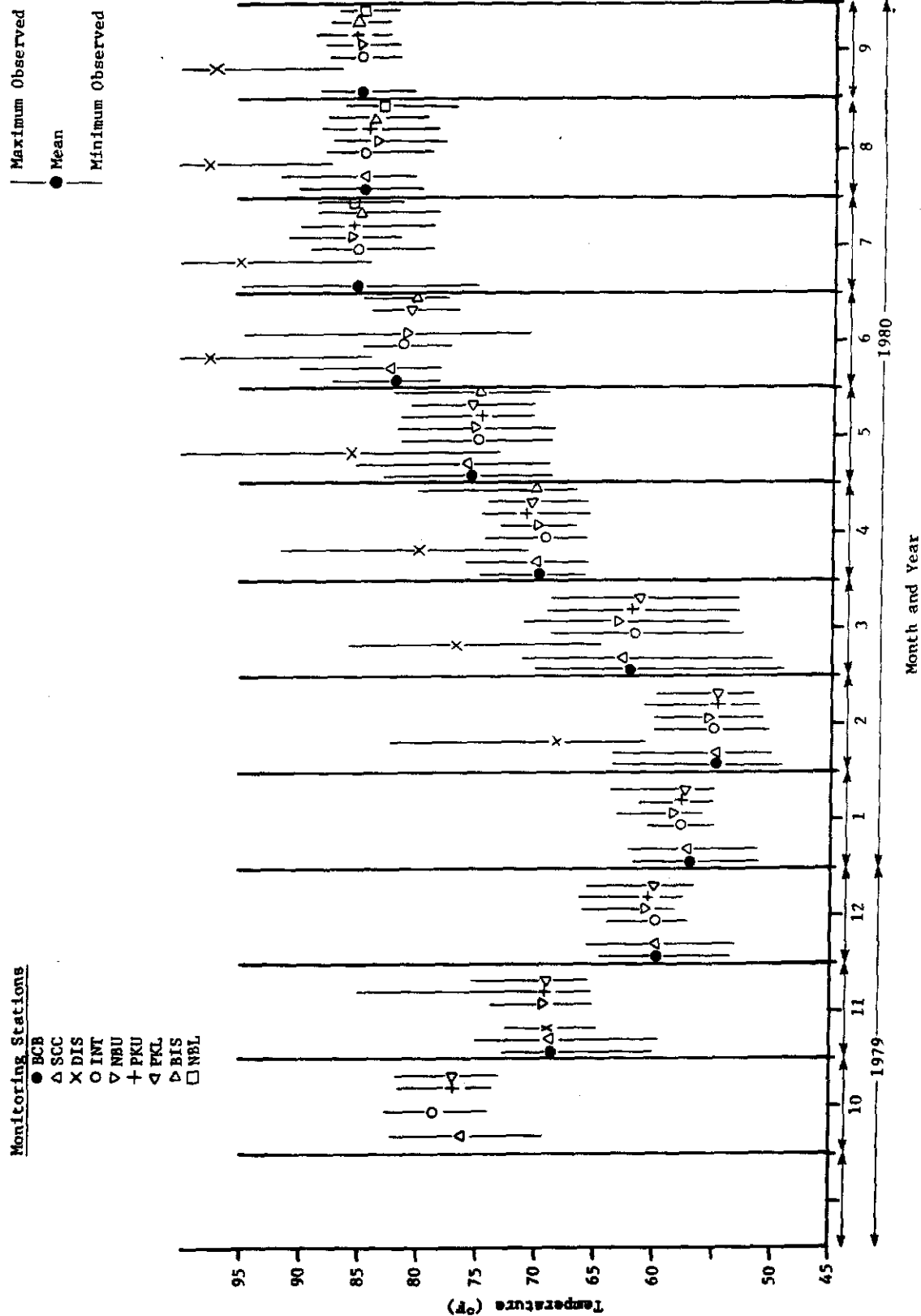


Figure 2.5-6

Monthly Variation of Maximum and Mean Current Speeds for Flood and Ebb Tides at Each Station



(Station Locations Shown on Figure 2.5-4)

Source: 1979-80 Pre-Operational Monitoring Program

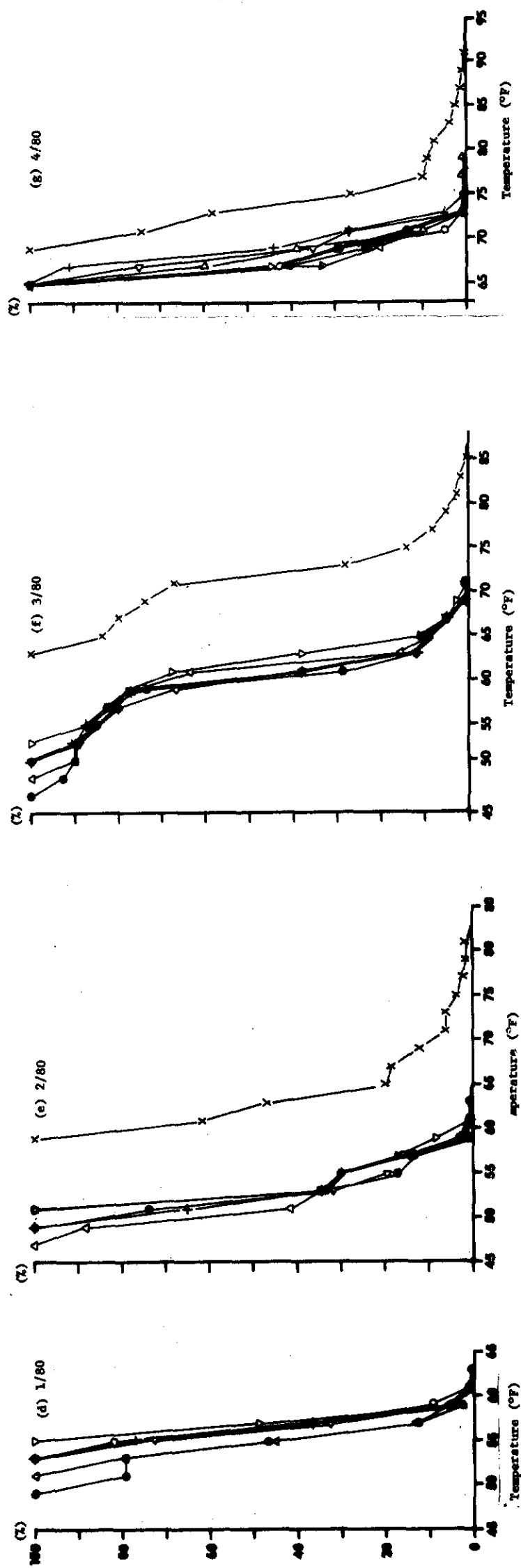
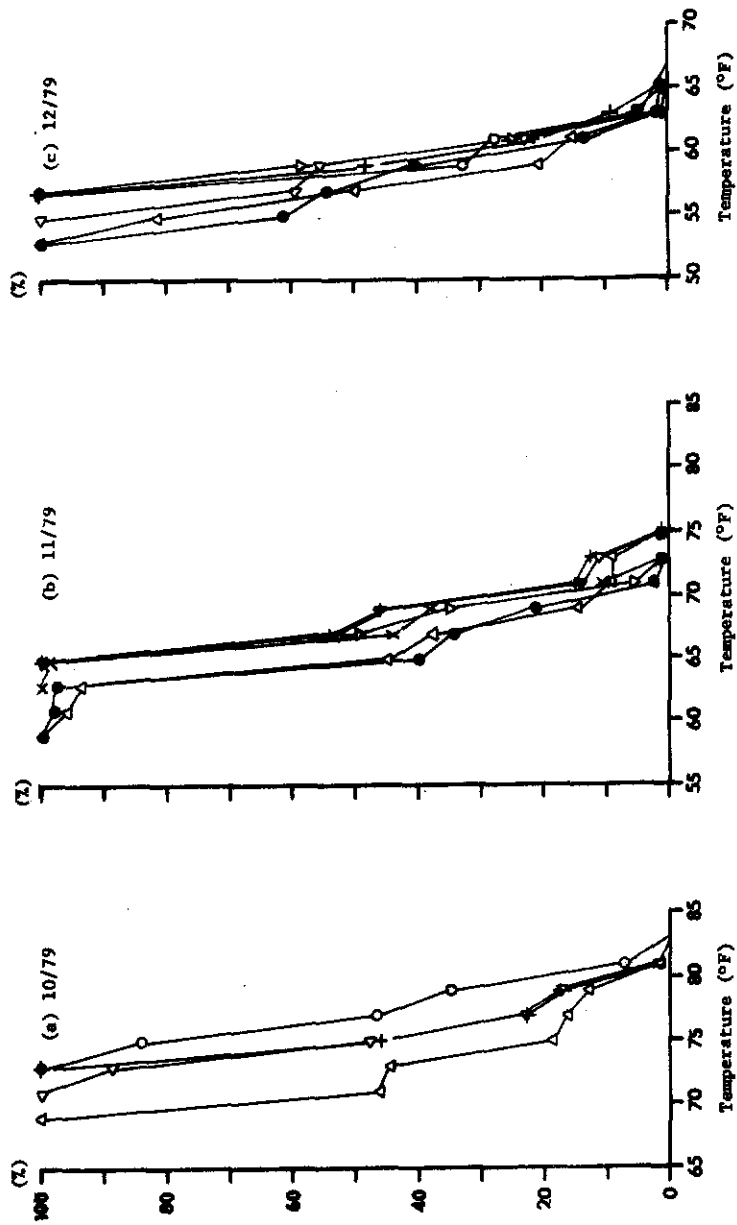
Figure 2.5-7

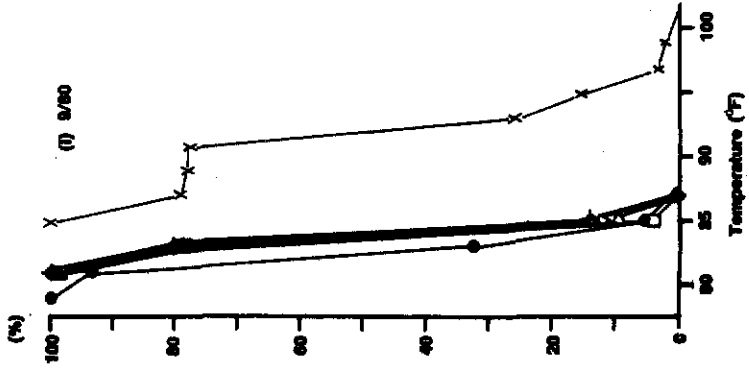
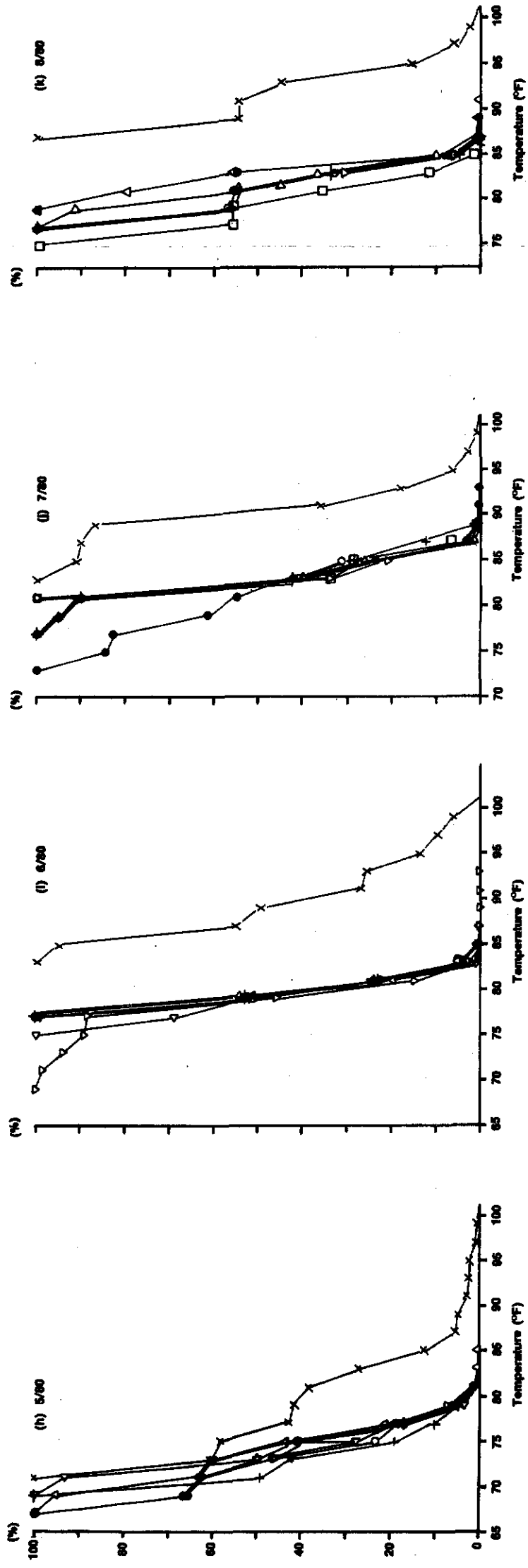
Monthly Mean Temperatures and Extremes in the St. Johns River at the Proposed Site, October 1979-September 1980

Monitoring Stations

- ECB
- △ SCC
- × DIS
- INT
- ▽ NSU
- + PKU
- ◁ PKL
- ▷ EIS

(Station Locations Shown on Figure 2.5-5)
Source: 1979-80 Pre-Operational Monitoring Program





Monitoring Stations

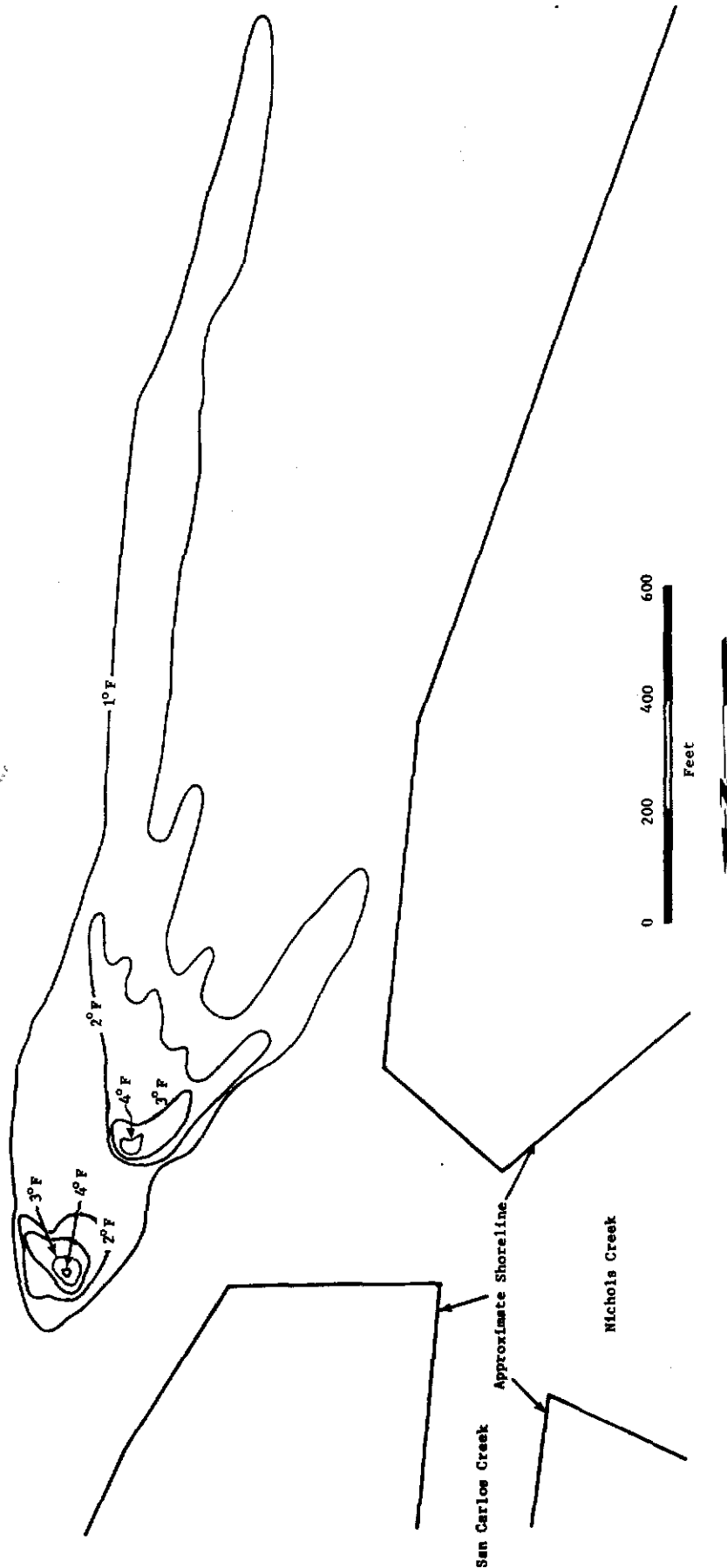
- BCB
- △ SOC
- × DIS
- INT
- ▽ NEU
- + PKU
- ◁ PFL
- ▷ RIS
- NBL

Figure 2.5-8

Monthly Temperature Frequency in the St. Johns River at the Proposed Site

102044 7/1/80

Blount Island Channel



Source: Pre-Operational Monitoring Program, September 3, 1980

Figure 2.5- 9 Extent of Northside Station Thermal Discharge, Plan View at One Meter Depth, Survey 1 (Flood Tide)

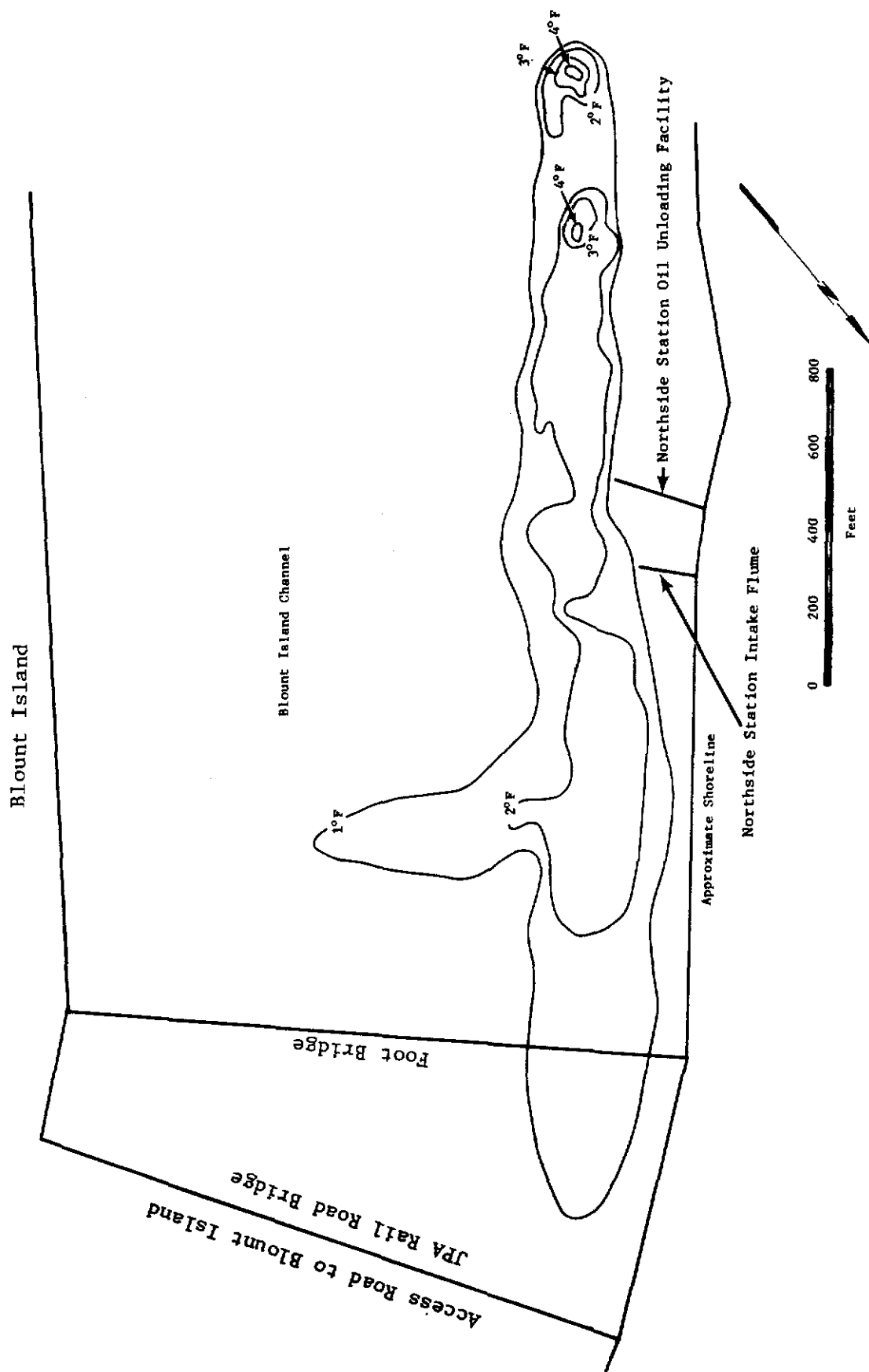


Figure 2.5-10 Extent of Northside Station Thermal Discharge, Plan View at One Meter Depth, Survey 2 (Ebb Tide)

Source: Pre-Operational Monitoring Program, September 3, 1980

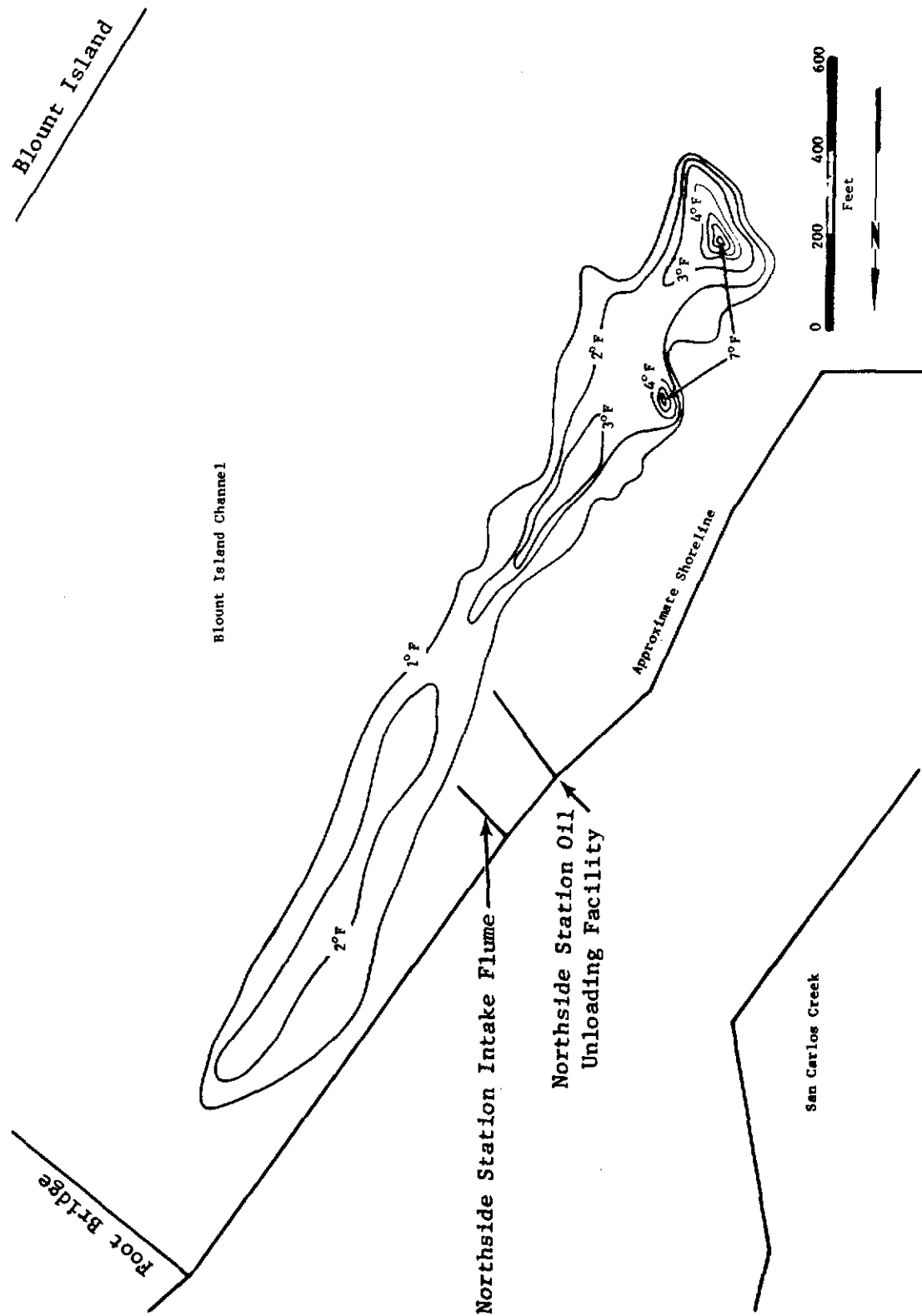


Figure 2.5-11

Extent of Northside Station Thermal Discharge, Plan View at One Meter Depth, Survey 3 (Start of Flood Tide)

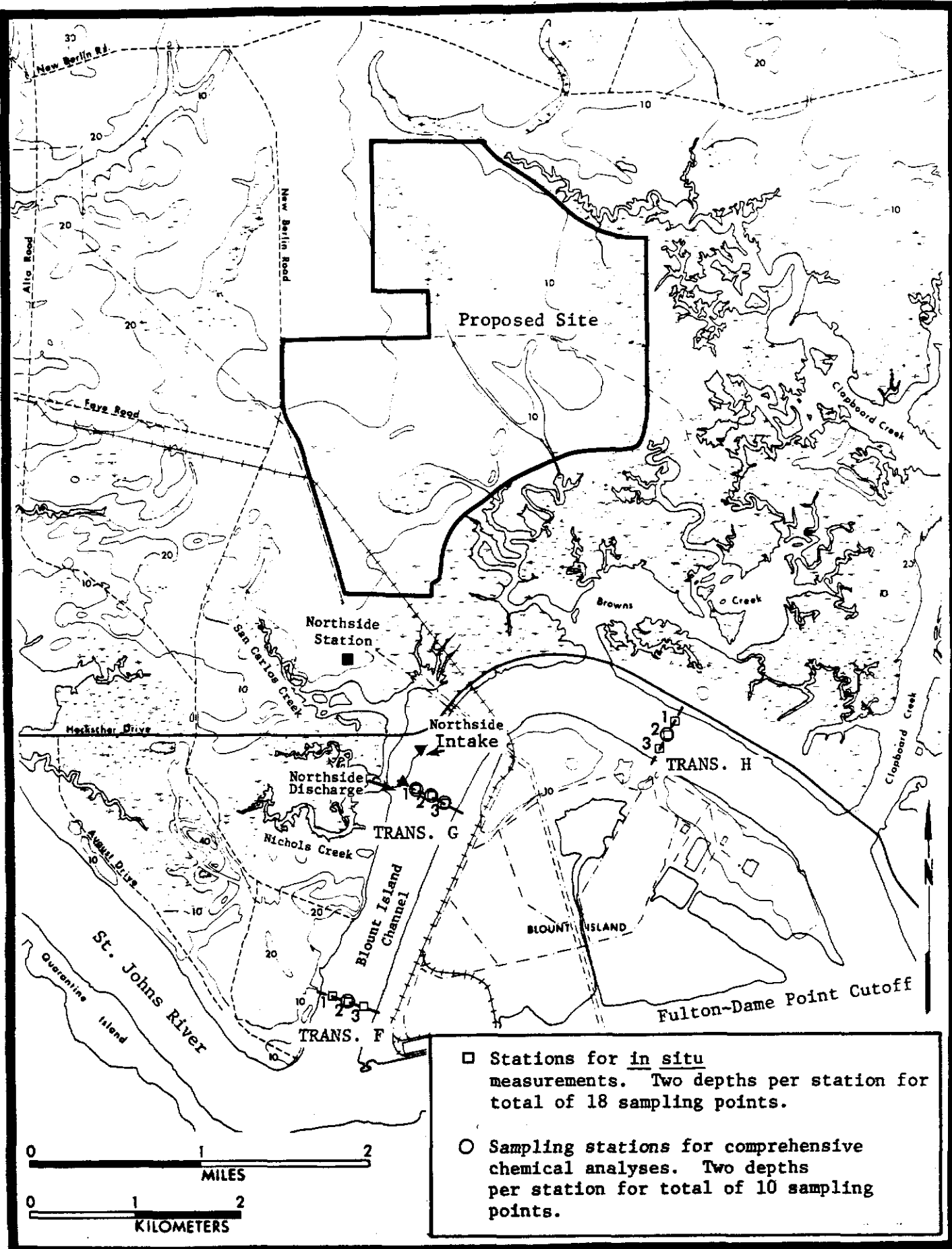


Figure 2.5-12

St. Johns River Water Quality Monitoring Locations

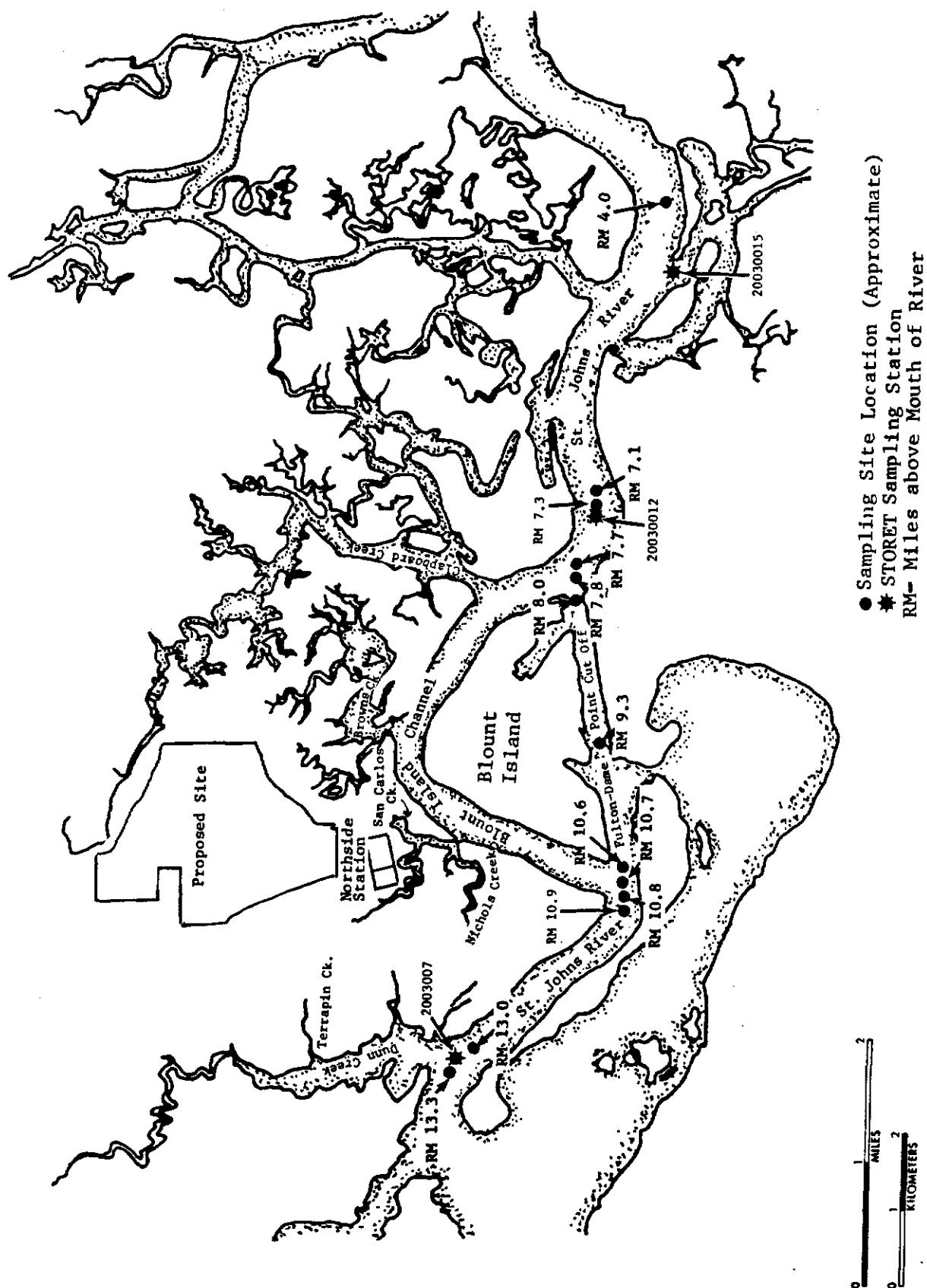


Figure 2.5-13 Historical Water Quality Sampling Sites - St. Johns River

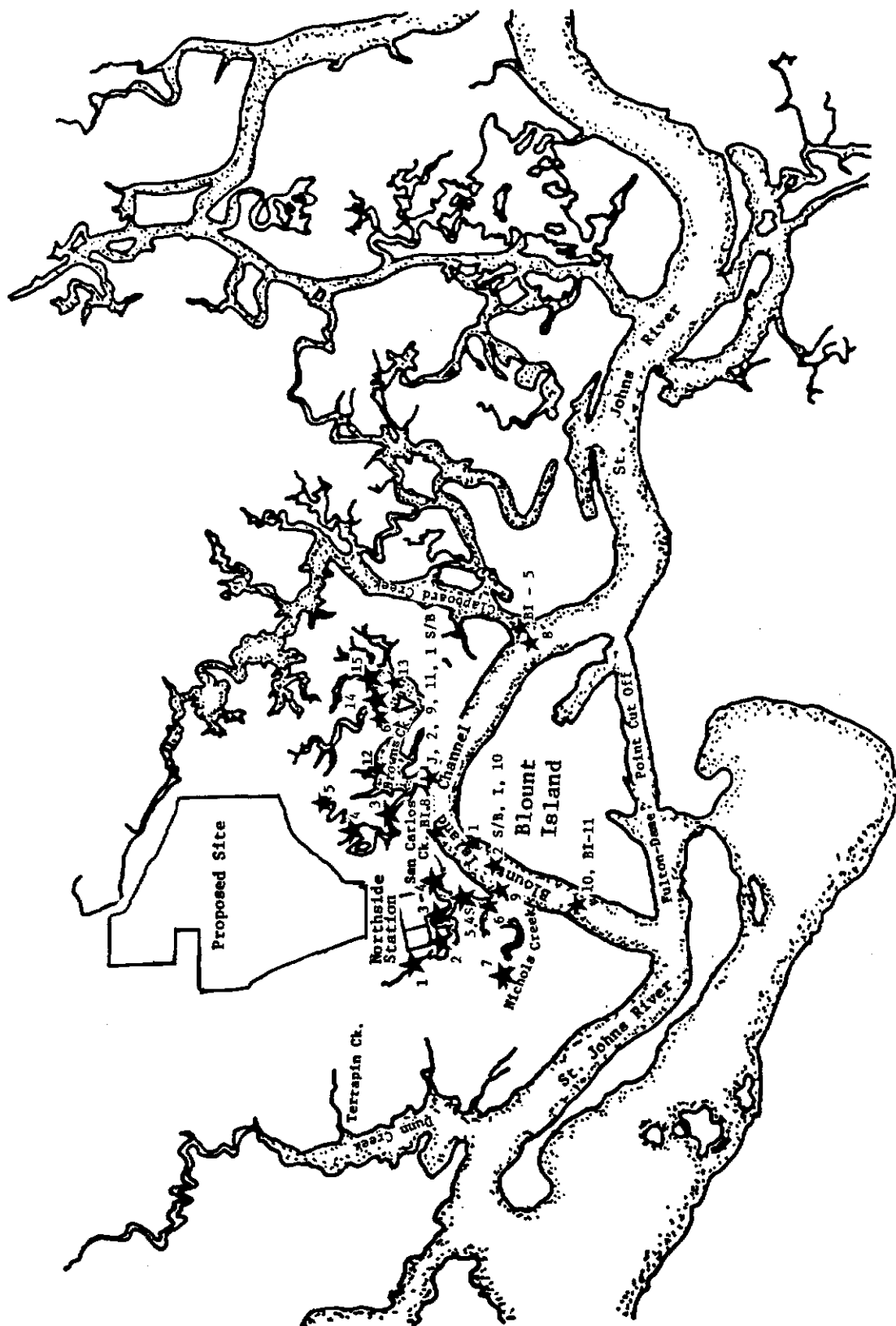


Figure 2.5-14 Historical Water Quality Sampling Sites - Blount Island Channel, Browns Creek, Nichols Creek, and San Carlos Creek

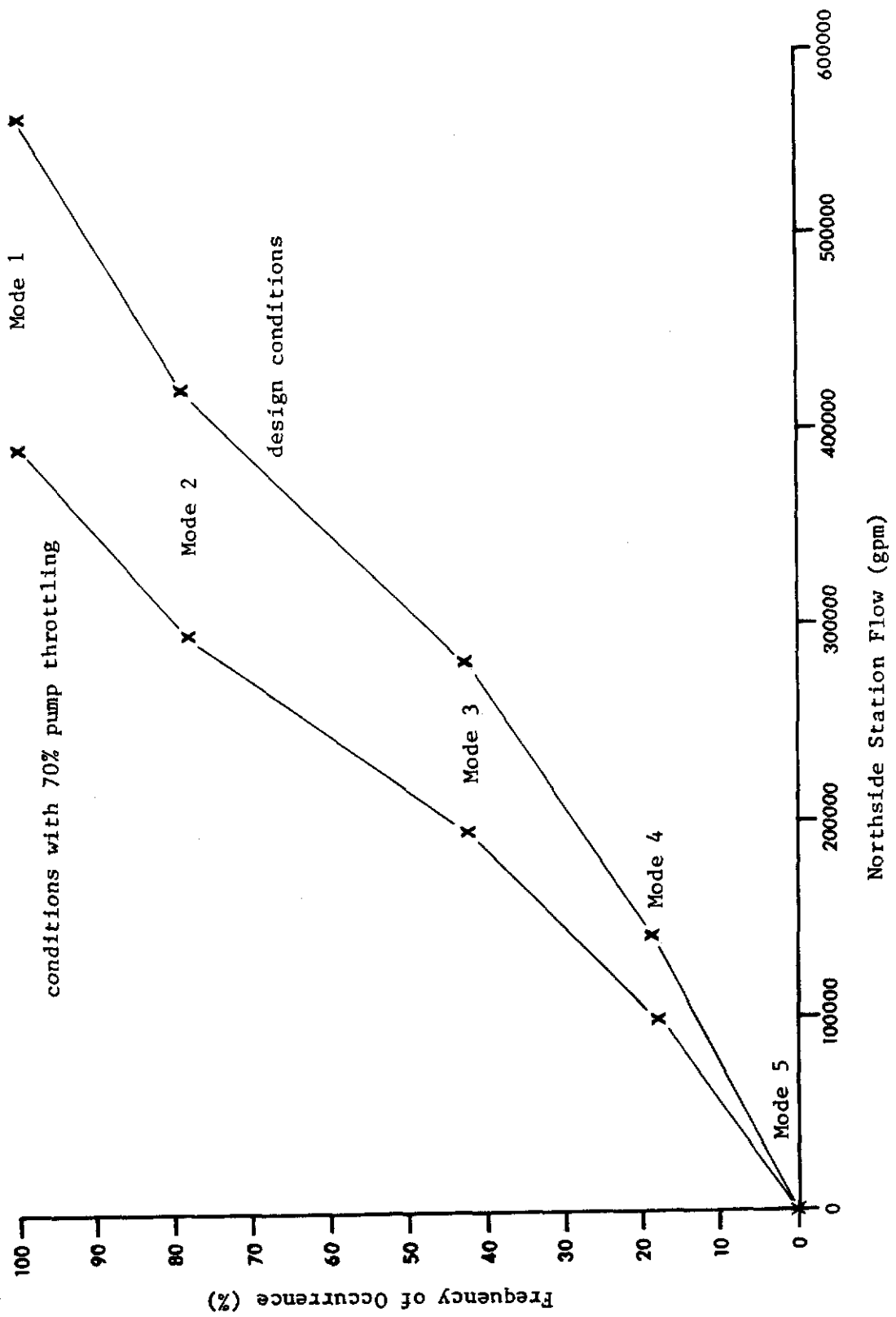


Figure 2.5-15 Frequency of Occurrence of Northside Station Pumping Modes

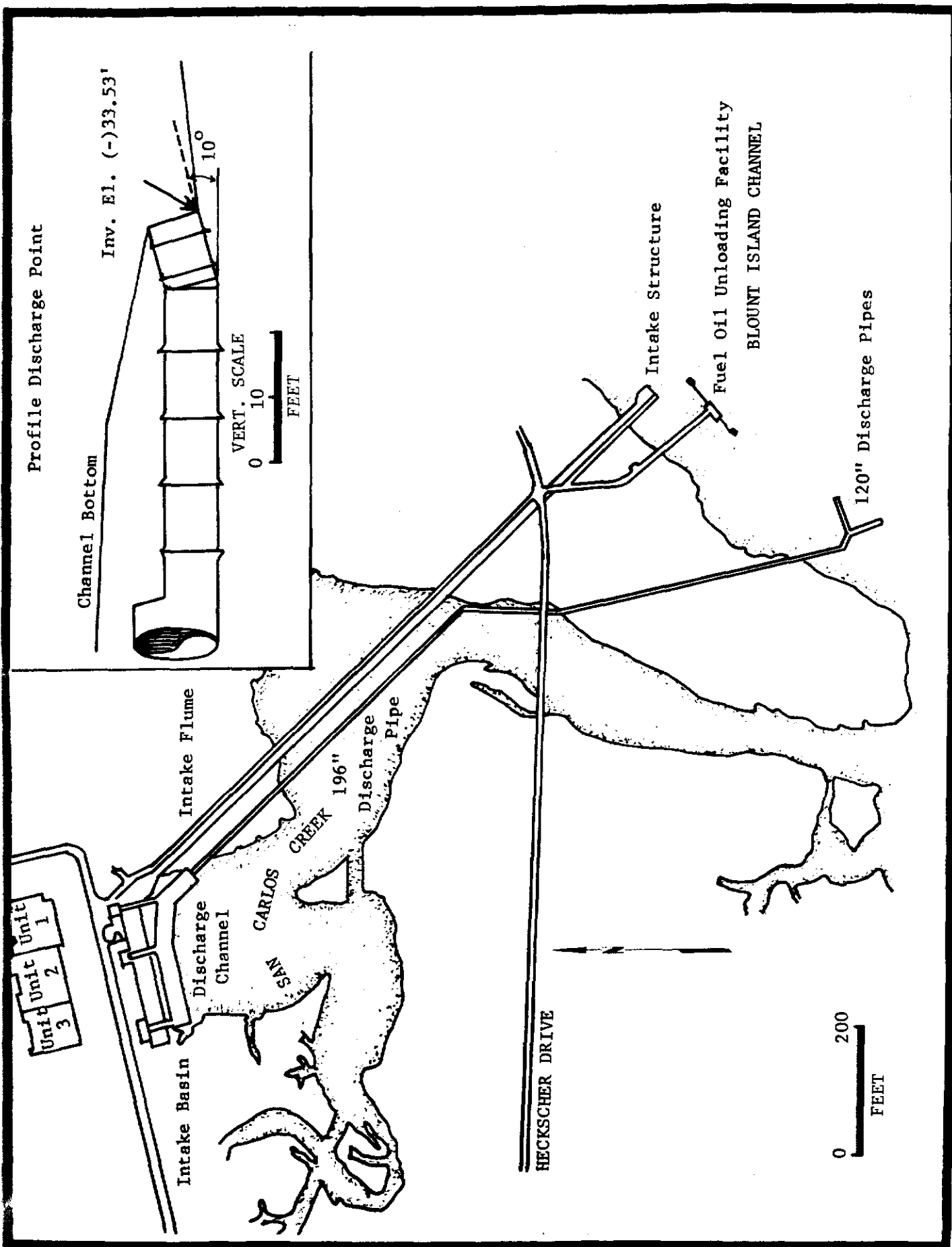


Figure 2.5-16 Northside Station Circulating Water System

Plume Centerline Distance to 2°F Isotherm
 Northside Only, Average Conditions

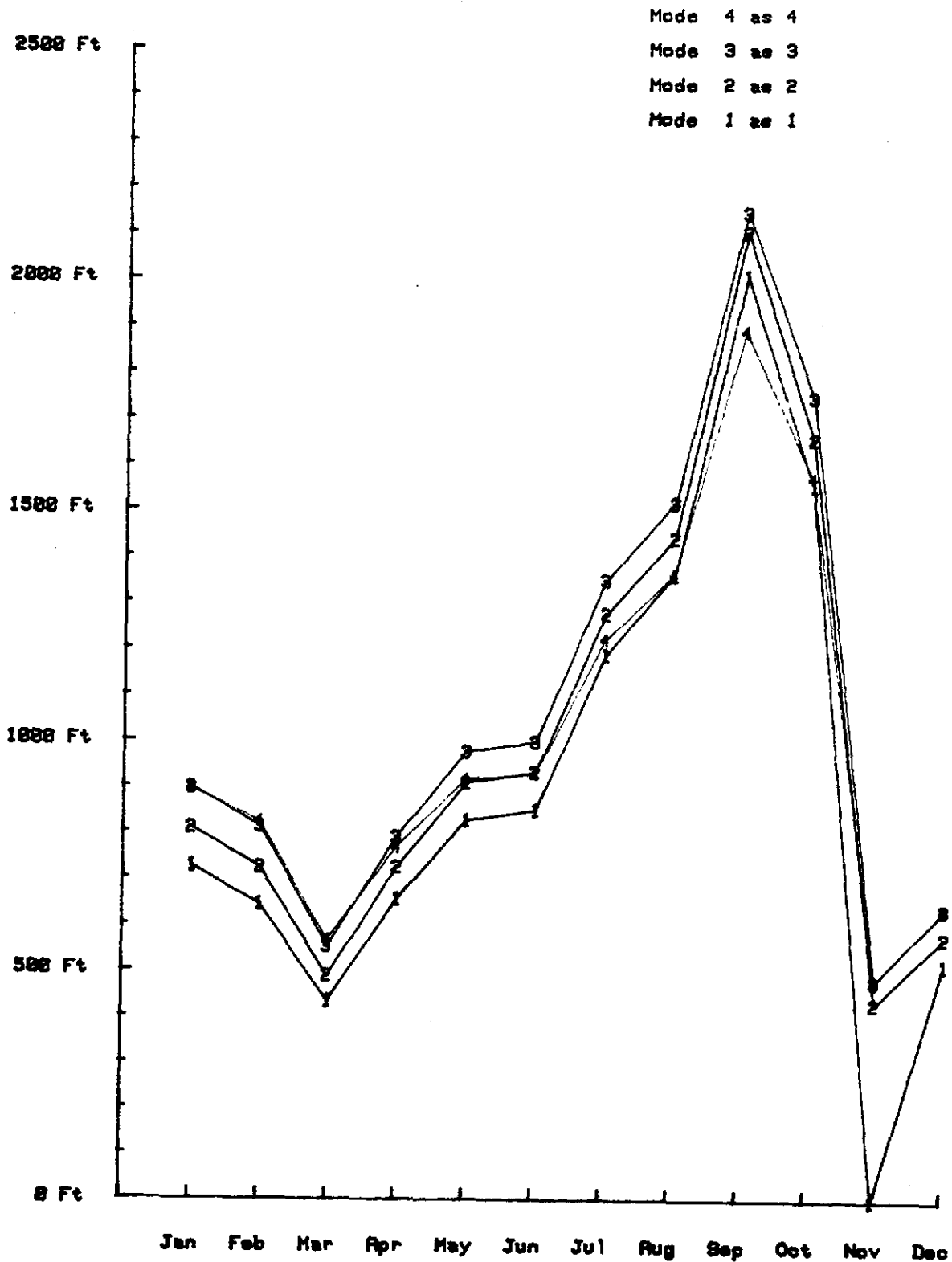


Figure 2.5-17

Predicted Plume Centerline Distance to 2°F Isotherm for Northside Station Operation, Average Conditions

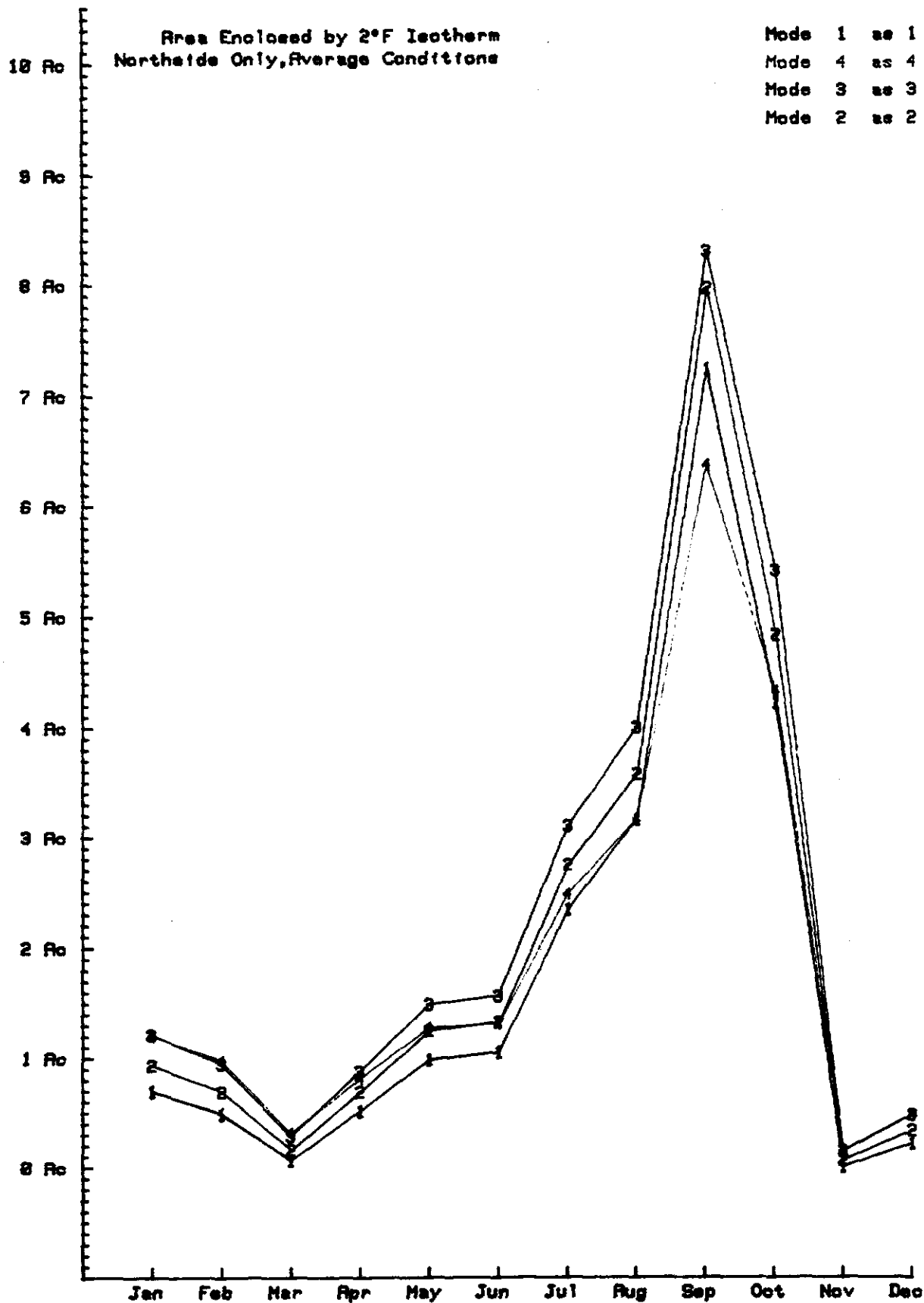


Figure 2.5-18

Predicted Area Enclosed by 2°F Isotherm for Northside Station Operation,
Average Conditions

Plume Centerline Distance to 2°F Isotherm
Northside Only, Extreme Conditions

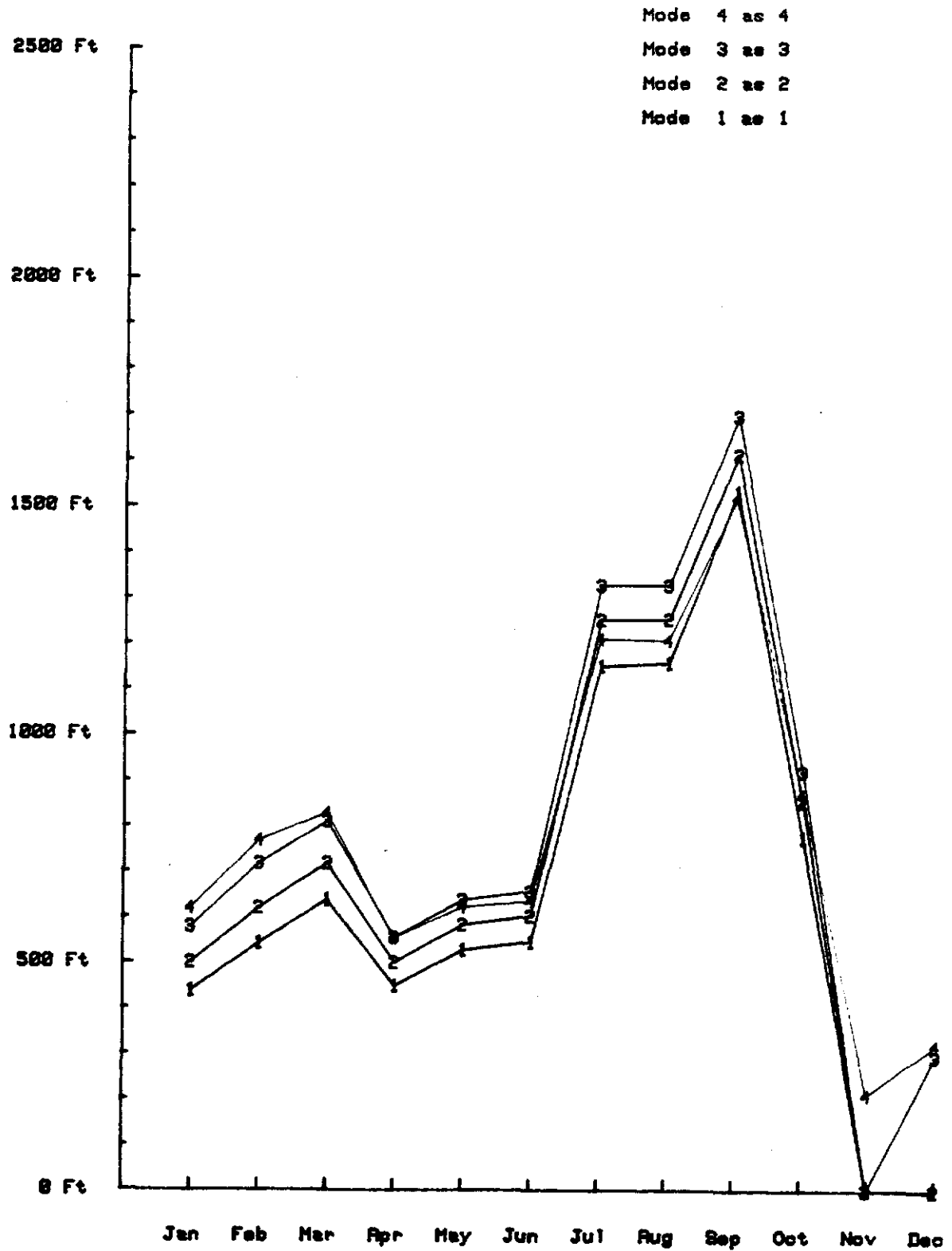


Figure 2.5-19

Predicted Plume Centerline Distance to 2° Isotherm for Northside Station Operation, Extreme Conditions

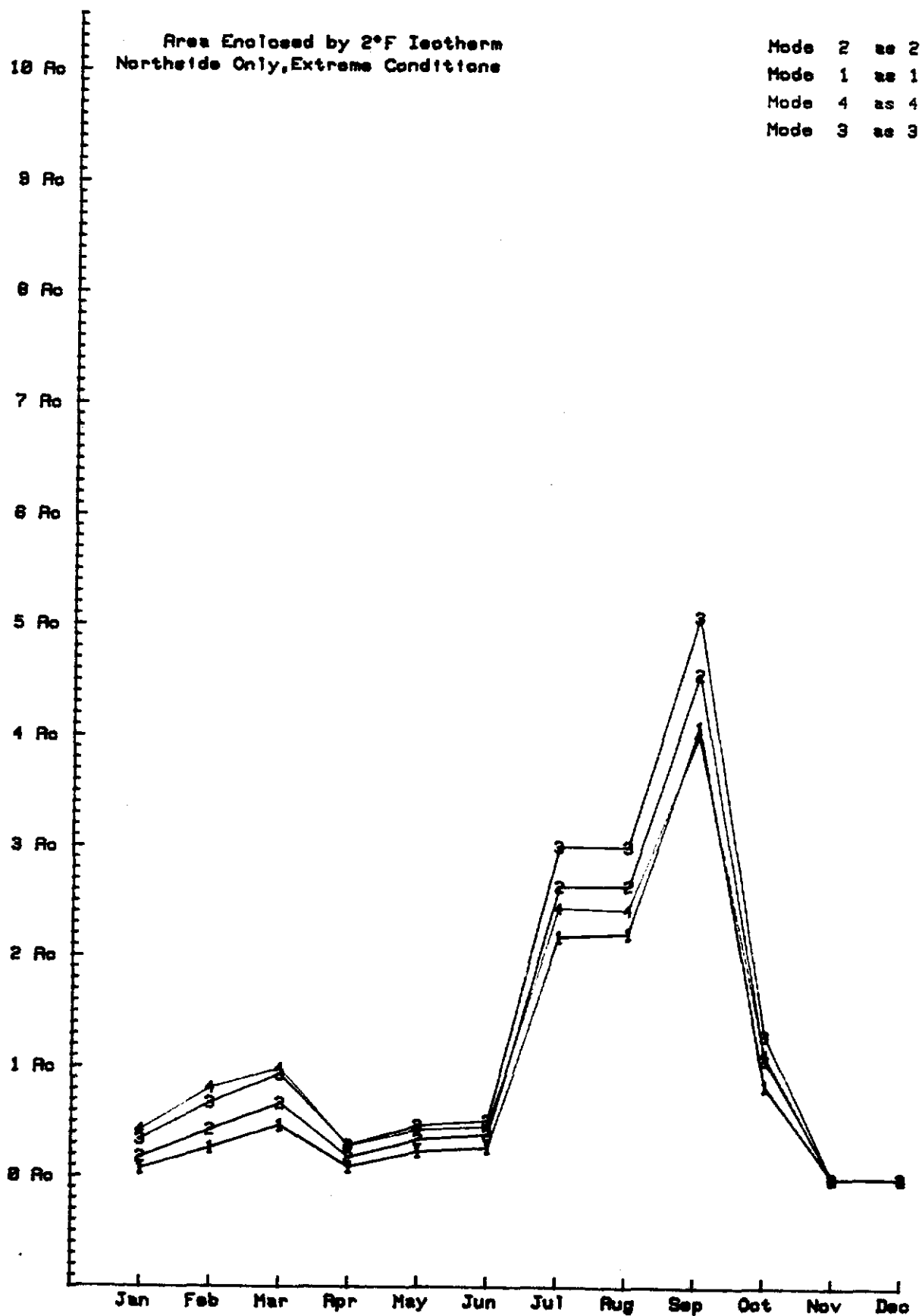


Figure 2.5-20

Predicted Area Enclosed by 2°F Isotherm for Northside Station Operation,
Extreme Conditions

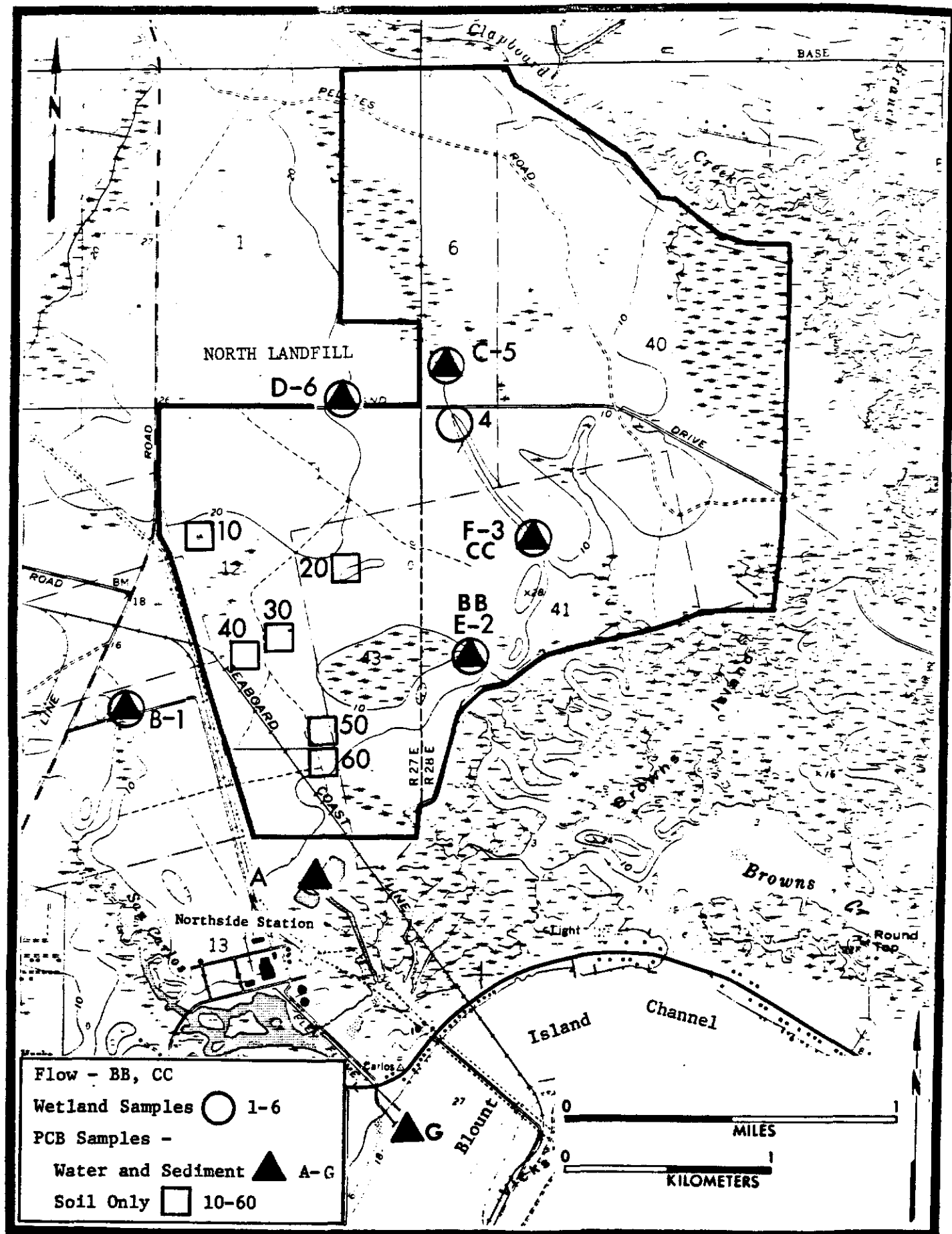
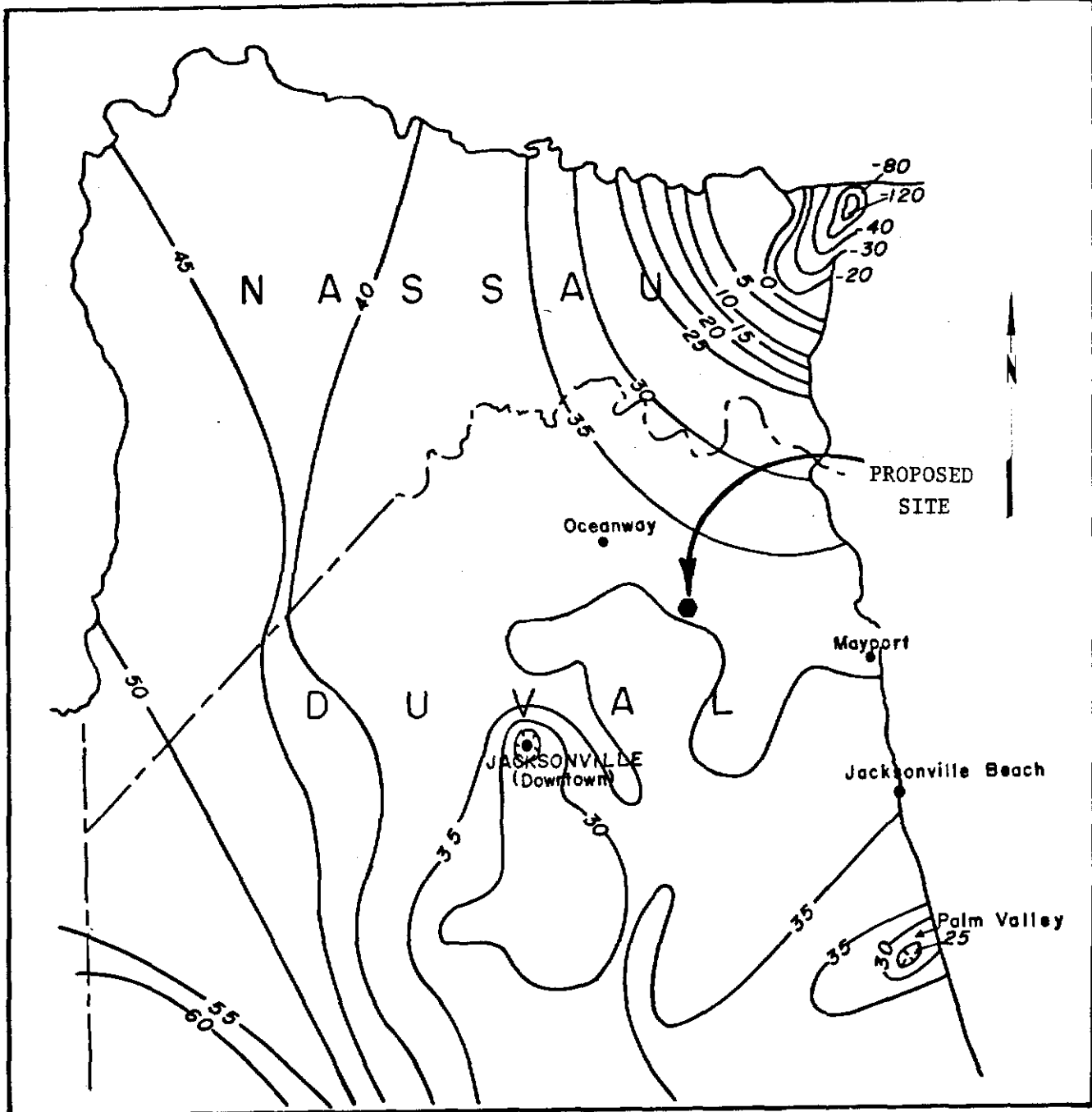


Figure 2.5-21 Water Quality and PCB Sampling Locations for Waterbodies in the Proposed Site Area



Source: Laughlin et al., 1980

—30— POTENTIOMETRIC CONTOUR - Shows altitude at which water level would have stood in tightly cased wells. Hachures indicate depressions. Contour intervals 5, 20, and 40 feet. Datum is National Geodetic Vertical Datum of 1929 (NGVD).

SCALE
10 MILES 0 10 MILES

Figure 2.5-22 Potentiometric Surface Map of the Floridan Aquifer:
May, 1979

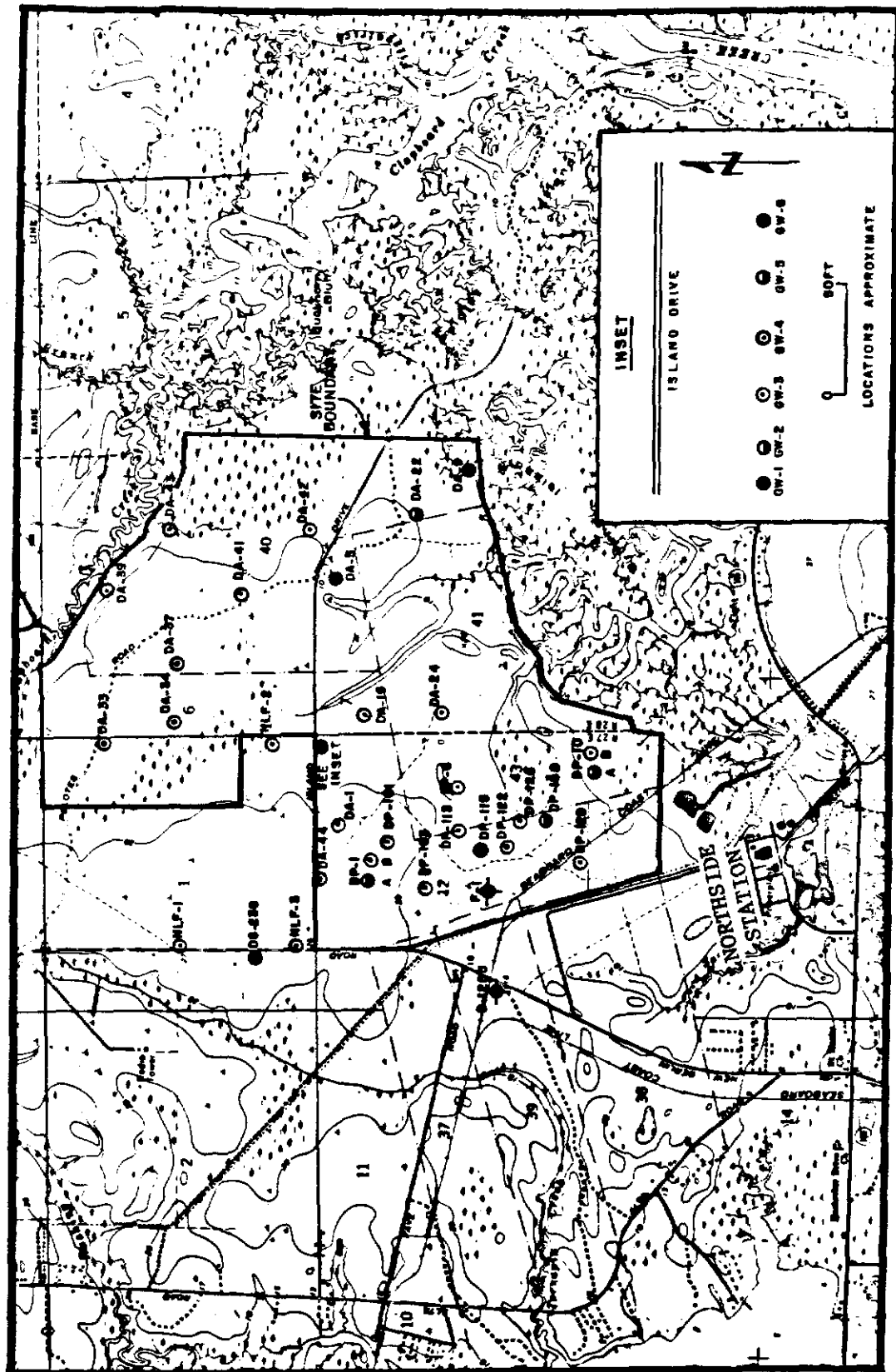


Figure 2.5-23

Locations of Test Wells, Piezometers, and Observation Wells on the Proposed Site

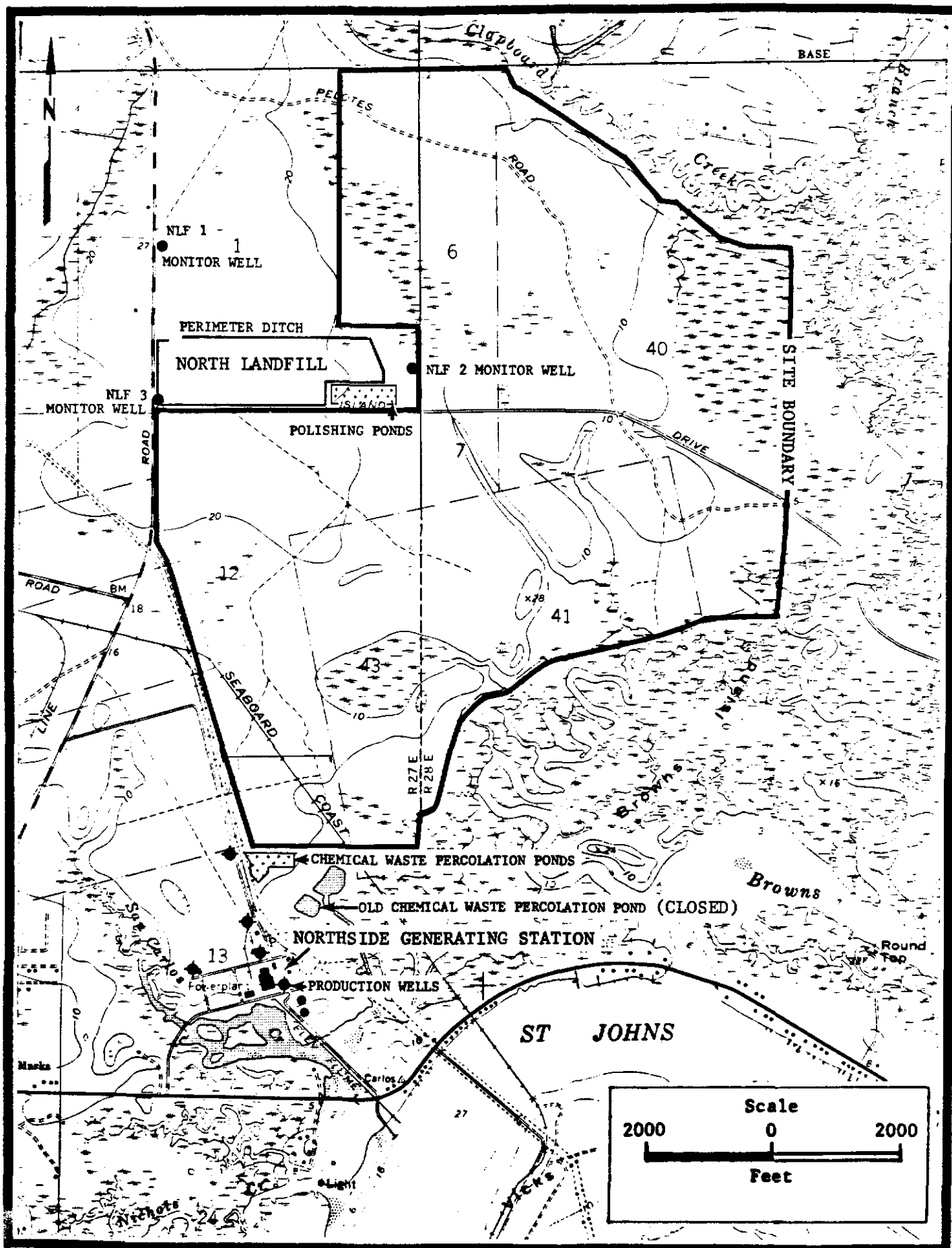


Figure 2.5-24 Location of Facilities Adjacent to the Proposed Site

2.6 CLIMATOLOGY

2.6.1 General Climatology

The influence of the Atlantic Ocean and the Bermuda high pressure system results in the prevailing subtropical marine climate of the northeastern Florida region. Long, warm, humid summers and short, mild winters prevail. Because of its southerly location and marine influences, this area exhibits a fairly constant climate, evidenced by small annual and diurnal temperature variations. Rainfall is moderate to heavy during the summer and light during the winter. Well developed extra-tropical migratory high and low pressure centers usually traverse north of the region, and their influence on the area is therefore minimal.

Extremely hot weather is rare because of the maritime climate. Maximum temperatures over a summer usually do not exceed the middle 90's, and winter temperatures are mild, interrupted only a few times per season by northerly or northwesterly intrusions of polar air. Inland locations generally display a greater range of temperatures than do coastal locations due to the rapid heating and cooling of ground surfaces as compared with water bodies.

Winds are of moderate speed and occur predominately from the southeast to southwest during the warmer half of the year. During the cooler months, the predominant wind direction is northwesterly. Along the coastal areas of northeastern Florida, local land-sea breeze circulations modify regional wind patterns by adding an easterly wind component during the daytime hours and a westerly component at night.

The average annual rainfall in this region is over 50 inches. Summer precipitation (May-October) is usually twice the winter precipitation (November-April). Winter precipitation results from frontal systems, pre-frontal squall lines, and wave disturbances along fronts stalled over the Florida peninsula. Summer precipitation is mostly of the convective

type, resulting in frequent summertime afternoon thundershowers. Tropical disturbances periodically cause significant additional precipitation during the summer and fall seasons.

2.6.2 Jacksonville Climatological Conditions

The following climatological summary information was obtained from meteorological data which were recorded at the Jacksonville International Airport and Imeson Field Airport. The Jacksonville International Airport (located approximately 14 km west-northwest of the site) is the closest currently operating first-order weather station. Imeson Airport (located approximately 8 km west of the site) was closed in 1971. The data collected from both of these locations are felt to be representative of long-term, on-site conditions because of their proximity to the proposed site.

2.6.2.1 Temperatures

Monthly and annual values of average daily mean, maximum and minimum temperatures recorded at Jacksonville during the period 1941-1970 are presented in Table 2.6-1. Temperature extremes are also included. The annual mean temperature is 68.4°F, with the monthly means ranging from 54.6°F in January to 81.0°F in July and August. The highest temperature recorded was 105°F (July, 1942), and the lowest temperature was 12°F (December, 1962).

2.6.2.2 Atmospheric Humidity

Because of its maritime location, the atmosphere in northeastern Florida is moist, with an average relative humidity of about 75 percent. Table 2.6-2 presents monthly and annual averages of relative humidity observed at Jacksonville. Relative humidities are generally highest during the early morning hours, typically ranging between 80 and 90 percent,

compared to about 50 and 60 percent during the afternoon. Mean relative humidities tend to be lowest in the spring months and highest in the summer months; however, seasonal differences are small.

2.6.2.3 Winds

Figure 2.6-1 is an annual surface level wind rose for the period 1970 to 1974 at Jacksonville. These data indicate a fairly even distribution of wind directions, but with winds from the southwest and northwest quadrants slightly more frequent than the others. Table 2.6-3 presents monthly average wind speeds and directions recorded at Jacksonville during the period 1941 to 1970. The annual average wind speed for this period was 8.4 miles per hour (mph), with northwesterly winds being most common. The most common direction varies from southwesterly in the spring and summer to northeasterly and northwesterly in the fall and winter. The monthly mean wind speed varies from 9.4 mph in February and March to 7.2 mph in August.

Winds in excess of 40 mph have been recorded in every month of the year at Jacksonville. Strong, gusty surface winds often occur in association with severe thunderstorm activity, well developed cold fronts, and tropical cyclones. The fastest mile of wind (the fastest speed, in miles per hour, of any "mile" of wind which passes the anemometer) on record at Jacksonville is 82 mph; it was associated with Hurricane Dora in September, 1964. One method which is used to quantify wind potential for a given area is the 100-year fastest mile wind speed which is the maximum expected wind over a 100-year interval. The 100-year fastest mile wind speed as calculated by the American National Standard Institute (ANSI, 1972) in the Jacksonville area is 100 mph.

2.6.2.4 Precipitation

Rainfall in the Jacksonville area reaches a maximum during the summer months and diminishes during the late fall and winter months. Summer rainfall tends to be in the form of convective showers with large differences in amounts from one location to another on any given day.

Winter precipitation is generally associated with frontal activity from migrating low pressure systems and is more evenly distributed in a spacial sense.

The average annual rainfall at Jacksonville during the period 1941 to 1970 was 54.47 inches (USDC, 1978). Monthly average rainfall amounts are listed in Table 2.6-4. The month with the highest average rainfall was August with 7.89 inches. Lowest average rainfall occurred during November with 1.79 inches. The record rainfall for one month occurred during September, 1949 when 19.36 inches were recorded. The record for a 24-hour period is 10.17 inches, which occurred in September, 1950.

Based on various observations and extrapolation techniques, Hershfield (1961) calculated expected maximum point precipitation quantities for various durations and return periods. These calculated values are presented in Table 2.6-5.

2.6.2.5 Visibility

Five years (1964-1968) of visibility data from the Imeson Airport were analyzed to determine background visibility in the Jacksonville region. The visibility data are those reported by the National Weather Service as "prevailing visibility". By definition, prevailing visibility means the greatest horizontal visibility (visual range) prevailing throughout at least half of the horizon circle which need not necessarily be continuous. Daytime visibility is measured by observing markers (i.e., buildings, towers, terrain) against the horizon sky; nighttime visibility measurements are based on observing unfocused, moderately intense light sources.

The results of a summary of the hourly observations for the five year period are presented in Table 2.6-6. The data indicated that the most frequent prevailing visibilities are between 8 and 12 miles. These values are fairly typical of visibilities in the eastern U.S. (Trijonis and Yuan, 1978).

2.6.3 Dispersion Climatology

2.6.3.1 Stability

Atmospheric stability in conjunction with general wind patterns and mixing height determines the potential of the atmosphere to disperse airborne pollutants. Atmospheric stability conditions are typically categorized as unstable, neutral, or stable. An unstable atmosphere is one in which rapid diffusion takes place in both the horizontal and vertical direction. In terms of temperature changes with height, an unstable atmosphere is characterized by a sharp decrease in temperature with height. Neutral conditions, which are characterized by moderate decreases of temperature with height, are common in the atmosphere and are associated with moderate diffusion rates. A stable atmosphere is characterized by only slight decreases, or even increases of temperature with height, and greatly reduced diffusion rates in comparison with unstable or neutral atmospheres.

The stability classifications presented in this section are based on the Turner (1964) or "STAR" method, which assigns a stability on the basis of surface wind speed, cloud cover, and solar angle. The mean seasonal and annual frequency distribution of stability classes for a five-year period from 1970 to 1974 at Jacksonville is summarized in Table 2.6-7. The seasonal stability distribution indicates that during the summer months there is a high incidence of unstable (Classes A, B and C) conditions (39 percent), while winter has the lowest incidence of unstable conditions (13 percent) and the highest percentage of neutral (Class D) conditions (48 percent). The largest relative percentage of stable (Class E) conditions (50 percent) occurs during the fall. There are also distinct diurnal trends displayed by atmospheric stability. The daytime hours are characterized by unstable conditions; stable conditions prevail at night.

Appendix F contains a summary of wind directions and speeds categorized by these stability classes. This is referred to as STAR program data.

2.6.3.2 Mixing Height

An important parameter which describes the regional dispersion capability of the atmosphere is mixing height. Mixing height is simply the vertical extent of the surface layer within which relatively vigorous mixing of pollutants takes place. Holzworth (1972) has compiled statistical summaries for mixing height at various locations throughout the United States based on twice daily balloon soundings. Average mixing heights and associated average wind speeds through the mixing layer for Jacksonville during the period 1960 to 1964 are shown in Table 2.6-8. This table also shows the number of episodes characterized by two or more consecutive days with mixing heights and mixing layer wind speeds lower than selected values. Holzworth's comparison of 62 locations throughout the United States indicates that conditions in northeastern Florida are more favorable for regional dispersion than are most other areas of the country.

2.6.4 On-Site Meteorological Conditions

2.6.4.1 General

An on-site meteorological monitoring program was conducted to provide data which would, together with the regional data described above, allow a description of on-site meteorological conditions to support the environmental impact analyses. Wind direction and speed, temperature, humidity, precipitation, and an atmospheric stability parameter were monitored from December, 1979 to December, 1980 at a location approximately 3.5 km north-northeast of the proposed plant stack. Figure 6.2-13 in Chapter 6 depicts the location of the monitoring facility and Section 6.2.6 provides a detailed discussion of the monitoring program.

Brief summaries of the data collected are presented in the following sections along with comparisons with regional data. The data reported for the month of December in the following paragraphs are actually a

combination of December, 1979 and December, 1980 data since the monitoring program actually commenced on December 10, 1979 and ceased on December, 10, 1980. The results of the monitoring program are discussed in more detail in four quarterly reports (Envirosphere; 1980, 1980a, 1980b, 1981), which have been submitted to the Florida Department of Environmental Regulation (FDER) and USEPA. These reports contain the raw hourly and/or daily data for the various parameters, monthly summaries, and quality assurance data.

2.6.4.2 Temperatures

Table 2.6-9 presents the monthly and annual mean and extreme temperatures measured at the monitoring facility along with the monthly mean Jacksonville International Airport temperatures reported during 1980. The highest recorded hourly average temperature was 98.9°F and the lowest was 28.0°F. The monthly mean temperatures ranged from 50.2°F in February to 80.6°F in July, and the annual mean temperature was 68.4°F. The monthly mean temperatures reported at the Jacksonville International Airport during the same period of record were 2 to 3°F higher than the mean monthly and annual temperatures recorded at the monitoring facility. The differences are probably due to a combination of different equipment, different measurement heights above ground level and the difference in distances from the ocean. With the exception of the below average temperatures recorded during the month of February, the year was comparable to the average temperatures normally observed at the airport, which are summarized in Table 2.6-1.

2.6.4.3 Atmospheric Humidity

Table 2.6-10 summarizes the monthly and annual mean relative humidity as a function of time of day at the monitoring facility. The relative humidity was computed from the ambient temperature and the dewpoint temperature which were both measured at the monitoring facility. The relative humidity at the site was high during the early morning hours

throughout the entire year, with mean 1 a.m. humidities ranging from 82 percent in February to 96 percent in September. The lowest relative humidity usually occurred during the afternoon hours. Seasonally, the lowest relative humidities generally occurred during the early spring and late fall months. These on-site mean relative humidity values are about 10 percent higher than the long term mean relative humidity values recorded at Jacksonville International Airport which are summarized in Table 2.6-2. This difference is probably due to a combination of different measuring equipment, differences in the measurement heights above ground level, differences in distance from the ocean and the proximity of the on-site monitoring station to ponds and wetlands.

2.6.4.4 Winds

Table 2.6-11 presents the monthly and annual averaged wind speeds and most frequent wind directions measured at the monitoring facility and at the Jacksonville International Airport during 1980. The monthly average wind speeds ranged from 4.5 mph in September to 7.3 mph in March. The prevailing wind directions during the winter months were generally northwesterly and shifted to the west during the early summer months and to the east in late summer/early fall. Wind speeds observed at the Jacksonville International Airport during the same period of record were slightly higher and wind directions generally exhibited a somewhat greater northerly component during the winter.

Comparison of the 1980 on-site and Jacksonville International Airport wind data to the long term average (1970-1974) wind conditions at the airport, as summarized in Table 2.6-3, indicates that the wind speeds during the past year were lower than normal, but that the distribution of directions were similar.

Figures 2.6-2 and 2.6-3 present the 1980 annual wind roses for the on-site and Jacksonville International Airport wind data, respectively. The 1980 Jacksonville International Airport wind rose is very similar to

the 5 year (1970-1974) airport wind rose presented in Figure 2.6-1, indicating that from a wind direction standpoint 1980 was a "representative" year. The 1980 on-site wind rose is similar to the airport wind rose, but there are a few differences. The on-site wind exhibited particularly large westerly, northwesterly and southwesterly components while the airport data exhibited strong westerly and northerly components. There were also a significantly higher number of calm wind conditions reported at the airport, and the on-site data exhibited a greater occurrence of winds between 1 and 3 mph. These differences can be attributed in part to the differences in measuring equipment and to the differences in observational methods used to compile the two data bases. While the on-site data uses electronically averaged wind data using up to 600 samples per hour, the airport data is a nearly instantaneous observation made by an observer once per hour.

2.6.4.5 Precipitation

The precipitation was measured at the monitoring facility using a volumetric rain gauge. The monthly precipitation totals are summarized in Table 2.6-12. Monthly totals ranged from a low of 1.05 inches in February to a high of 8.08 inches in June. The annual total precipitation measured during the year (41.2 inches) was relatively light compared to the climatological normal of 54.5 inches measured at the Jacksonville International Airport as presented in Table 2.6-4.

2.6.4.6 Stability

The horizontal wind direction standard deviation, or wind sigma, was computed directly from the wind direction measurements at the on-site monitoring station. The wind direction standard deviation provides one indication of the atmospheric stability. Table 2.6-13 presents the seasonal and annual frequency distributions of the various stability classes as determined by this method. Although there was some variation of

the stability classifications throughout the year, the only clear seasonal pattern was the occurrence of less unstable and more stable conditions during the winter than in the other seasons.

The stability classification system used on the Jacksonville International Airport data, discussed in Section 2.6.3.1, is based on a different method which used cloud cover, wind speed and sun angle. This stability classification, commonly referred to as the Turner classification method, was applied to five years of airport data and is summarized in Table 2.6-7. A comparison of Tables 2.6-7 and 2.6-13 indicates significantly more stable conditions at the airport than on-site. However, the difference is more likely due to differences in stability determination methods than to actual stability condition differences.

2.6.5 References

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Table 2.6-1

ATMOSPHERIC TEMPERATURE (°F) AT JACKSONVILLE, FLORIDA
1941-1970

<u>Month</u>	<u>Averages</u>		<u>Mean</u>	<u>Extremes</u>	
	<u>Daily Max.</u>	<u>Daily Min.</u>		<u>Highest</u>	<u>Lowest</u>
Jan	64.6	44.5	54.6	85	19
Feb	66.9	45.7	56.3	88	19
Mar	72.2	50.1	61.2	91	25
Apr	79.0	57.1	68.1	95	35
May	84.6	63.9	74.3	100	45
Jun	88.3	70.0	79.2	103	56
Jul	90.0	72.0	81.0	105	61
Aug	89.7	72.3	81.0	102	64
Sep	86.0	70.4	78.2	100	50
Oct	79.2	61.7	70.5	96	38
Nov	71.4	51.0	61.2	88	21
Dec	65.6	45.1	55.4	84	12
Annual	78.1	58.7	68.4	105	12

Source: U.S. Department of Commerce, 1978

Table 2.6-2

MEAN MONTHLY AND ANNUAL RELATIVE HUMIDITY (%)
AT JACKSONVILLE, FLORIDA
1936-1978

Month	Hour of the Day (LST)			
	0100	0700	1300	1900
Jan	85	87	57	74
Feb	82	85	52	68
Mar	82	85	49	65
Apr	83	85	47	64
May	85	84	50	66
Jun	87	86	56	72
Jul	88	87	58	75
Aug	90	90	60	78
Sep	89	91	62	79
Oct	88	90	58	78
Nov	87	89	55	78
Dec	86	88	58	77
Annual	86	87	55	73

Source: U.S. Department of Commerce, 1978

Table 2.6-3

LONG-TERM AVERAGE
WIND CONDITIONS AT JACKSONVILLE, FLORIDA

<u>Month</u>	<u>Average Speed (mph) (1941-1970)</u>	<u>Most Common Direction (1950-1963)</u>	<u>Fastest Mile (1941-1970)</u>
Jan	8.4	NW	41
Feb	9.4	WSW	52
Mar	9.4	NW	44
Apr	9.1	SE	48
May	8.6	WSW	62
Jun	8.3	SW	76
Jul	7.5	SW	49
Aug	7.2	SW	52
Sep	8.1	NE	82
Oct	8.6	NE	72
Nov	8.1	NW	60
Dec	8.2	NW	62
Annual	8.4	NW	82

Source: U.S. Department of Commerce, 1978

Table 2.6-4

AVERAGE MONTHLY RAINFALL AT JACKSONVILLE, FLORIDA
1941-1970

<u>Month</u>	<u>Mean (inches)</u>	<u>Maximum (inches)</u>	<u>Minimum (inches)</u>
Jan	2.78	7.29	0.06
Feb	3.58	8.85	0.52
Mar	3.56	10.18	0.18
Apr	3.07	11.61	0.17
May	3.22	10.43	0.61
Jun	6.27	12.90	2.19
Jul	7.35	16.21	1.97
Aug	7.89	16.24	1.92
Sep	7.83	19.36	1.02
Oct	4.54	13.44	0.16
Nov	1.79	7.85	T
Dec	<u>2.59</u>	7.09	0.04
Annual	54.47		

a Trace

Source: U.S. Department of Commerce, 1978

Table 2.6-5

JACKSONVILLE AREA
CALCULATED MAXIMUM POINT PRECIPITATION
(inches)

<u>Rainfall Period</u>	<u>Return Period (Years)</u>						
	<u>1</u>	<u>2</u>	<u>5</u>	<u>10</u>	<u>25</u>	<u>50</u>	<u>100</u>
30 minutes	1.5	1.7	2.1	2.4	2.7	3.0	3.2
1 hour	2.0	2.2	2.6	3.0	3.4	3.8	4.1
2 hours	2.3	2.7	3.3	3.7	4.3	4.8	5.3
3 hours	2.5	3.0	3.8	4.2	4.8	5.4	6.0
6 hours	3.0	3.5	4.5	5.1	6.0	6.9	7.3
12 hours	3.5	4.2	5.5	6.4	7.2	8.0	9.0
24 hours	4.0	4.9	6.4	7.5	8.5	9.8	11.0

Source: Hershfield, 1961

Table 2.6-6 (Revision 1)

PERCENT FREQUENCY DISTRIBUTION OF VISIBILITY
AT IMESON AIRPORT
(1964-1968)

<u>Season</u>	<u>0-2</u>	<u>2-4</u>	<u>Distance (Miles)</u>		<u>8-12</u>	<u>>12</u>
			<u>4-6</u>	<u>6-8</u>		
Spring	9.6	6.5	8.1	26.3	39.7	9.7
Summer	3.5	4.6	7.1	32.7	46.3	5.8
Fall	2.6	3.9	7.6	38.2	45.1	2.6
Winter	<u>5.1</u>	<u>5.7</u>	<u>9.1</u>	<u>36.7</u>	<u>38.1</u>	<u>5.3</u>
Annual	5.2	5.1	8.0	33.5	42.4	5.8

Source: U.S. Department of Commerce, 1969

Table 2.6-7

FREQUENCY DISTRIBUTION OF STABILITY CLASSES
AT JACKSONVILLE, FLORIDA
1970-1974

<u>Pasquill Stability Class</u>	<u>Percent Frequency by Season</u>				
	<u>Dec-Feb</u>	<u>Mar-May</u>	<u>Jun-Aug</u>	<u>Sept-Nov</u>	<u>Annual</u>
A - Extremely Unstable	0	1	2	1	1
B - Unstable	4	6	15	5	7
C - Slightly Unstable	9	14	22	11	14
D - Neutral	48	40	20	33	35
E - Stable (all)	39	39	41	50	43

Source: U.S. Department of Commerce, 1974

Table 2.6-8

AVERAGE MIXING HEIGHTS AND EPISODES OF LIMITED DISPERSION
AT JACKSONVILLE, FLORIDA
1960-1964

	Morning		Afternoon	
	Average Mixing Height (m)	Average Mixing Layer Wind Speed (m/s)	Average Mixing Height (m)	Average Mixing Layer Wind Speed (m/s)
Winter	345	5.2	1058	6.7
Spring	447	5.3	1639	7.1
Summer	567	4.3	1681	5.6
Autumn	418	4.7	1321	6.5
Annual	444	4.9	1424	6.5

Number of Episodes Lasting Two or More Days

<u>Mixing Height (m)</u>	<u>Wind Speed (m/s)</u>		
	<u>≤2</u>	<u>≤4</u>	<u>≤6</u>
≤ 500	0	0	1
≤ 1000	0	2	12
≤ 1500	0	12	43

Source: Holzworth, 1972

Table 2.6-9

MONTHLY MEAN AND EXTREME TEMPERATURES (°F)
 MEASURED AT THE ON-SITE MONITORING FACILITY
 VERSUS MONTHLY MEAN TEMPERATURES MEASURED
 AT JACKSONVILLE INTERNATIONAL AIRPORT DURING 1980

<u>Month</u>	<u>On-Site Monitoring Facility</u>			<u>Jacksonville Airport</u>
	<u>Highest</u>	<u>Lowest</u>	<u>Mean</u>	<u>Mean</u>
January	74.6	28.0	52.5	53.1
February	78.3	24.8	50.2	50.9
March	81.4	23.3	61.5	62.3
April	86.5	43.5	66.4	68.8
May	89.0	55.9	72.7	74.3
June	92.5	57.7	77.5	80.2
July	98.9	62.4	80.6	83.0
August	93.3	67.0	79.4	81.9
September	89.7	64.8	77.5	79.8
October	86.9	36.5	66.7	68.2
November	80.4	32.1	59.4	62.1
December	76.0	31.1	54.9	56.3
Annual	98.9	28.0	65.8	68.3

Table 2.6-10

MONTHLY AND ANNUAL MEAN RELATIVE HUMIDITY (%)
MEASURED AT THE ON-SITE MONITORING FACILITY DURING 1980

<u>Month</u>	<u>Hour of Day (LST)</u>			
	<u>0100</u>	<u>0700</u>	<u>1300</u>	<u>1900</u>
January	95	97	84	89
February	82	87	60	68
March	86	87	63	73
April	86	92	56	68
May	92	96	71	73
June	91	97	68	73
July	93	98	71	76
August	92	98	67	73
September	96	98	66	73
October	92	96	64	71
November	90	90	64	84
December	94	97	66	86
Annual	91	94	67	75

Table 2.6-11

MONTHLY AND ANNUAL WIND SPEED AND DIRECTION
 MEASURED AT THE ON-SITE MONITORING FACILITY AND
 JACKSONVILLE INTERNATIONAL AIRPORT
 DURING 1980

<u>Month</u>	<u>On-Site Monitoring Facility</u>		<u>Jacksonville International Airport</u>	
	<u>Most Frequent Direction</u>	<u>Speed (mph)</u>	<u>Most Frequent Direction</u>	<u>Speed (mph)</u>
January	WNW	5.0	N	6.0
February	NW	6.1	SW	7.2
March	SW	7.3	SW	8.4
April	WSW	6.7	W	7.2
May	W	6.3	W	6.3
June	WSW	5.7	WSW	6.2
July	W	5.9	W	6.7
August	NE	5.1	ENE	5.1
September	ENE	4.5	E	3.8
October	NNW	4.8	N	4.3
November	NNW	5.2	N	5.1
December	<u>NNE</u>	<u>5.1</u>	<u>NE</u>	<u>5.8</u>
Annual	WSW	5.6	W	6.0

Table 2.6-12

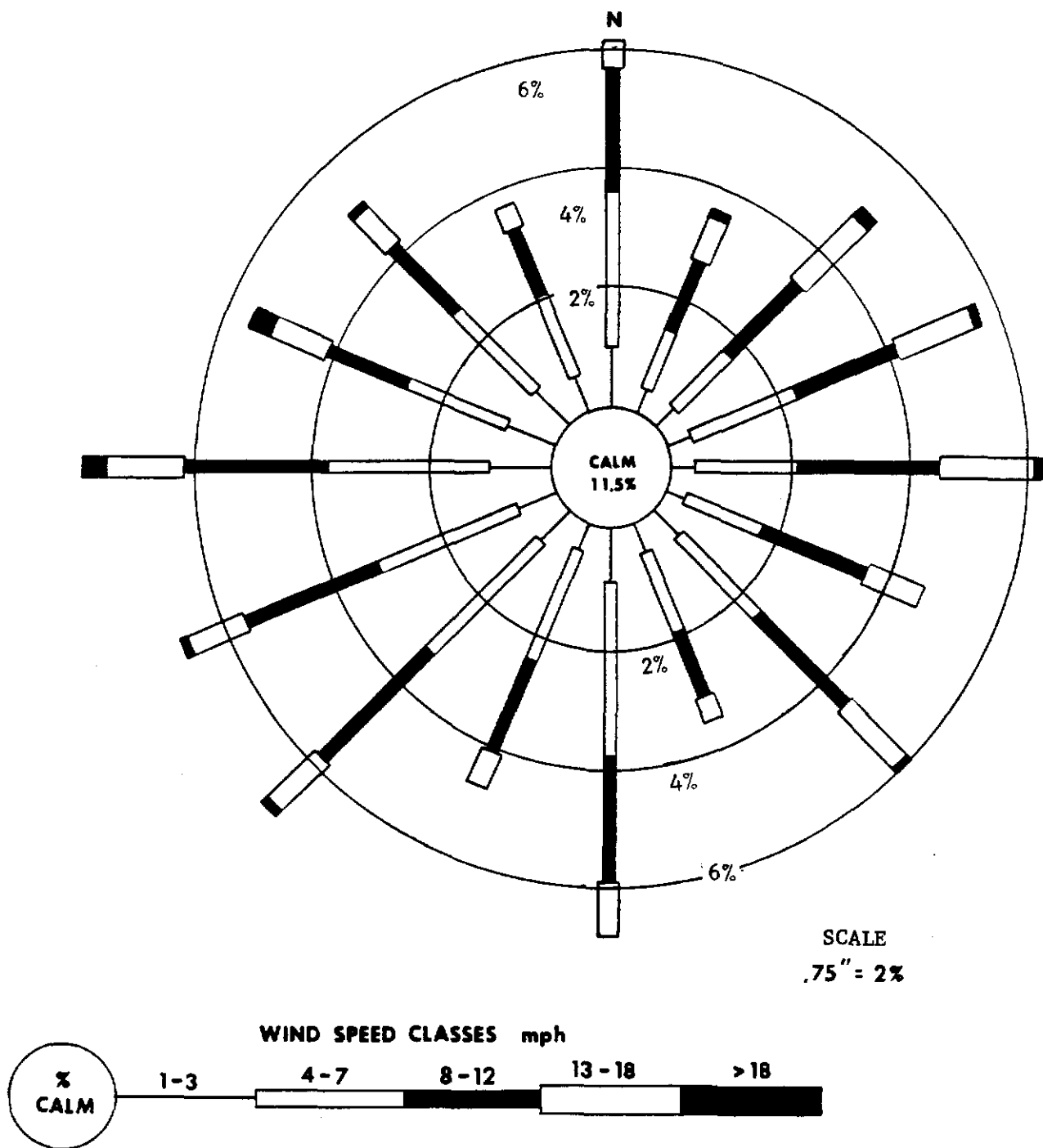
MONTHLY AND ANNUAL PRECIPITATION
MEASURED AT THE ON-SITE MONITORING FACILITY
DURING 1980

<u>Month</u>	<u>Total (inches)</u>
January	3.37
February	1.05
March	6.41
April	4.39
May	3.65
June	8.08
July	1.99
August	3.44
September	2.91
October	1.26
November	1.88
December	2.76
Annual	41.19

Table 2.6-13

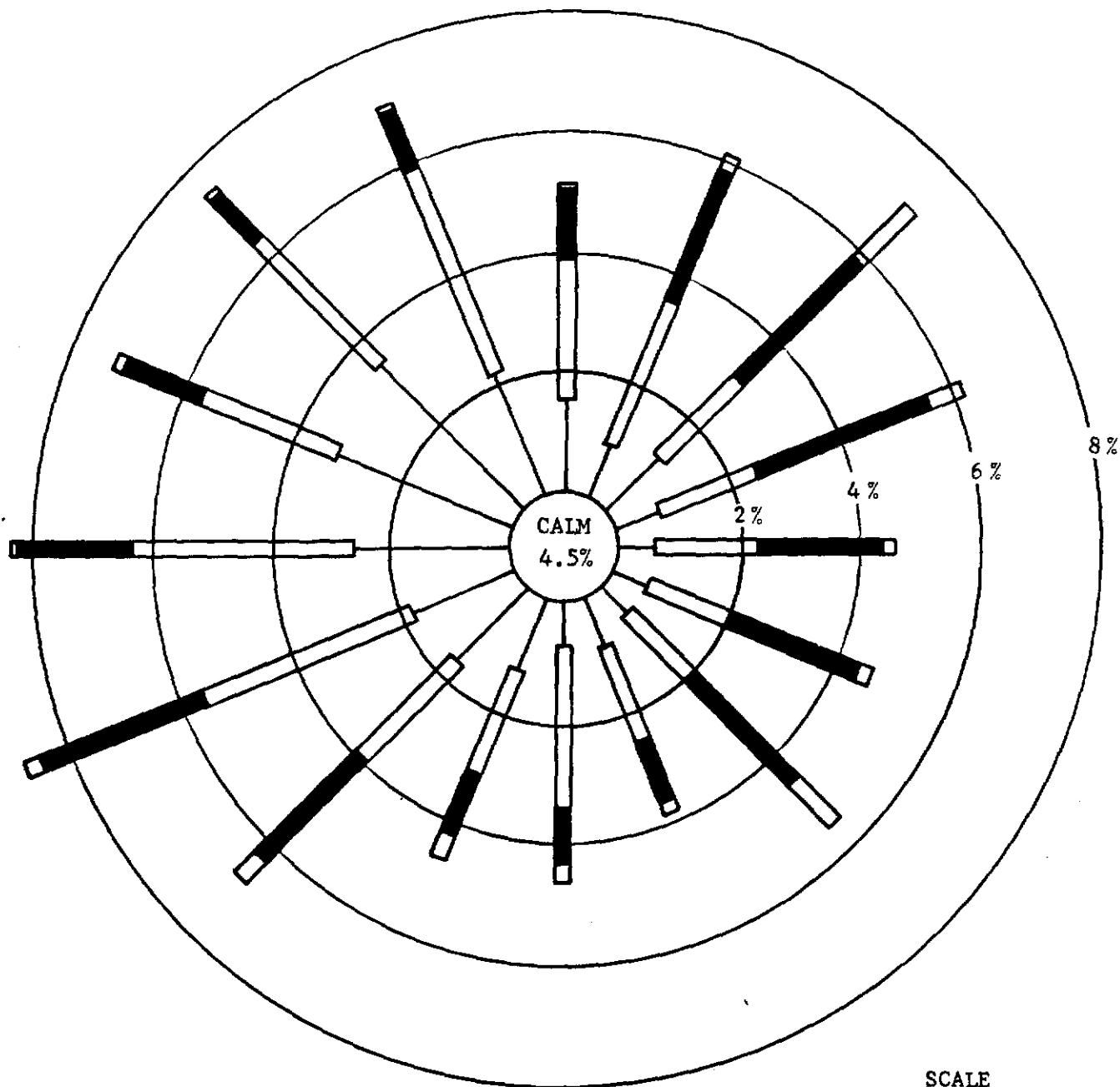
SEASONAL AND ANNUAL FREQUENCY DISTRIBUTION
OF STABILITY CLASS AS DETERMINED BY WIND SIGMA IN 1980

<u>Stability Class:</u>	<u>Sigma Range (Degrees)</u>	<u>Percent Frequency by Season</u>				
		<u>Dec-Feb</u>	<u>Mar-May</u>	<u>Jun-Aug</u>	<u>Sept-Nov</u>	<u>Annual</u>
A - Extremely Unstable	≥ 22.5	3.3	6.5	10.6	7.9	8.2
B - Unstable	17.5-22.4	9.5	11.8	12.0	13.8	12.4
C - Slightly Unstable	12.5-17.4	21.9	26.4	26.0	29.8	27.2
D - Neutral	7.5-12.4	31.0	37.1	36.5	26.5	33.3
E - Slightly Stable	3.8-7.5	19.4	9.1	8.8	11.9	10.2
F - Stable	< 3.8	14.9	9.1	6.1	10.1	8.7



Source: USDC, 1974

Figure 2.6-1 Jacksonville, Florida Annual Wind Rose (1970-1974)



SCALE
 .75" = 2%

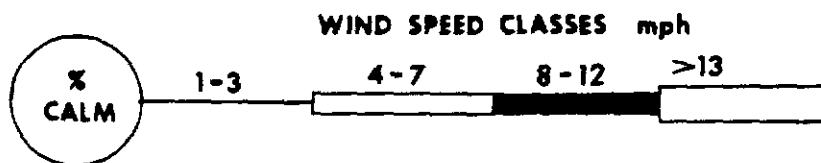


Figure 2.6-2

Annual Wind Rose (Dec. 10, 1979-Dec. 10, 1980) On Site Monitoring Facility

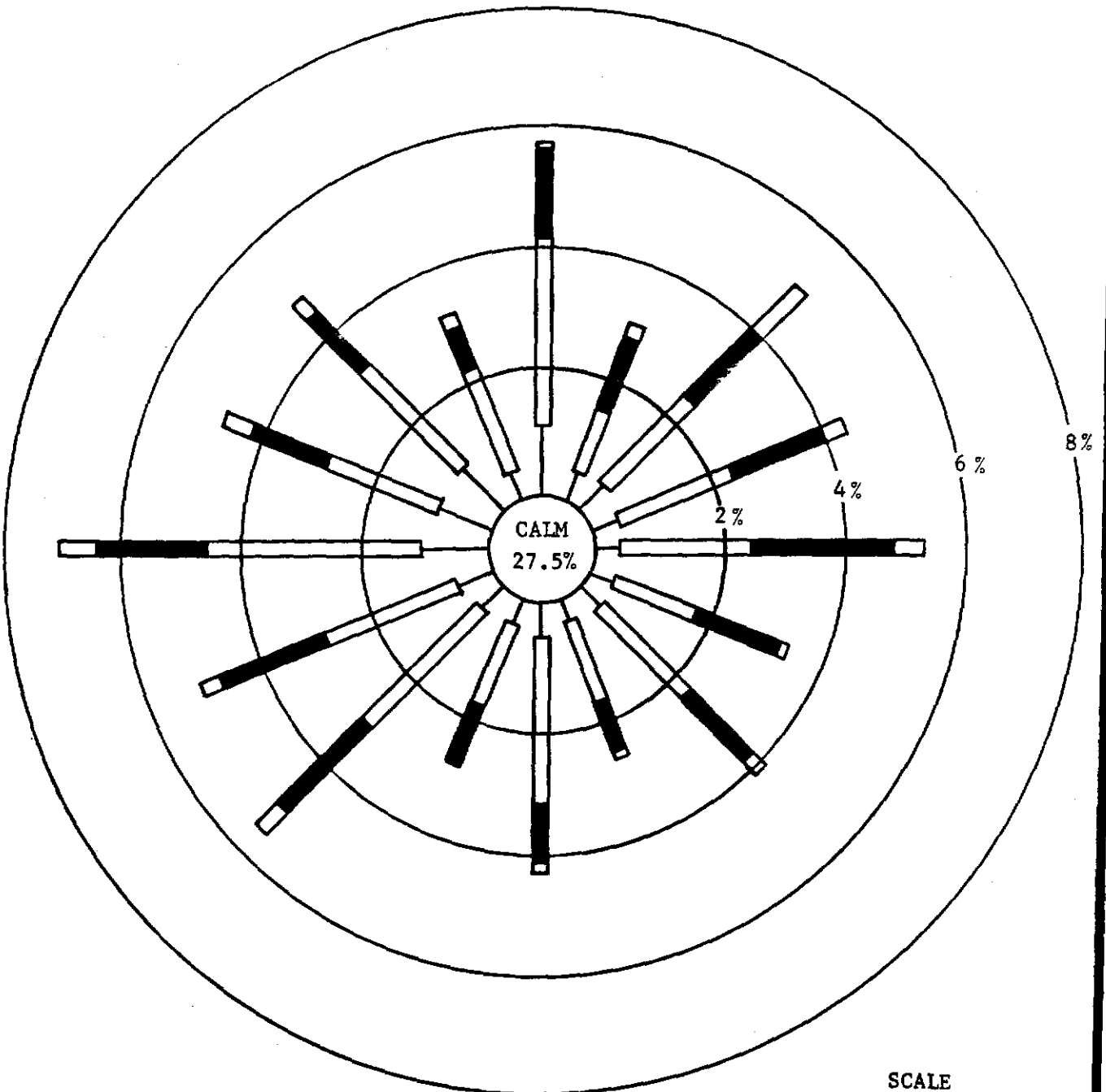


Figure 2.6-3

Annual Wind Rose (Dec. 10, 1979-Dec. 10, 1980)
Jacksonville International Airport

2.7 AIR QUALITY

2.7.1 Ambient Air Quality Standards

Ambient air quality standards (AAQS) have been established by the USEPA and the FDER to protect the health and welfare of the general public. These standards (NAAQS and FAAQS) have been developed for seven air pollutants, known as the criteria pollutants, and are presented in Table 2.7-1. The national primary standards define levels of air quality which the USEPA Administrator judges are necessary to protect public health with an adequate margin of safety. The national secondary standards define levels of air quality which the USEPA Administrator judges are necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. The States have the flexibility to establish ambient standards which are more stringent than the national standards, and in fact, Florida has established standards which are more stringent than the federal primary standards for sulfur dioxide, particulates and ozone (photochemical oxidants).

The current attainment status of Duval and its contiguous counties with respect to meeting national ambient air quality standards as determined by USEPA and the states of Florida and Georgia through monitoring and/or other means is shown in Table 2.7-2. In general, the counties of interest meet the primary and secondary NAAQS for almost all criteria pollutants. The exception is the Jacksonville Metropolitan Area (Duval County) which is listed as a nonattainment area for ozone and the secondary particulate standard. In the case of the secondary particulate standard, the actual area of nonattainment is that portion of Jacksonville bounded on the south and east by the St. Johns River, on the west by I-95 and on the north by the Trout River as indicated in Figure 2.7-1 (FDER, 1979). The proposed plant will be 9.4 km from the closest boundary of this nonattainment area. For ozone, the entire county is nonattainment.

2.7.2 Prevention of Significant Deterioration Increments

Both federal and state regulations require that major new sources (such as the proposed plant) undergo a review to ensure that the projected emissions together with emissions from other new sources (constructed after a certain baseline date) will not cause significant deterioration of air quality above baseline air quality levels. This applies in areas where current air quality is cleaner than that allowed by the ambient air quality standards discussed above. The amount of incremental air quality deterioration allowed (PSD increment) for sulfur dioxide and particulates is dependent upon the classification of the region. Class I areas (national parks, wilderness areas, etc.) are allowed very limited increases in calculated ground level pollutant concentrations while moderate increases are allowed in Class II areas. Class III areas are allowed even greater concentration increases. Table 2.7-3 presents the allowable ground level concentration increases for Class I, Class II, and Class III areas.

Duval County and all contiguous counties are designated as Class II areas (moderate amounts of air quality deterioration allowed) under classifications created by PSD regulations promulgated by EPA on December 5, 1974, and confirmed by the Clean Air Act Amendments of 1977 (CAA77). Areas which are nonattainment for sulfur dioxide or particulates are not affected by this classification since the PSD regulations do not apply to those areas.

The CAA77 mandated that certain international and national parks and wilderness areas above specified size limits and other specified federal lands be Class I for PSD. The Okefenokee Wilderness, located in southern Georgia with a small extension into northern Florida, received the Class I designation. The southern boundary of the Okefenokee Wilderness Area is 61 km from the proposed site. The only other PSD Class I areas designated for the state of Florida are the Everglades National Park, the Bradwell Bay

Wilderness Area, the Saint Marks Wilderness Area, and the Chassahowitzka Wilderness Area, all of which are too distant for consideration in this document. In neighboring Georgia, the Wolfe Island Wildlife Refuge is the next closest Class I area; however, it is farther than 100 km from the proposed site and is not considered further in this document.

As indicated above, only emissions from certain new sources count against the PSD increments; impacts from older sources (constructed prior to a specific baseline date) are counted as part of the baseline air quality. The entire PSD increment is available to a major new source unless (1) other new sources have been constructed since the baseline date and therefore consume some of the PSD increments, (2) the baseline air quality levels (those existing as of the baseline date) were already so high that adding the entire PSD increment would result in violation of the ambient air quality standards (which form a lid or cap on total allowable pollutant concentrations), or (3) a combination of these two factors. Thus, in order to determine how much of the PSD increments in Table 2.7-3 are available to the proposed project, it is necessary to determine the baseline date and the baseline concentrations of sulfur dioxide and particulates.

The latest revisions to the federal PSD regulations [45 FR (154) 52675-52748, August 7, 1980] fix the baseline date as the first date after August 7, 1977 on which a complete PSD application is received for a source in the baseline area. This was December 27, 1977. Thus all sources which came into operation after this date consume PSD increment. However, under the federal rules, major sources commencing construction after January 6, 1975 (as well as major modifications) consume PSD increment also. Under the Florida PSD regulations (FAC, Chapter 17-2, 1979), all sources which were issued a construction permit after December 31, 1974 consume PSD increment. Therefore, all three of these dates must be noted when determining whether the emissions from a particular source count against the available increments. This increment consumption analysis is contained in Chapter 5, Section 5.3.

Since no air quality monitoring equipment was actually in operation in the immediate site vicinity on either December 27, 1977 or December 31, 1974, baseline air quality levels for the proposed site were assumed to be current air quality levels, as determined from the 1979-80 on-site monitoring program. As indicated in Section 2.7.3.2, the current air quality levels are low enough such that when added to the allowable PSD increments, the resulting totals do not exceed FAAQS or NAAQS; thus the entire PSD increments are available for the proposed project and other increment consuming sources.

2.7.3 Existing Air Quality

2.7.3.1 Existing Regional Air Quality Data

Criteria Pollutants

The existing regional air quality data presented in this section were supplied by the Jacksonville Bio-Environmental Services Division (BESD) (1980). The locations of the air quality monitoring sites are depicted in Figure 2.7-1. Although none of the stations are located close enough to the proposed site to be considered entirely representative, the available data from these monitoring stations do provide a good indication of regional air quality patterns.

The available data for particulates (TSP) are presented in Table 2.7-4. TSP data were collected by the high volume sampler method. These data indicate that annual levels in the outlying areas average less than 40 micrograms per cubic meter (ug/m^3). Some of the downtown Jacksonville locations slightly exceed the annual standard of $60 \text{ ug}/\text{m}^3$. Maximum 24-hour values in the rural areas average less than $90 \text{ ug}/\text{m}^3$, whereas, some of the downtown locations are most recently (1979 data) reporting $100\text{--}200 \text{ ug}/\text{m}^3$. The most recent data (1979) indicate that second-highest 24-hour values (second-highest short-term values rather than highest values are compared with standards) downtown still slightly exceed the $150 \text{ ug}/\text{m}^3$ standard.

Table 2.7-5 presents the available sulfur dioxide (SO_2) data. Some of the data were collected by continuous samplers while some were collected by 24-hour bubblers. Annual values in the outlying areas are 5 to 15 ug/m^3 . However, some of the monitors close to major emission sources (see Figure 2.7-1) report annual values of 20 ug/m^3 (i.e., Heckscher and Wayland). Highest 24-hour averages in the outlying areas are mostly in the range of 30-60 ug/m^3 whereas monitors close to the major emission sources report highest 24-hour averages of 100-200 ug/m^3 and highest 1-hour averages of 400-900 ug/m^3 . Most of the monitors are significantly influenced by the existing major SO_2 sources.

The available data on nitrogen dioxide (NO_2) concentrations are presented in Table 2.7-6. Some of these data were collected by continuous analyzers and some by 24-hour bubblers. The data indicate that annual concentrations in the outlying areas average less than 20 ug/m^3 whereas downtown values are about 40 ug/m^3 . Some of the monitors are affected by major point sources and others are presumably greatly influenced by transportation sources.

Small amounts of data are also available for carbon monoxide (CO) and ozone (O_3) (Jacksonville BECD, 1978). These data indicate that maximum CO levels are about 8,000 ug/m^3 , 8-hour average, and 14,000 ug/m^3 , 1-hour average (well below the allowable values of 10,000 ug/m^3 8-hour average and 40,000 ug/m^3 1-hour average). The O_3 1-hour average Florida standard of 160 ug/m^3 is, however, often exceeded in the warm summer months; maximum values reported have been nearly 300 ug/m^3 .

Sulfates

Although there are no ambient standards for sulfates, these pollutants have been receiving increasing attention in connection with acid precipitation concerns. Therefore, the background values for this parameter were investigated so that the predicted plant impacts (Chapter 5) could be put in perspective. Background sulfates data were obtained from

the FDER (1980). Data were available for only one year (1979) in Jacksonville. Twenty-six samples from the hi-vol particulate filters were taken (essentially every other hi-vol filter) and the mean sulfate concentration was 9.06 ug/m^3 . The highest 24-hour average value reported was 18.20 ug/m^3 and the lowest was 2.90 ug/m^3 .

Precipitation Acidity

Precipitation chemistry in the Jacksonville region has been investigated by Brezonik, et al. (1980) as part of a statewide study to assess the regional variations in atmospheric fluxes of nutrients to lakes and soils. As part of this study, a precipitation chemistry network of 24 stations was set up beginning in the fall of 1977. The Jacksonville area station, located near the International Airport, commenced operation in August of 1978 and continued until fall of 1979.

Results indicate a mean volume-weighted precipitation pH of 4.69 for Jacksonville for the available data in calendar year 1979 on a total rainfall of 157 cm. For the data available in the period from May 1, 1978 to April 30, 1979 (Brezonik's one year intensified project effort), the volume weighted pH was 4.74 on a total rainfall of 122 cm. This latter value can be compared with other values observed in the state by examining Figure 2.7-2, taken from the Brezonik study. It should be recognized, however, that there is great variability within the data, on a seasonal basis and even within rainfall events.

2.7.3.2 On-Site Air Quality Conditions

General

An on-site air quality monitoring program was conducted in conjunction with the on-site meteorological monitoring program discussed in Section 2.6.4.1. The purpose of the air quality monitoring program, which is described in detail in Chapter 6, Section 6.2.6, was to determine baseline

air quality concentrations over the monitoring period, which extended from December, 1979 to December, 1980, for use in the air quality impact assessment contained in Chapter 5, Section 5.3. Data were collected for sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, total suspended particulates, lead, and a number of trace elements.

The results of the monitoring program are presented in detail in four quarterly reports (Envirosphere; 1980, 1980a, 1980b, 1981) which have been submitted to the FDER and USEPA. These reports contain the raw hourly and/or daily data as well as monthly summaries and quality assurance data. Only brief summaries of the monitoring results are presented in the following paragraphs.

Two sets of air quality background data are presented below. For each parameter a summary of the entire data base is presented, followed by a summary of the values which occurred in conjunction with winds from 290 degrees clockwise through 160 degrees (corresponding roughly with the northwest, northeast, and southeast quadrants). This second set of values for each parameter is intended to represent background air quality levels uninfluenced by the major existing sources (which generally exist in the southwest quadrant) whose impacts are modelled in the air quality impact analyses in Chapter 5, Section 5.3. These concentrations represent the baseline concentration levels for purposes of the PSD analysis which were referred to in Section 2.7.2 as well as the background concentrations used in determining compliance with ambient air quality standards discussed in Section 2.7.1. This procedure for determining baseline/background concentrations differs from that presented in the PSD report for the project (Envirosphere, 1980c) because on-site data were not available for use in that document. However, use of the on-site data in this manner for baseline/background determination was discussed with and approved by Region IV EPA (Nagler, 1980).

Sulfur Dioxide

A summary of the sulfur dioxide data collected in the on-site monitoring program is presented in Table 2.7-7. As indicated, the annual arithmetic mean was 7 ug/m^3 , which is well within the allowable annual level of 60 ug/m^3 in Florida. Second-highest 24 and 3-hour averages were 116 ug/m^3 and 289 ug/m^3 , respectively, both of which are well below the Florida standards of 260 ug/m^3 and 1300 ug/m^3 . For winds other than from the southwest quadrant, as discussed above, background values measured were 4 ug/m^3 , 21 ug/m^3 , and 90 ug/m^3 for the annual, second-highest 24-hour, and second-highest 3-hour periods, respectively. This second set of background values is used in the air quality analyses in Chapter 5, Section 5.3.

Nitrogen Dioxide

A summary of the nitrogen dioxide data collected in the on-site monitoring program is presented in Table 2.7-8. The annual arithmetic mean concentration recorded was 12 ug/m^3 , which is well below the standard of 100 ug/m^3 . By eliminating values associated with winds from the southwest quadrant, an annual background value of 10 ug/m^3 was computed. This value is utilized in the air quality analyses in Chapter 5, Section 5.3.

Carbon Monoxide

Table 2.7-9 presents a summary of the on-site carbon monoxide data. The second-highest 8-hour and 1-hour averages were $4,500 \text{ ug/m}^3$ and $5,200 \text{ ug/m}^3$, respectively. These values are well below the 8-hour and 1-hour standards of $10,000 \text{ ug/m}^3$ and $40,000 \text{ ug/m}^3$, respectively. The annual arithmetic mean carbon monoxide concentration was 600 ug/m^3 .

4

Ozone

Table 2.7-10 presents a summary of the on-site ozone data. Ozone monitoring was conducted during the "warm season" only (that is, from April through October) since this is when the highest concentrations normally occur. The results indicate a second-highest measured 1-hour average of 210 ug/m^3 versus the federal standard of 235 ug/m^3 .

Total Suspended Particulates

A summary of the on-site total suspended particulates data is presented in Table 2.7-11. The data indicate an annual geometric mean concentration of 29 ug/m^3 which is much lower than the Florida and federal annual secondary standard of 60 ug/m^3 . The second-highest 24-hour average value recorded was 57 ug/m^3 , versus the Florida and federal secondary standard of 150 ug/m^3 . Considering days when at least two thirds of the winds were from other than the southwest quadrant, the annual and short-term background levels were 27 ug/m^3 and 50 ug/m^3 . These somewhat lower values are used in the ambient impact analyses in Chapter 5, Section 5.3.

Lead

A number of the on-site particulate filters were analyzed for lead. The quarterly arithmetic mean concentrations were 0.16 ug/m^3 , 0.09 ug/m^3 , 0.07 ug/m^3 , and 0.07 ug/m^3 for the first, second, third and fourth calendar quarters of 1980. These values are all far below the 1.5 ug/m^3 quarterly arithmetic mean allowed by the federal standard.

Trace Elements

An analysis for several trace elements was conducted on twelve of the particulate filters (one per month selected at random). The highest and lowest values as well as the mean concentrations for sulfate, nitrate, chloride, fluoride, arsenic, beryllium, cadmium, mercury, selenium, and asbestos are presented in Table 2.7-12. The sulfate values agree well with the regional data discussed in Section 2.7.3.1; comparable data for the other parameters were not available.

2.7.4 Existing Air Pollution Sources

The locations of the major pollutant sources in the area are depicted in Figure 2.7-1. In addition to these major sources, there are a large number of minor sources in the area which also contribute to air pollution. Emissions characteristics for the sources within 50 km of the proposed plant (and for certain new sources within 100 km of the nearest Class I area) were obtained from the Jacksonville BESD (Drake, 1980), FDER (Cole, 1980), and Georgia Department of Natural Resources (Mitchell, 1980). Emission rate data for SO_2 and TSP, the two primary pollutants from stationary point sources, were obtained.

Tables 2.7-13 and 2.7-14 present the emission characteristics, stack parameters, and locations of the significant existing sources in the area for SO_2 and TSP, respectively, in addition to those for the proposed plant. It should be noted that the emission parameters presented in Table 2.7-13 and 2.7-14 do not in all cases exactly represent every discrete point source. Various point sources of relatively small emission levels were judiciously combined using the most representative stack and exit parameters; i.e., the emission parameters which either represent the largest proportion of total emissions, or the emission parameters which theoretically result in the highest ground level concentrations (low stack heights, low exit velocities and temperatures). In all cases, however, the correct total emissions from all existing sources were maintained.

2.7.5 References

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Table 2.7-1 (Revision 1)

NATIONAL AND FLORIDA AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	National		Florida Standards ($\mu\text{g}/\text{m}^3$)
		Primary ($\mu\text{g}/\text{m}^3$)	Secondary ($\mu\text{g}/\text{m}^3$)	
Sulfur Dioxide	Annual	80		60
	24-Hour ^a	365		260
	3-Hour ^a		1,300	1,300
Particulates	Annual ^b	75	60 ^c	60
	24-Hour ^a	260	150	150
Nitrogen Oxides	Annual	100	100	100
Carbon Monoxide	8-Hour ^a	10,000	10,000	10,000
	1-Hour ^a	40,000	40,000	40,000
Ozone	1-Hour ^a	235	235	-
Photochemical Oxidants	1-Hour ^a	-	-	160
Nonmethane Hydrocarbons ^c	3-Hour ^a	160	160	160
Lead	3-Month	1.5	1.5	-

a Not to be exceeded more than once per year

b Geometric mean

c Only a guide

Sources: 40 CFR50, 1971
FAC, Chapter 17-2, 1979

Table 2.7-2

ATTAINMENT STATUS OF DUVAL AND NEARBY COUNTIES
WITH RESPECT TO THE NATIONAL AMBIENT AIR QUALITY STANDARDS

<u>County</u>	<u>TSP</u>	<u>SO₂</u>	<u>O₃</u>	<u>NO_x</u>	<u>CO</u>
Georgia					
Charlton	4	4	3, 4	3, 4	3, 4
Camden	4	4	3, 4	3, 4	3, 4
Florida					
Nassau	4	4	3, 4	3, 4	3, 4
Duval	2	3	1	3, 4	3, 4
Clay	4	4	3, 4	3, 4	3, 4
St. Johns	4	4	3, 4	3, 4	3, 4
Baker	4	4	3, 4	3, 4	3, 4

Code: 1 Does not meet primary standards
 2 Does not meet secondary standards
 3 Cannot be classified
 4 Better than national standards
 3, 4 Cannot be classified or better than national standards

Source: Federal Register, March 3, 1978

Table 2.7-3

ALLOWABLE PSD INCREMENTS

<u>Pollutant</u>	<u>Class I</u> <u>(ug/m³)</u>	<u>Class II</u> <u>(ug/m³)</u>	<u>Class III</u> <u>(ug/m³)</u>
Sulfur Dioxide			
Annual arithmetic mean	2	20	40
24-hour maximum ^a	5	91	182
3-hour maximum ^a	25	512	700
Particulates			
Annual geometric mean	5	19	37
24-hour maximum ^a	10	37	75

a Not to be exceeded more than once per year.

Source: Federal Register, June 19, 1978

Table 2.7-4

JACKSONVILLE AREA HISTORICAL
TOTAL SUSPENDED PARTICULATES DATA ($\mu\text{g}/\text{m}^3$)

<u>Site</u>	<u>Year</u>	<u>Highest 24-Hour</u>	<u>Second-Highest 24-Hour (Standard: 150)</u>	<u>Annual Geometric Mean (Standard: 60)</u>
E. Adams	1977	279	196	67.1
	1978	364	255	67.6
	1979	195	176	62.1
Arlington River	1977	110	107	44.6
W. Monroe	1977	198	106	57.0
San Mateo	1977	91	83	38.5
Hendricks	1977	143	98	48.1
	1978	91	87	44.9
	1979	162	124	54.0
Margaret	1977	130	114	64.9
Verna	1977	91	86	42.4
Sandalwood	1977	86	73	32.3
Lenox	1977	101	88	37.0
2800 University	1977	65	60	34.3
	1978	89	76	37.8
	1979	72	68	37.0
Sixth Street	1977	95	84	50.4
	1978	110	103	47.6
	1979	116	110	44.1
Ft. Caroline	1977	92	81	44.7
Edenfield	1977	80	77	35.9
	1978	100	68	43.8
New Berlin	1977	85	79	37.4
	1978	97	84	36.1

Table 2.7-4 (Continued)

JACKSONVILLE AREA HISTORICAL
TOTAL SUSPENDED PARTICULATES DATA ($\mu\text{g}/\text{m}^3$)

<u>Site</u>	<u>Year</u>	<u>Highest 24-Hour</u>	<u>Second-Highest 24-Hour (Standard: 150)</u>	<u>Annual Geometric Mean (Standard: 60)</u>
Heckscher	1977	80	78	46.7
	1978	82	70	44.6
4012 University	1977	84	71	37.6
	1978	93	91	41.6
Craig Field	1978	87	65	33.1
	1979	75	60	35.1
Shell Oil	1979	120	114	48.1
Spring Park	1978	62	61	35.7
Sheffield	1979	64	64	33.4
Beaver	1979	81	79	47.3
Ft. Caroline Stp.	1979	78	76	45.6
Cedar Bay Stp.	1979	74	69	37.0

Source: Jacksonville BESD, 1980

Table 2.7-5 (Revision 1)

JACKSONVILLE AREA HISTORICAL
SULFUR DIOXIDE DATA (ug/m³)

Site	Year	Highest 1-Hour	Second Highest 1-Hour	Highest 24-Hour	Second Highest 24-Hour (Standard: 260)	Annual Mean (Standard: 60)
E. Adams	1977	---	---	84	55	19.0
	1978	---	---	65	55	17.8
Arlington River	1977	---	---	55	39	8.5
Kooker Park	1977	681	641	135	102	17.1
	1978	393	353	72	53	16.9
	1979	432	406	---	---	7.0
San Mateo	1977	---	---	36	17	4.9
W. Monroe	1977	602	524	89	75	9.3
Hendricks	1977	---	---	128	103	16.0
	1978	---	---	123	113	22.4
Margaret	1977	---	---	36	26	6.1
Verna	1977	---	---	48	6	6.7
Sandalwood	1977	---	---	58	26	6.9
Lenox	1977	---	---	54	20	6.8
2800 University	1977	---	---	58	48	14.0
	1978	---	---	41	34	14.8
Sixth Street	1977	---	---	76	64	13.5
	1978	---	---	48	24	12.2

Table 2.7-5 (Revision 1) (Continued)

JACKSONVILLE AREA HISTORICAL
SULFUR DIOXIDE DATA ($\mu\text{g}/\text{m}^3$)

Site	Year	Highest 1-Hour	Second Highest 1-Hour	Highest 24-Hour	Second Highest 24-Hour (Standard: 260)	Annual Mean (Standard: 60)
Lancaster	1977	---	---	60	51	11.2
Ft. Caroline	1977	---	---	45	41	10.5
Le Baron	1977	458	314	82	52	12.1
	1978	249	249	82	48	17.8
Edenfield	1977	---	---	101	55	13.8
	1978	---	---	41	37	14.7
New Berlin	1977	484	432	64	48	11.1
	1978	---	---	81	59	16.5
Heckscher	1977	---	---	122	118	20.0
	1978	355	330	43	40	16.4
Blount Island	1977	---	---	217	52	14.3
Eastport	1977	---	---	101	72	13.5
	1978	---	---	39	27	12.2
Wayland	1977	---	---	227	80	20.7
4012 University	1977	851	733	83	65	12.5
	1978	956	929	122	35	17.9
Craig Field	1978	---	---	27	22	13.4
Fire Station	1979	524	445	---	---	---

Table 2.7-5 (Revision 1) (Continued)

JACKSONVILLE AREA HISTORICAL
SULFUR DIOXIDE DATA ($\mu\text{g}/\text{m}^3$)

Site	Year	Highest 1-Hour	Second Highest 1-Hour	Highest 24-Hour	Second Highest 24-Hour (Standard: 260)	Annual Mean (Standard: 60)
Spring Park	1978	---	---	27	23	14.9
Ft. Caroline Stp	1979	209	170	---	---	---
Southside Library	1979	537	497	---	---	---
Cedar Bay Stp.	1979	406	353	---	---	---

Source: Jacksonville BESO, 1980

Table 2.7-6

JACKSONVILLE AREA HISTORICAL
NITROGEN DIOXIDE DATA ($\mu\text{g}/\text{m}^3$)

Site	Year	Highest 24-Hour	Second-Highest 24-Hour	Annual Mean (Standard: 100)
E. Adams	1977	74	68	40.9
	1978	46	44	33.8
Arlington River	1977	58	45	31.2
Kooker Park	1977	67	63	40.7
	1978	50	47	33.3
San Mateo	1977	159	55	27.7
W. Monroe	1977	67	57	40.0
Hendricks	1977	70	55	34.2
	1978	59	46	30.2
Margaret	1977	76	74	38.8
Verna	1977	63	61	36.4
2800 University	1977	52	42	24.6
	1978	34	31	20.3
Sixth Street	1977	64	54	37.7
	1978	58	46	32.6
Edenfield	1977	38	32	18.5
	1978	26	23	15.3
New Berlin	1977	31	28	15.1
	1978	29	22	13.5
Heckscher	1977	43	41	22.8
	1978	29	29	20.6
Blount Island	1977	40	32	16.4
Eastport	1977	45	34	18.9
	1978	27	23	16.4

Source: Jacksonville BESD, 1980

Table 2.7-7

MONTHLY AND ANNUAL ON-SITE SULFUR DIOXIDE CONCENTRATIONS (ug/m³)

Month	1-Hour		3-Hour		24-Hour		Arithmetic Mean	Number of Observations
	High	2nd High	High	2nd High	High	2nd High		
December 1979	131	107	90	86	24	23	5	466
January 1980	450	361	323	289	116	116	9	689
February	146	75	49	49	12	12	3	645
March	306	227	204	170	40	40	6	626
April	92	81	58	51	22	21	3	668
May	178	165	128	117	34	33	7	708
June	157	155	107	103	34	34	8	688
July	144	131	81	73	33	31	7	693
August	249	199	171	148	60	59	10	678
September	291	168	199	177	42	40	10	658
October	165	136	93	80	19	19	4	705
November	149	128	115	106	27	27	6	677
December	223	183	107	101	29	29	10	216
Annual	450	361	323	289	116	116	7	8117
Standard	-	-	-	1300	-	260	60	

Table 2.7-8

MONTHLY AND ANNUAL ON-SITE NITROGEN DIOXIDE CONCENTRATIONS ($\mu\text{g}/\text{m}^3$)

<u>Month</u>	<u>1-Hour</u>		<u>Arithmetic Mean</u>	<u>Number of Observations</u>
	<u>High</u>	<u>2nd High</u>		
December 1979	48	43	10	505
January 1980	94	73	14	643
February	69	67	25	610
March	67	60	13	659
April	55	51	13	668
May	55	55	10	698
June	70	51	11	673
July	56	55	7	665
August	39	39	4	679
September	56	55	8	654
October	56	56	14	706
November	62	56	14	680
December	86	79	23	218
Annual	94	86	12	8058
Standard	-	-	100	

Table 2.7-9

MONTHLY AND ANNUAL ON-SITE CARBON MONOXIDE CONCENTRATIONS (ug/m³)

<u>Month</u>	<u>1-Hour</u>		<u>8-Hour</u>		<u>Arithmetic</u> <u>Mean</u>	<u>Number of</u> <u>Observations</u>
	<u>High</u>	<u>2nd High</u>	<u>High</u>	<u>2nd High</u>		
December 1979	7300	4500	4500	4500	800	504
January 1980	2700	2300	2000	2000	700	692
February	3900	3800	3700	3600	200	635
March	3100	1900	1500	1500	200	687
April	1500	1500	1400	1400	500	669
May	1700	1700	1600	1500	600	702
June	3000	2900	2400	2300	600	600
July	4000	3500	2900	2900	500	701
August	5200	5000	4500	4500	1000	344
September	4100	4000	3300	3000	500	586
October	2200	2100	1900	1900	500	692
November	4400	4100	1100	1100	300	681
December	2400	1700	1400	1400	500	217
Annual	7300	5200	4500	4500	600	7710
Standard	-	40,000	-	10,000	-	

Table 2.7-10

MONTHLY AND ANNUAL ON-SITE OZONE CONCENTRATIONS ($\mu\text{g}/\text{m}^3$)

<u>Month</u>	<u>1-Hour</u>		<u>Arithmetic</u> <u>Mean</u>	<u>Number of</u> <u>Observations</u>
	<u>High</u>	<u>2nd High</u>		
April 1980	190	190	79	619
May	198	178	75	743
June	200	186	76	711
July	212	210	65	694
August	198	196	52	702
September	174	153	43	704
October	169	167	54	735
Season	212	210	61	4908
Standard	-	235	-	

Table 2.7-11

MONTHLY AND ANNUAL ON-SITE TOTAL SUSPENDED PARTICULATE
CONCENTRATIONS ($\mu\text{g}/\text{m}^3$)

<u>Month</u>	<u>24-Hour</u>		<u>Geometric Mean</u>	<u>Number of Observations</u>
	<u>High</u>	<u>2nd High</u>		
December 1979	34	30	22	6
January 1980	41	36	27	11
February	44	42	33	8
March	37	37	30	10
April	61	42	31	10
May	57	41	31	10
June	57	57	38	10
July	55	39	31	10
August	48	39	26	11
September	33	32	22	7
October	50	48	34	10
November	41	41	30	10
December	27	21	21	3
Annual	61	57	29	116
Standard	-	150	60	

Table 2.7-12

ON-SITE AIRBORNE TRACE ELEMENT CONCENTRATIONS (ug/m³)

<u>Parameter</u>	<u>Lowest Concentration</u>	<u>Highest Concentration</u>	<u>Mean Concentration</u>
Sulfate, SO ₄	1.2	19.1	10.7
Nitrate, NO ₃	0.8	.34	.17
Chloride, Cl	0.0	2.49	.85
Fluoride, F	.001	.5	.15
Arsenic, As	< .001	< .002	< .002
Beryllium, Be	< .002	< .003	< .003
Cadmium, Cd	< .0003	.0024	.0009
Mercury, Hg	0.0	.003	.0009
Selenium, Se	< .0003	< .0005	< .0005
Asbestos	ND	ND	ND

ND = None Detected

Note: When all concentrations for a parameter were below detection limits, the highest detection limit is reported as the mean; this is the case for arsenic, beryllium, and selenium. When only some of the concentrations for a parameter were below detection limits, the mean was computed using values 1/10,000 less than the detection limits for those cases when the value reported was less than the detection limit; this was the case only for cadmium.

Table 2.7-13 (Revision 1)

SO₂ EMISSION INVENTORY

	Emm. Rate (G/Sec)	Stack Ht. (M)	Stack Temp. (Deg-K)	Exit Vel. (M/Sec)	Stack Dia. (M)	X-Coord. (KM)	Y-Coord. (KM)
1. St. Johns River Power Park 1&2	1176.6	194.2	327.6	18.29	10.13	447.1	366.3
1a. SJRPP Auxiliary Boilers	25.6	85.4	441.0	12.2	2.08	447.0	366.5
2. Container Corp.	154.4	103.6	441.5	12.89	4.51	455.1	386.7
3. Florida Steel	15.1	48.8	589.0	2.4	2.10	406.3	350.5
4. Naval Air Station	4.4	13.1	505.4	6.1	1.07	434.3	343.5
5. Alton Box Board	37.9	76.2	477.0	9.2	3.78	439.9	359.3
6. Alton Box Board	14.0	56.7	424.0	10.0	3.20	439.9	359.3
7. Alton Box Board	2.5	9.8	491.0	9.1	1.00	439.7	358.1
8. Anchor Hocking	5.6	14.6	573.0	15.6	0.91	431.5	357.5
9. Celotex	4.7	22.9	700.0	3.5	0.91	446.4	362.6
10. Celotex	7.3	15.5	586.0	11.7	1.22	427.6	357.3
11. Celotex	5.0	13.7	339.0	14.6	1.20	446.4	362.6
12. Celotex	3.1	15.2	436.0	7.7	0.94	446.4	362.6
13. Dickerson (Sommers)	1.8	9.2	340.0	26.0	1.07	438.8	361.1
14. Houdaille (Phillips)	9.3	11.6	376.0	31.1	0.98	442.7	345.7
15. Houdaille (Soutel)	8.4	11.6	380.0	31.9	0.98	429.0	361.4
16. JEA Bulk Terminal	4.2	12.2	355.0	9.5	0.91	439.3	359.8
17. JEA Kennedy Turbines	117.0	13.7	714.0	8.8	5.84	440.0	359.1
18. JEA Kennedy 8,9,10	308.4	84.0	408.0	23.2	4.12	440.0	359.1
19. JEA Northside Turbines	117.0	10.1	780.0	18.3	6.56	446.9	364.9
20. JEA Northside 1	667.0	76.2	414.0	19.0	4.88	446.9	364.9
21. JEA Northside 2	589.7	91.4	408.0	8.5	5.33	446.9	364.9
22. JEA Northside 3	1194.9	106.7	407.0	17.4	7.01	446.9	364.9
23. JEA Southside 3&4	181.1	84.0	415.0	21.7	3.24	437.6	353.8
24. JEA, SS. 1,2,5, Turbines	295.7	84.0	422.0	21.6	4.27	437.6	353.8
25. NAS Mayport	3.5	12.2	544.0	4.0	0.91	460.4	362.8
26. Refined Metals	5.0	31.1	355.0	18.7	0.77	431.8	358.3
27. Glidden	17.8	12.2	658.0	9.8	1.12	436.1	360.7
28. Glidden	21.2	15.2	514.0	18.2	1.22	436.1	360.7
29. St. Regis Paper	3.1	18.3	505.0	4.0	0.91	440.2	368.3
30. St. Regis Paper	146.7	32.3	433.0	16.1	2.13	441.8	365.6
31. St. Regis Paper	22.8	40.5	500.0	11.4	2.44	441.8	365.6

Table 2.7-13 (Continued)

SO₂ EMISSION INVENTORY

	Emm. Rate (G/Sec)	Stack Ht. (M)	Stack Temp. (Deg-K)	Exit Vel. (M/Sec)	Stack Dia. (M)	X-Coord. (KM)	Y-Coord. (KM)
32. St. Regis Paper	35.9	38.1	389.0	14.9	2.59	441.8	365.6
33. St. Regis Paper	3.0	22.9	350.0	9.5	1.42	441.8	365.6
34. Anheuser Busch	60.9	15.9	505.0	8.6	1.37	437.9	366.8
35. Anheuser Busch	12.3	21.3	333.0	11.4	2.06	437.9	366.8
36. Anheuser Busch	9.0	21.3	333.0	8.3	1.68	437.9	366.8
37. Union Camp	7.3	15.5	586.0	11.7	1.22	427.6	357.3
38. Container Corp	78.6	75.6	485.0	14.4	2.44	455.1	386.7
39. Dickerson (Talleyrand Rd)	22.1	9.2	340.0	26.0	1.07	438.5	355.5
40. Naval Air Station Mayport	1.4	18.3	505.4	7.9	1.52	460.4	362.8
41. St. Regis Container	3.1	15.2	436.0	7.7	0.94	446.4	362.6
42. Container Corp	128.7	75.6	485.0	14.4	2.44	455.1	386.7
43. Container Corp	273.6	75.6	480.0	16.25	3.35	455.1	386.7
44. Container Corp	78.7	75.6	480.0	19.35	2.44	455.1	386.7
45. Container Corp	35.3	88.1	484.0	18.65	1.22	455.1	386.7
46. NAS Jacksonville	1.4	13.11	505.4	61	1.07	434.3	343.5
47. ITT Rayonier	3.5	37.5	307.0	19.57	.91	453.0	385.0
48. ITT Rayonier	4.4	37.5	303.0	4.24	.91	453.0	385.0
49. ITT Rayonier	22.1	30.5	308.0	8.05	.61	453.0	385.0
50. ITT Rayonier	43.0	76.2	371.0	13.13	2.29	453.0	385.0
51. Gainesville Alachua Power Plant	277.0	106.7	408.0	15.24	5.29	364.0	292.6
52. Occidental Chemical	12.9	15.2	467.0	23.9	1.46	320.9	369.8
53. Occidental Chemical	15.5	30.5	468.0	11.8	2.29	328.9	368.9
54. Occidental Chemical	84.0	61.0	356.0	30.6	1.83	320.9	369.8
55. Occidental Chemical	15.5	15.3	468.0	11.8	2.29	321.1	369.8

Sources: Drake, 1980; Cole, 1980; Mitchell, 1980

Note: Emission sources listed include those within 50 km of the proposed plant or within 100 km of the Okefenokee Wilderness Area.

Table 2.7-14 (Revision 1)

TSP EMISSION INVENTORY

	Emm. Rate (G/Sec)	Stack Ht. (M)	Stack Temp. (Deg-K)	Exit Vel. (M/Sec)	Stack Dia. (M)	X-Coord. (KM)	Y-Coord. (KM)
1. St. Johns River Power Park 1&2	46.4	194.2	327.6	18.29	10.13	447.1	366.3
2. St. Johns River Power Park 1&2 (Fugitives)	15.4	Various source heights and locations in plant vicinity					
3. Alton Box Board	12.1	76.2	477.0	9.2	3.78	439.9	359.3
4. Alton Box Board	11.2	56.7	424.0	10.0	3.20	439.9	359.3
5. Anchor Hocking	5.1	14.6	573.0	15.6	0.91	431.5	357.5
6. Celotex	2.2	22.9	700.0	3.5	0.91	446.4	362.6
7. Celotex	5.3	13.7	339.0	14.6	1.20	446.4	362.6
8. Celotex	4.8	27.4	338.8	21.4	1.00	446.4	362.6
9. Dickerson (Sommers)	2.0	9.2	340.0	26.0	1.07	438.8	361.1
10. Houdaille (Phillips)	5.1	11.6	376.0	31.1	0.98	442.7	345.7
11. Houdaille (Soutel)	9.2	11.6	380.0	31.9	0.98	429.0	361.4
12. JAX Bulk Terminal	7.8	12.2	355.0	9.5	0.91	439.3	359.8
13. JEA Kennedy Turbines	18.2	13.7	714.0	8.8	5.84	440.0	359.1
14. JEA Kennedy 8,9,10	30.5	84.0	408.0	23.2	4.12	440.0	359.1
15. JEA Northside Turbines	18.2	10.1	780.0	18.3	6.56	446.9	364.9
16. JEA Northside 1	24.5	76.2	414.0	19.0	4.88	446.9	364.9
17. JEA Northside 2	21.1	91.4	408.0	8.5	5.33	446.9	364.9
18. JEA Northside 3	58.8	106.7	407.0	17.4	7.01	446.9	364.9
19. JEA Southside 3&4	19.4	84.0	415.0	21.7	3.24	437.6	353.8
20. JEA, SS. 1,2,5, Turbines	32.8	84.0	422.0	21.6	4.27	437.6	353.8
21. Refined Metals	1.0	31.1	355.0	18.7	0.77	431.8	358.3
22. Glidden	3.8	12.2	658.0	9.8	1.12	436.1	360.7
23. Glidden	4.0	15.2	514.0	18.2	1.22	436.1	360.7
24. St. Regis Paper	9.3	32.3	433.0	16.1	2.13	441.8	365.6
25. St. Regis Paper	14.6	40.5	500.0	11.4	2.44	441.8	365.6
26. St. Regis Paper	19.2	38.1	389.0	14.9	2.59	441.8	365.6
27. St. Regis Paper	6.0	22.9	350.0	9.5	1.42	441.8	365.6
28. Anheuser Busch	4.3	15.9	505.0	8.6	1.37	437.9	366.8
29. Anheuser Busch	1.7	21.3	333.0	11.4	2.06	437.9	366.8
30. Anheuser Busch	2.3	21.3	333.0	8.3	1.68	437.9	366.8
31. Container Corp	13.6	103.6	441.5	12.89	4.51	455.1	386.7

Table 2.7-14 (Continued)

TSP EMISSION INVENTORY

	Emm. Rate (G/Sec)	Stack Ht. (M)	Stack Temp. (Deg-K)	Exit Vel. (M/Sec)	Stack Dia. (M)	X-Coord. (KM)	Y-Coord. (KM)
32. Container Corp	54.6	75.6	480.0	16.0	3.00	455.1	386.7
33. Naval Air Station, Jax	2.6	13.1	505.4	6.1	1.07	434.3	343.5
34. Dickerson (Talleyrand Rd)	4.5	13.4	331.0	5.8	1.83	438.5	355.5
35. Dickerson (Talleyrand Rd)	1.6	9.2	340.0	26.0	1.07	438.5	355.5
36. Naval Air Station, Mayport	3.5	18.3	505.4	7.9	1.52	460.4	362.8
37. Livingston Ind.	1.2	11.0	310.0	23.4	0.52	439.5	365.9
38. Container Corp	9.6	76.6	485.0	14.4	2.44	455.1	386.7
39. Container Corp	17.3	75.6	480.0	16.25	3.35	455.1	386.7
40. Container Corp	10.5	88.1	484.0	18.65	1.22	455.1	386.7
41. Cargill	1.4	34.75	Amb.+10°F	19.4	1.07	416.0	350.0
42. Anheuser Busch	1.3	21.2	322.1	9.9	1.68	437.9	366.8
43. Anheuser Busch	1.4	21.3	327.0	10.6	2.06	437.9	366.8
44. Jax Bulk Term	.4	3.63	Amb.	38.4	1.07	439.3	359.8
45. Union Camp	.4	15.54	586.0	11.7	1.22	427.6	357.3
46. Livingston	1.2	11.0	Amb.	23.4	.52	439.5	365.9
47. ITT Rayonier	4.5	30.5	453.0	8.02	3.05	453.0	385.0
48. ITT Rayonier	4.5	30.5	438.0	9.27	3.05	453.0	385.0
49. Gainesville Alachua Power Plant	23.0	106.7	408.0	14.25	5.29	364.0	292.6
50. Occidental Chemical	.5	15.2	467.0	23.9	1.46	320.9	369.8
51. Occidental Chemical	3.2	61.0	356.0	30.6	1.83	320.9	369.8

Sources: Drake, 1980; Cole, 1980; Mitchell, 1980

Note: Emission sources listed include those within 50 km of the proposed plant or within 100 km of the Okefenokee Wilderness Area.

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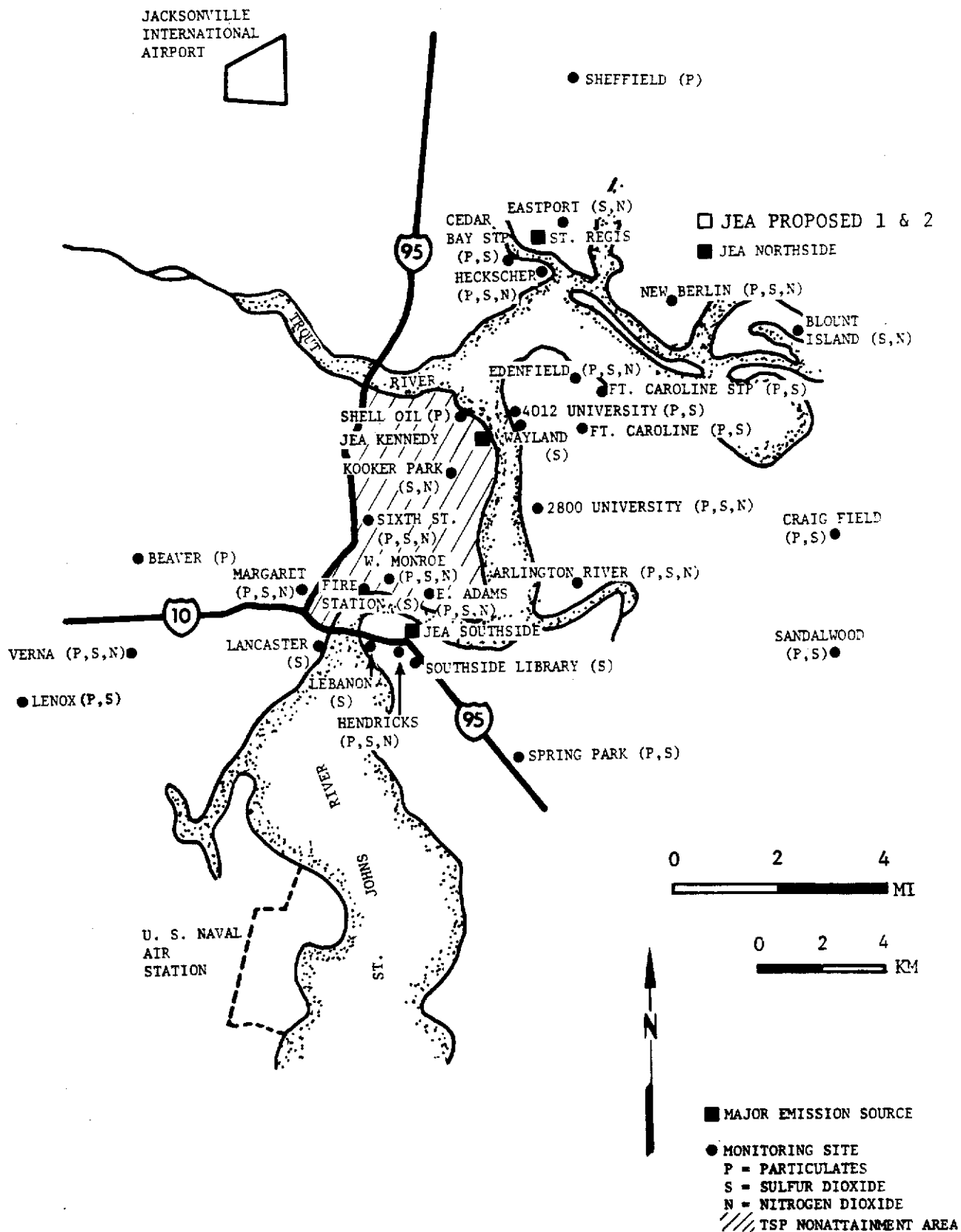
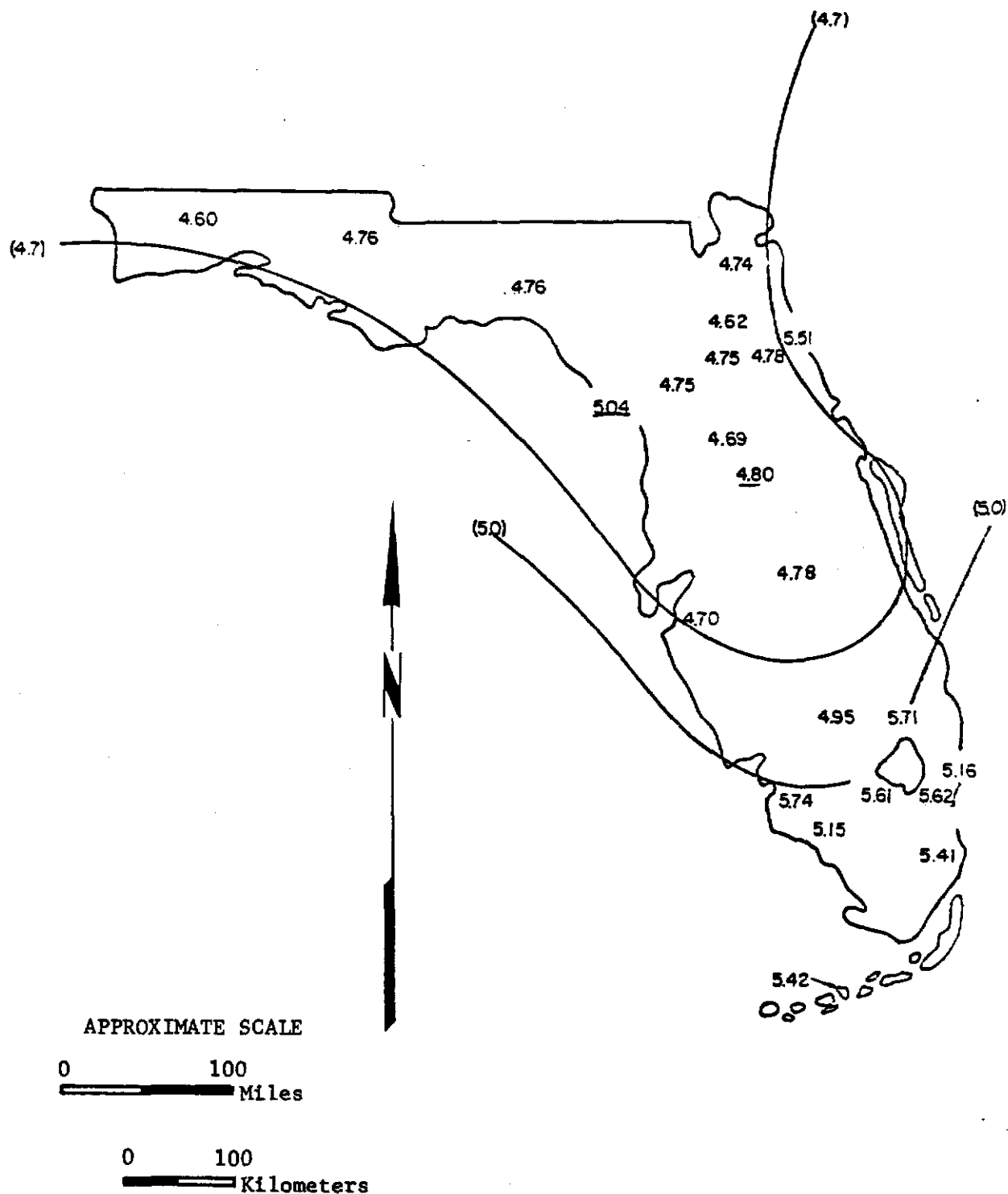


Figure 2.7-1

Locations of Major Emission Sources and Monitoring Sites



Source: Brezonik, et.al., 1980

Figure 2.7-2 Volume-weighted Mean pH of Precipitation Throughout Florida, May 1978-April 1979

2.8 AQUATIC ECOLOGY

2.8.1 Aquatic Environment in the Area

The aquatic habitats of the St. Johns River on and in the vicinity of the proposed plant site and the coal unloading facility site are shown in Figure 2.8-1. Figure 2.8-2 shows the relationship of the proposed site to the Designated Critical Habitat of the Florida Manatee and the Nassau River-St. Johns River Marshes Aquatic Preserve.

On-site freshwater habitats consist of two creeks, associated perched hardwood swamps and cypress swamps. The creeks originate on the site and discharge into the Browns Creek salt marsh complex. Freshwater habitats in these areas are typical of many similar habitats throughout the region. Seasonal fluctuations in water levels and stream flows limit the number and diversity of the freshwater flora and fauna.

The tidal creek and salt marsh areas that border the site are contiguous with the extensive Atlantic coastal marsh system. This type of area provides habitat for many common estuarine fish, and serves as a nursery area for most of the commercially and recreationally important species located in the region. The tidal creeks are commercially fished for blue crabs and shrimp. There is year-round recreational fishing off boats, bridges, and shore.

The Blount Island Channel of the St. Johns River was the main river channel before the Fulton-Dame Point Cutoff was constructed in 1950-51. The present channel is bordered in some areas by narrow strips of salt marsh contiguous with the tidal creek salt marshes. In addition, the Blount Island Channel supports both commercial and recreational fisheries for blue crabs, shrimp and fish.

Food chains and other interspecies relationships of the study area's aquatic ecosystem are outlined in Figure 2.8-3. These pathways and relationships have been studied and described in the literature by E.P. Odum (1971), H.T. Odum (1971), Lugo et al. (1971), Olson and Burgess (1967), Lauff (1967) and many others. As depicted in Figure 2.8-3, the primary producers of this ecosystem include the salt marsh plants, periphyton and phytoplankton. Periphyton and phytoplankton are microscopic single celled or filamentous algae whereas the salt marsh vegetation are larger rooted plants. These producers all have one major ecological function in common; through the process of photosynthesis, they convert solar energy into usable energy in the form of organic matter. As a result, a reservoir of organic matter is maintained within the system, thereby providing a substantial food supply or energy source to the heterotrophic organisms, i.e., bacteria, invertebrates and vertebrates.

Phytoplankton are planktonic and consequently occur throughout the water column; however, their role in primary production is restricted to the upper surface waters (approximately 1-2 meters) of the study area. In contrast, periphyton grow in the photic zone attached to submerged substrates such as those which occur in the salt marsh and on tidal flats. As previously mentioned, extensive growths of salt marsh vegetation occur in the study area, particularly adjacent to the tidal creeks. These rooted plants shed their dying and dead stems, leaves and roots. Microbial heterotrophs, in turn, facilitate the utilization of this particulate organic detritus by zooplankton and other detritus consumers. In comparison to this major pathway, a second pathway links the autotrophs to the heterotrophs. Microflora, phytoplankton and periphyton, are grazed upon by herbivores and filter feeders such as attached macroinvertebrates and various zooplankters and fish. In turn, these herbivores, filter feeders, as well as detritivores are subjected to predation by carnivores. Other pathways linking typical species of nekton to lower trophic levels and commercial and recreational fishing are also shown in Figure 2.8-3.

2.8.2 Plankton

2.8.2.1 Zooplankton

The following two components of the zooplankton community, based on size, were monitored on a quarterly basis from fall 1979 to summer 1980:

Mesoplankton - those planktonic animals (holoplankton and meroplankton) which are retained by a 202 micron mesh net but not by a 363 micron mesh net (i.e., cladocerans, copepods).

Macrozooplankton - large agile holoplankters and meroplankters that are larger than 363 microns (i.e., mysids, cumaceans).

Appendix B, Table B-4 lists seasonal average mean densities for total zooplankton in the Blount Island area (Figure 2.8-4) while Appendix B, Table B-5 lists the occurrence of zooplankton with respect to type and season.

The mesoplankton were dominated by copepods with occasional occurrences of cladocerans. In all four seasons the copepods were dominated by the calanoid Acartia tonsa. Acartia tonsa is a euryhaline species and is commonly found in subtropical as well as temperate estuaries in North America. A review of A. tonsa, other species of calanoids and their eurytopic natures (Bowman, 1971) suggests the following sensitivities to fluctuations in salinity and temperature in order of least susceptibility: Acartia tonsa < Psuedodiaptomus coronatus < Paracalanus crassirostris < Labidocera aestiva < Paracalanus parvus < Temora turbinata < Centropages furcatus < Temora stylifera. The above ordination closely follows the succession of calanoids in this estuary.

The number of calanoid species found within the vicinity of the proposed plant site is typical of southern estuaries. Generally, the number of calanoid species increases as one leaves the estuaries and

proceeds toward the open ocean. This change in species richness is due to an increase in intraspecific competition and a narrowing of ecological niches (Bowman, 1971).

Generally, the variety of cyclopoid and calanoid species peaked during the winter while greatest numbers occurred in the spring and summer. Species of calanoid copepods in the Blount Island Channel ranged from four during the summer and fall to six during the winter while species of cyclopoid copepods ranged from one during the spring and summer to three during the winter. Tidal creeks and the river had the same species of cyclopoid and calanoid copepods but their densities were different. Variable densities are considered to be attributable to the patchy distribution of zooplankton rather than to environmental stress.

Cladocerans in this portion of the St. Johns estuary appeared during all four seasons. During fall the freshwater cladoceran Bosmina longirostris was found both in the river and tidal creeks. Numbers of B. longirostris were less than 1 individual/m³ and represented only a fraction of a percent of the total zooplankton population. The appearance of B. longirostris was due to a shift in the salinity regime from greater than 18 to less than 10 ppt. B. longirostris is common to the lower southern reaches of the St. Johns River where salinities are less than 1 mg/l (previous sampling by Envirosphere). A similar instance where Bosmina sp. were reported in the vicinity of the proposed plant site (mouth of San Carlos Creek) occurred during August, 1973 and July, 1975. During this time, respective salinities were 18.2 and 13.2 mg/l (Rehm et al., 1975).

During the winter and spring of 1980, the marine cladoceran Podon polyphemoides was present. Gravid organisms carrying from one to five eggs were found in the river and tidal creeks. With the exception of the river station EPl (Figure 2.8-4) during the winter, their average mean densities were less than 5 individuals/m³. At river station EPl, P. polyphemoides had an average mean density of 43 individuals/m³ and represented 4 percent of the total zooplankton population.

Daphnia spp. and Evadne normandii were other cladocerans present in both the river and tidal creeks. These plankters appeared during August, 1980 with average mean densities of 3 and 8 organisms/m³ and accounted for less than one percent of the total zooplankton community.

In addition, the mesoplankton are comprised of small meroplankters (temporary plankters) which become inhabitants of benthic and attached communities. These meroplankton were dominated by barnacle nauplii and cypris (Balanus sp.) with greatest nauplii densities occurring in spring. Barnacles appear to be the major fouling organism associated with the cooling water condensers at the Northside Station (plant operator personal communication). Other meroplankters found within the study site were polychaete larvae, bivalve veligers, and post-larvae clams and snails.

Sagitta sp. (arrowworm) and mysids were found to be the most abundant macrozooplankton (Appendix B, Table B-6 and B-7). Mysids were the dominant epibenthic macrozooplankters while Sagitta sp. was most abundant near the surface. Less abundant macrozooplankton but ecologically and economically important are the early life stages of the nekton community. These are conveniently defined as the "ichthyoplankton" and are described in greater detail in Section 2.8.5.1.

An atypical macrozooplankton in the estuarine community, Creseis acicula, appeared in the Blount Island Channel on August 8, 1980. These plankters, often called "sea butterflies" (Russell and Yonge, 1975), are normally found in the Gulf Stream and open ocean where the deposition of their skeletons results in an oceanic sediment known as pteropod ooze. The presence of C. acicula was associated with salinities greater than 25 ppt, confirming they were transported into the river from the ocean.

2.8.2.2 Phytoplankton

The composition of the phytoplankton community in the vicinity of the proposed plant site (Figure 2.8-4) is typical of an estuarine system which has a salinity range from 10 to 30 ppt. In a recent study (JEA, 1976), it

was shown that the phytoplankton communities were dominated by pennate and centric diatoms, dinoflagellates and cryptomonads with occasional occurrences of green and blue-green algae. Total densities of algae were found to range from 200 to 6,750 organisms/ml.

Phytoplankton primary productivity studies in the study area are being conducted for the NGS NPDES Permit renewal in 1982. Levels of primary production during June and August, 1980 ranged from 5 to 8 gO₂/m³/day in the tidal creeks while they were found to range from 3 to 5 gO₂/m³/day in Blount Island Channel. As evidenced by the data, productivities tend to be high in the tidal creeks and moderately high in the river during the growing season.

2.8.3 Periphyton

Periphyton studies are being conducted in the study area as part of the comprehensive NPDES study for the NGS. Examination of general trends during the fall of 1979 through the summer of 1980 showed that periphyton colonization rates on artificial substrates are higher in summer and spring than in fall and winter. Macroscopic observations of the biofouled substrates showed they were covered with green filamentous algae which were later identified as the centric diatom Melosira nummuloides. Microscopic examination showed that the artificial substrates were dominated by pennate diatoms of the genus Navicula, with Navicula cancellata as the dominant species.

2.8.4 Macroinvertebrates

2.8.4.1 Benthic Macroinvertebrates

The St. Johns River in the vicinity of the proposed plant site (Figure 2.8-4) supports a sparse benthic community with species of macroinvertebrates that are characteristic to southeastern estuaries in the United States (Roberts, 1974).

Results of the 1979-80 study of the benthic macroinvertebrates are tabulated in Appendix B, Tables B-8 and B-9. Two distinct faunal assemblages were observed in the tidal creeks and river channel in the vicinity of the proposed site. The sediment distribution in the vicinity of the proposed site is presented in Figure 2.8-5. Fine mud and sand found in the tidal creeks were dominated by polychaetes and amphipods, whereas the muddy sand substrate of the river channels was dominated by a small clam, Mulinia lateralis. M. lateralis showed seasonal shifts in population with peak abundance in the winter and lower numbers in the summer. Williams (1978) reported similar seasonal shifts for M. lateralis in the Cape Fear River, North Carolina. Polychaete and amphipod communities in the creeks had lowest population densities during the winter and highest in the spring and summer.

The river stations in Blount Island Channel (Figure 2.8-4) generally had a lower faunal variety than the tidal creek stations. Both the creek and channel stations exhibited a greater variety of species than the far field stations in Dunn Creek and Mill Cove.

The sampling revealed that the macroinvertebrate population at all stations is sparse. The lowest density of organisms per square meter was recorded at river station EP2 in the fall and the highest density at station EP3 in the spring; less than one organism per square meter and 12,157 organisms per square meter, respectively. Results of this study correlate well with previous studies done in the area (U.S. Army Corps of Engineers, 1973; Rehm, et al., 1975; JEA, 1973).

The benthic nekton and invertebrate densities as shown in Appendix B, Table B-8 for the St. Johns River and contiguous creeks near the NGS shows a seasonal distribution which is typical of the southeastern United States region. Seasonal occurrences of species is as would be expected and is in agreement with previous studies in the southeastern region. The distribution of organisms and their densities reflects the hydrography of the region. In an estuarine ecosystem, the habitat differences between

stations is often times significant. This results in populations of organisms accumulating in habitat which is optimum for that particular species. This trend was reflected in sampling the St. Johns River and its contiguous creeks and is seen in the localized concentrations of particular species during sampling periods.

The proposed site for the coal unloading facility is located on Blount Island adjacent to the Fulton-Dame Point Cutoff (Figure 2.8-4). Benthic invertebrate densities near the proposed coal unloading site are presented in Appendix B, Table B-8. Depauperate densities may be a reflection of the previous environmental impact from periodic dredging. Species density and composition of the OP stations when compared with the Mill Cove (MCV) Station shows a reduced numbers in species and densities. Of the OP stations, Station OP3 shows a greater variety of species. Blount Island is a dredge spoil island and distribution of organisms is suspected to have been impacted by that action. Freshwater runoff and tidal activity limit species composition in the area.

2.8.4.2 Fouling Organisms

The organisms responsible for bio-fouling, called the fouling community, in an estuarine environment are oysters, barnacles and other organisms which attach to structures that are submerged during a tidal cycle. The fouling community found in the study area of the St. Johns River is typical of similar estuaries. From observations made within the study area, there are several varieties of species with normal population densities within the fouling community. The communities display predictable species succession. That is, the sequence of species at various times and locations was similar to those described in past studies in like environments (Roberts, 1974).

Samples taken from intertidal structures within the study area were dominated by barnacles and oysters. No economic importance is attached to these communities. The oysters are not of economic importance because the Florida Department of Natural Resources has classified the St. Johns River in Duval County as unapproved for shellfish harvesting (Van Tassel, 1980).

In comparing samples taken from the immediate vicinity of the proposed plant site to samples taken in adjacent areas, no apparent variation occurred. This was probably due to the well mixed estuarine characteristics of the St. Johns River. Such mixing promotes fouling organism homogeneity which can be indicative of overall water quality and the abundance of fouling organisms' larvae available to colonize exposed surfaces.

2.8.5 Fish and Other Nekton

2.8.5.1 Ichthyoplankton (Nekton Larvae)

Total Ichthyoplankton

Mean densities of total fish larvae, including shrimp larvae and crab post-larvae, in river and creek zones (Figure 2.8-4) showed similar seasonal trends over the 12 month study period (Appendix B, Figure B-1). A minor peak of about 235 larvae/1000 m³ occurred in late January, following November densities of approximately 50/1000 m³ and 100/1000 m³ in the river and creeks, respectively. The January peak was associated with reduced salinities (Appendix B, Figure B-2) which might have caused larval concentration in the lower estuary as larvae moved away from fresher waters in the upper estuary. Maximum densities were observed in late May when fish larvae numbered about 16,000/1000 m³ in both channel and creeks. Mean densities remained at about 16,000/1000 m³ in the creeks and plateaued at around 10,000/1000 m³ in the river through the end of the study. Generally, greatest numbers of larvae were taken at the bottom over incoming and outgoing tides. Highest mean densities were

observed at the bottom on the outgoing tide. Seasonally, total numbers of species within the study area increased from 14 in the fall to a high of 46 during the spring and declined to 18 in the summer. Over the same period, total mean densities increased. Annual occurrence of selected species is shown in Figure 2.8-6. Tables B-10 and B-11 of Appendix B list seasonal average mean densities for ichthyoplankton and nekton post-larvae in the study area.

Important Species

Weakfish (Cynoscion regalis) appeared in the study area in early April (Appendix B, Figure B-3). Mean densities were low, with the channel about four times greater than the creeks. Density in the river increased through May to approximately $950/1000\text{ m}^3$, decreased and then peaked at $1,539/1000\text{ m}^3$ in August. Creeks reached a maximum density ($2,081/1000\text{ m}^3$) in May, declined below river densities and then had a minor peak in August. These data infer a second spawning effort. Highest densities occurred at the bottom for both rising and falling tides.

Spot (Leiostomus xanthurus) were collected initially during mid-December sampling in Blount Island Channel, but were not taken in the creeks until early January (Appendix B, Figure B-4). Once they appeared in the study area, densities increased and decreased in waves. River collections demonstrated three peaks; early January ($11/1000\text{ m}^3$), late February ($8/1000\text{ m}^3$) and mid-April ($20/1000\text{ m}^3$). Creeks were concurrent with peak river concentrations at densities of $16/1000\text{ m}^3$, $31/1000\text{ m}^3$ and $38/1000\text{ m}^3$. No depth preference was detected. Spot larvae were not found in the channel after late April or late May in the creeks.

Menhaden (Brevoortia spp.) entered the channel in early January and creeks by late January (Appendix B, Figure B-5). Numbers peaked in late February at densities of 19 and 58 per 1000 m^3 in the channel and creeks, respectively. In the channel, larvae maintained densities of around

10/1000 m³ through late March with a minor density peak (17/1000 m³) over April. A secondary peak (43/1000 m³) in the creeks was observed in late April. Densities were greater in creeks, but never exceeded 100/1000 m³. No depth preferences were noted. The second peak of menhaden is believed to be primarily attributable to Brevoortia smithi. Menhaden larvae disappeared from the river in late May and were not collected in creeks after June.

Spotted seatrout (Cynoscion nebulosus) first appeared in samples during May (Appendix B, Figure B-6). Channel densities were 272/1000 m³, declining to 96/1000 m³ in early June, and reached 624/1000 m³ by the termination of the study in August. Highest densities were collected consistently from the bottom on incoming tides and dominated the outgoing tidal samples through May. After May, surface samples had highest densities. In the tidal creeks, bottom samples of both tides consistently had greater numbers of larvae. From July through the end of the study, densities in the creeks were greater than in the channel, indicating the marsh was being utilized as a nursery.

Throughout the study period, croaker (Micropogonias undulatus) densities (Appendix B, Figure B-7) were greatest at the bottom and densities in the channel were greater than in the creeks. Croaker preferred the bottom on the incoming tide in the channel from November to late February and in the creeks from early April until they disappeared from samples in June. Density peaks were found in late January and early April. The January peak of 232/1000 m³ in the channel and 166/1000 m³ in the creeks was associated with decreased salinity. No croaker were collected after June.

Silver perch (Bairdiella chrysura) were collected from late April through August. Density peaked in late May at 69 and 68 per 1000 m³ in the channel and creeks, respectively, and declined through the termination of the study (Appendix B, Figure B-8). The bottom was preferred at all stations through the tidal cycle and study period.

Black drum (Pogonias cromis) was present for only a short period during the late spring (Appendix B, Figure B-9). Larvae were collected first in early April at 98/1000 m³ (river) and 45/1000 m³ (creeks) and were not caught beyond early June. Channel density was greater than creeks, but no tidal patterns were noted.

Early drum larvae that could not be identified were categorized as "Sciaenidae species". Because several different species were composited in this class, no distinct density peaks were detected. These unknown sciaenid larvae showed a preference for the bottom on an incoming tide (Appendix B, Figure B-10), perhaps riding a lower, more dense water mass into the estuary. When first collected in late April, densities were relatively high (169/1000 m³ in the river and 208/1000 m³ in the creeks), indicating that spawning was probably occurring in or near the estuary. Densities increased into July to 980/1000 m³ in the river and 302/1000 m³ in the creeks and then decreased through August. The study area is considered a nursery area for this group.

Blue crab post-larvae and juveniles entered the study area in January (Appendix B, Figure B-11). Maximum channel densities of 24/1000 m³ were recorded for late May while creek densities peaked approximately one month later in early July (43/1000 m³). In August, densities declined. Overall, highest densities were found in the creeks.

Penaeid shrimp post-larvae were present in fall samples at densities of 14 and 25 per 1000 m³ in the river and creeks, respectively (Appendix B, Figure B-12). Shrimp were present in reduced numbers until April when numbers began to increase. Peak numbers were collected in August when estimated densities reached 1286/1000 m³ in the channel and 970/1000 m³ in the creeks. Surface river samples normally provided the highest densities after January.

Anchovy species is a combined category for larvae and early juveniles of bay and striped anchovies. Anchovies were present in reduced numbers from November into April (Appendix B, Figure B-13). Their abundance began

to increase in late May, with approximately 3,900/1000 m³ in the river and 3,300/1000 m³ in the creeks. Densities were roughly unchanged through July followed by maximum densities of 5,400/1000 m³ in August. Tidal or depth patterns were not seen in the creeks, but anchovies appeared to favor the bottom on an incoming tide in the channel from May until the end of the study. From the larval stages collected, it was concluded that the study area is being utilized as a spawning ground and nursery.

Goby species (Appendix B, Figure B-14) is a composite of all the species of gobies collected during the study. Though collected in all seasons, goby densities remained at about ten or less per 1000 m³ within the study area until early March. A minor peak of about 1,600/1000 m³ occurred in the river in late May. Density in the creeks steadily increased to an August maximum of approximately 8,400/1000 m³. Maximum river densities in August were about 2,500/1000 m³. During the summer, largest larval density in the creeks was usually at the surface on an outgoing tide and serves as an efficient dispersal mechanism.

Spawning and Nursery Grounds

Silverside species utilized the marsh as spawning and nursery grounds in the late winter and early spring. Gobies, blennies, silversides, and sciaenid species spawned in the spring through the summer in tidal creeks and salt marshes and appeared to utilize these areas as a nursery.

Spot, which spawn offshore, utilized the marsh as a nursery. Black drum, weakfish, and spotted seatrout apparently spawned in Blount Island Channel or the nearby river channel. Their larvae used the estuary as a nursery ground. Croaker and menhaden, which spawn offshore, were collected in both tidal creeks and channel zones. Low numbers and consistent standard length measurements suggest that the study area is not a nursery for these species. Life history information on the commercially important species is supplied in Appendix B.

Anchovies were the only fish that spawned in both the creeks and channel. After hatching, larvae used both areas as nurseries. The majority of the anchovy species collected were probably the bay anchovy, but their lack of fin ray development precluded positive identification. When anchovy larvae were identifiable by fin ray counts, samples contained some striped as well as bay anchovies.

An assessment of the spawning and nursery grounds in the waters adjacent to the proposed coal unloading facility (Figure 2.8-4) was performed during the spring and summer. The larval ichthyofauna of the drainage ditch bordering the coal unloading facility site was dominated by the naked goby, 445/1000 m³ (Appendix B, Table B-21). Commercially important species comprised only 13 percent of the spring sample. The relatively small numbers of individuals collected and limited habitat size would preclude this area as an important spawning or nursery ground for any species except the naked goby.

Ichthyoplankton Entrained by Northside Station

Although ichthyoplankton densities in the NGS discharge (source of makeup for proposed plant) were greater than channel densities for certain species, total densities were consistently lower. Likewise, the number of species entrained was less than the number collected in sampling zone EP2 (Figure 2.8-4), the source of cooling water makeup for NGS. Direct comparison of NGS entrainment and subzone EP2 data for species such as gobies would be biased. Gobies are believed to be spawning and living in the attached oyster community encrusting the cooling water intake flume. Data for entrained ichthyoplankton are presented in Appendix B, Table B-12. In winter, total entrainment densities (77/1000 m³) were about one-fourth the average mean density of ichthyoplankton found in subzone EP2 (327/1000 m³). Spot and menhaden were the only commercially important species entrained in densities greater than those found in subzone EP2. Of the forage species, concern has been expressed over the entrainment of the

Atlantic silverside, (Menidia menidia) (Beck and Miller, 1974). During the survey, numbers of entrained silverside species were relatively low (4-9 per 1000 m³).

Spring entrainment numbers (2,394/1000 m³) for total ichthyoplankton were less than half the average mean density found in subzone EP2 (5,543/1000 m³). Spot, croaker and menhaden were entrained in densities greater than those in the general water column of subzone EP2. High croaker entrainment values resulted from an unusually large number of croaker larvae being entrained during a single sampling episode.

Ichthyoplankton entrained by the NGS during the summer was about one half (4,555/1000 m³) of the ichthyoplankton density (10,686/1000 m³) in subzone EP2. Numbers of species entrained were always less than those found in EP2. Individual species densities, except for the gobies which live and spawn in the oyster community of NGS's intake flume, were consistently less than those found in the contiguous channel subzone.

2.8.5.2 Adult and Juvenile Nekton

Results of the quarterly fishery survey conducted from fall 1979 to summer 1980 in the three predominant aquatic habitats (freshwater creeks, tidal creeks, river) in the vicinity of the proposed plant site are discussed in this section. Sampling sites are shown in Figure 2.8-4.

Fish species and numbers sampled by electrofishing in the two freshwater creeks on the proposed site are listed in Appendix B, Table B-13. No fish collected during this survey were not listed as being rare or endangered.

Fish from each freshwater creek were found to be similar. Each fish community consisted primarily of poecillids, and the least killifish (Heterandria formosa). Other fish collected included two types of catfish; yellow and black bullhead (Ictalurus natalis and Ictalurus melas), redbfin

pickerel (Esox americanus), bluegill sunfish (Lepomis macrochirus) and black crappie (Pomoxis nigromaculatus). Although the latter two species are considered to have recreational value, none were larger than 15 cm. Absence of large sunfish and crappie may be the result of the size of their habitat, especially during dry periods when the amount of freshwater is limiting. As a result, there was no recreational fishing observed in the creeks during the study period. Other organisms associated with these two freshwater creeks, such as amphibians and reptiles, are presented in Section 2.9.2.2.

Types and numbers of fish, crab and shrimp collected in the tidal creeks (San Carlos and Browns Creeks) are presented in Appendix B, Tables B-14 and B-15. Common estuarine organisms such as grass shrimp (Palaeomonetes spp.), killifish (Fundulus spp.), silversides (Menidia spp.), and majorras (Eucinostomus argenteus), were found to occur in large numbers during all seasons. These organisms are typical of estuarine salt marsh creeks. With the exception of the mojarras, these organisms spend their entire life cycle within the tidal tributaries of the St. Johns River. Large numbers of other organisms were collected in the tidal creeks only during specific seasons. This substantiates the seasonal role of the tidal creeks and marsh as a nursery area. Most of these organisms are commercially valuable and enter the estuary as post-larvae after being spawned offshore. They include penaeid shrimp (Penaeus setiferus, P. aztecus and P. duorarum), blue crabs (Callinectes sapidus), Atlantic croaker (Micropogonias undulatus), spot (Leiostomus xanthurus), sea trouts (Cynoscion spp.), drum (Sciaenops ocellata, Pogonias cromis), and Atlantic menhaden (Brevoortia tyrannus). No rare or endangered fish were observed or collected in the tidal creeks.

Results of the current nekton survey (fish, crabs and shrimp) in the St. Johns River (Blount Island Channel) are presented in Appendix B, Tables B-16 and B-17. The species composition and periodicity of occurrence observed during the survey are considered typical for this type of estuary (Dahlberg, 1976). Fall and winter otter trawl collections were dominated

by a small non-commercially important sciaenid, the star drum (Stellifer lanceolatus). In spring and summer, the Atlantic croaker (Micropogonias undulatus) was dominant. No rare or endangered fish species were collected or observed in the estuarine study zones during the monitoring period.

Nekton collected in selected areas near the proposed coal unloading facility site (Figure 2.8-4) are listed in Appendix B, Tables B-18, B-19, and B-20. Aquatic sampling areas for this facility included a dredge spoil pond and drainage ditch on Blount Island, and the Fulton-Dame Point Cutoff.

The dredge spoil pond is a vestige of the Back River that has been used as a settling pond for dredged spoil effluent and as such has a bottom composed of silty fines. Water depth in the pond is approximately 2 feet. The dominant fish collected in the pond by seining, i.e., sheepshead minnow (Cyprinodon variegatus), was highly stress tolerant. Fish collections made by gill netting were dominated by blue crabs (Callinectes sapidus) and mullet (Mugil cephalus and M. curema). Seine collections in the drainage ditch which connects the spoil area to the Fulton-Dame Point Cutoff were dominated by killifish (Fundulus spp.) and spot (Leiostomus xanthurus). Fish catches from otter trawling in the Fulton-Dame Point Cutoff consisted of common estuarine forms. With the exception of the manatee and the alligator, no rare, threatened, or endangered nekton were observed in the vicinity of the proposed coal unloading facility site during the sampling period.

2.8.6 Aquatic Macrophytes

Freshwater macrophytes occur in the aquatic communities present on the proposed plant site and located in the vicinity of the site during the wet season. Types of freshwater communities on the site include hardwood swamp, cypress swamp, and creek habitats (Section 2.9.2). Hardwood swamps were dominated by bladderworts (Utricularia spp). Other aquatic plants

found in the hardwood swamps included duckweed (Lemna minor), floating heart (Nymphoides spp.), white arum (Peltandra sagittaeifolia), pickerel-weed (Pontederia cordata), and cat-tail (Typha latifolia). Representatives of the cypress swamps included bladderworts (Utricularia spp), sphagnum moss (Sphagnum spp.), narrow leaved sagittaria (Sagittaria graminea), pickerel weed (Pontederia cordata), floating heart (Nymphoides spp.), water lily (Nymphaea odorata) and duckweed (Lemna minor). On-site creeks which are bordered by hardwood bottomlands exhibit little diversity and have small populations of duckweed (Lemna minor) and golden club (Orontium aquaticum).

Extensive tidal salt marshes border the proposed site on both the south and east sides (Figure 2.8-1). The dominant estuarine aquatic macrophytes in these areas are black rush (Juncus roemerianus) and salt marsh cordgrass (Spartina spp.). Areas of Blount Island Channel in the vicinity of the proposed site are bordered by narrow marshy areas with growths of black rush and cordgrass. These areas are not extensive due to the channelized nature of the river and construction of sea walls and rip rap embankments. Submerged aquatic macrophytes do not occur in the channel.

2.8.7 Aquatic Mammals

A weekly manatee watch was conducted at the Northside Station from January to April, 1980, as described in Chapter 6, Section 6.2.4.2. Manatees were not seen in the vicinity of the Northside thermal discharge during the watch. A single manatee was seen in the Blount Island Channel during the summer sampling period and several sightings were reported by local inhabitants during the same period. Although the study area is within the designated critical habitat of the manatee, little or no forage is available for the manatee. Therefore, the vicinity of the proposed plant is probably not a preferred habitat. The only other aquatic mammal observed in the study area was the bottlenose dolphin, which was seen in the vicinity of the Fulton-Dame Point Cutoff.

2.8.8 References

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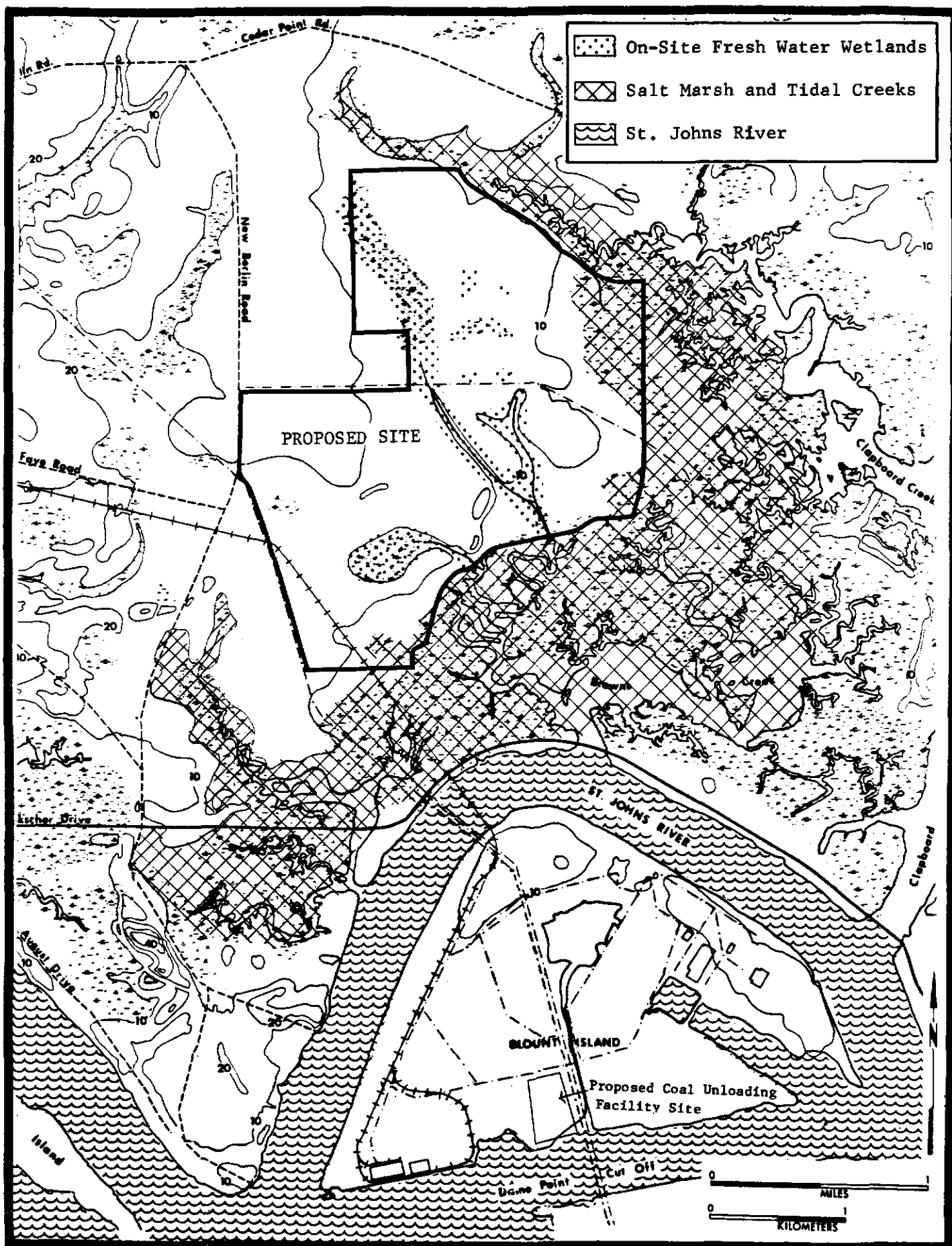


Figure 2.8 -1 Aquatic Habitat Types in the Vicinity of the Proposed Site

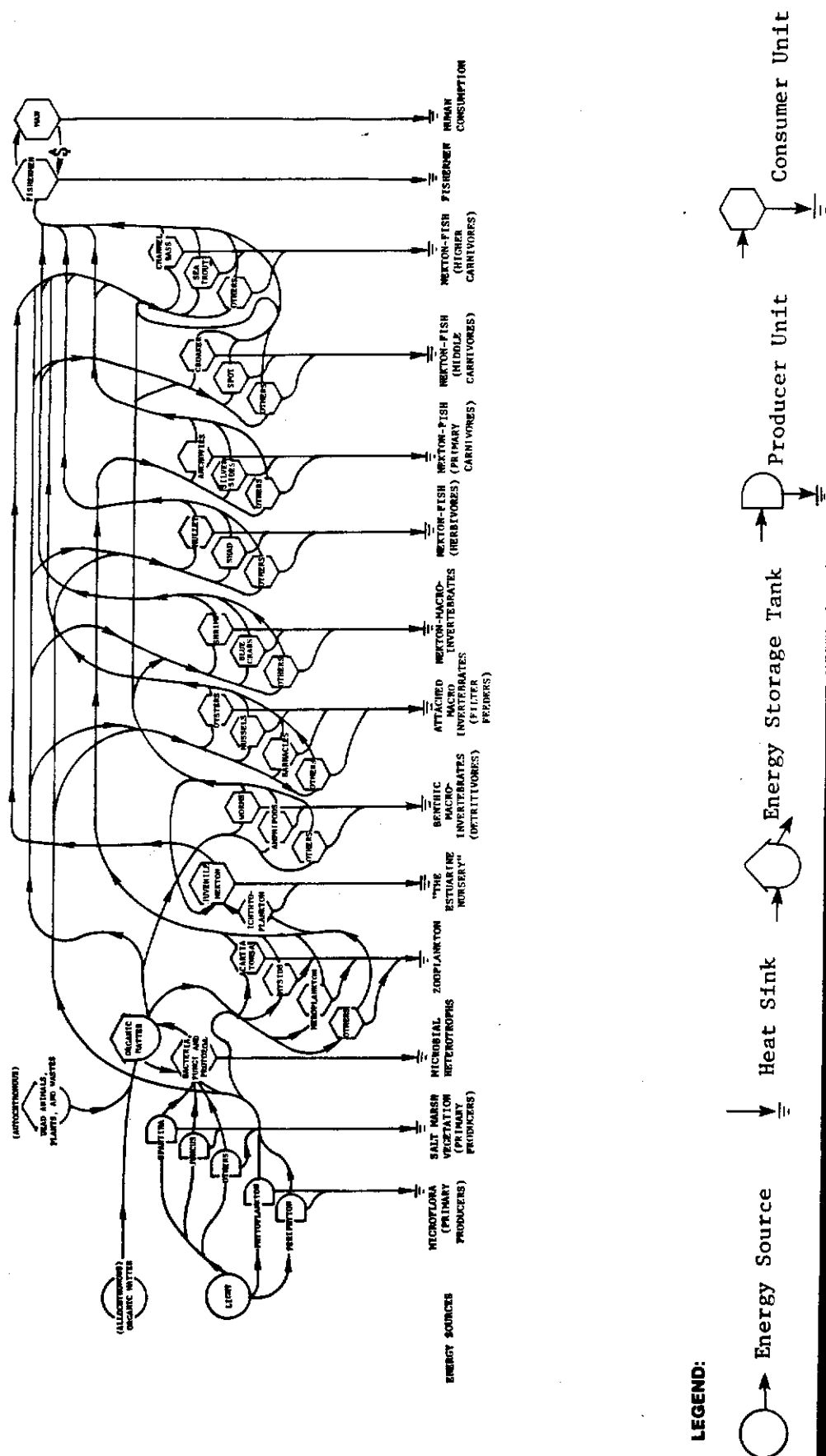


Figure 2.8-3

Food Chains and Other Interspecies Relationships of the Blount Island Channel Ecosystem and Adjacent Aquatic Communities

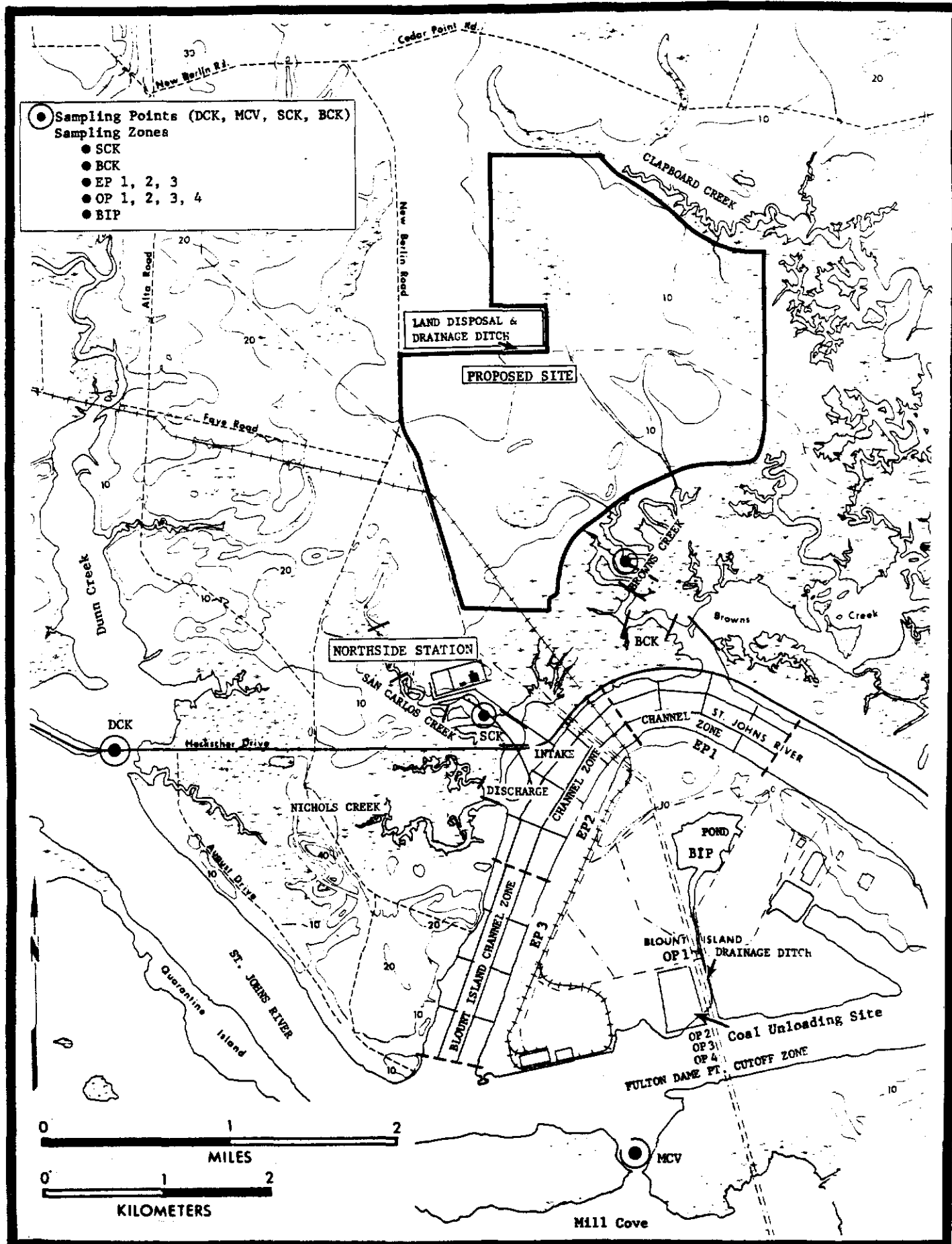


Figure 2.8-4 Aquatic Ecology Study Area

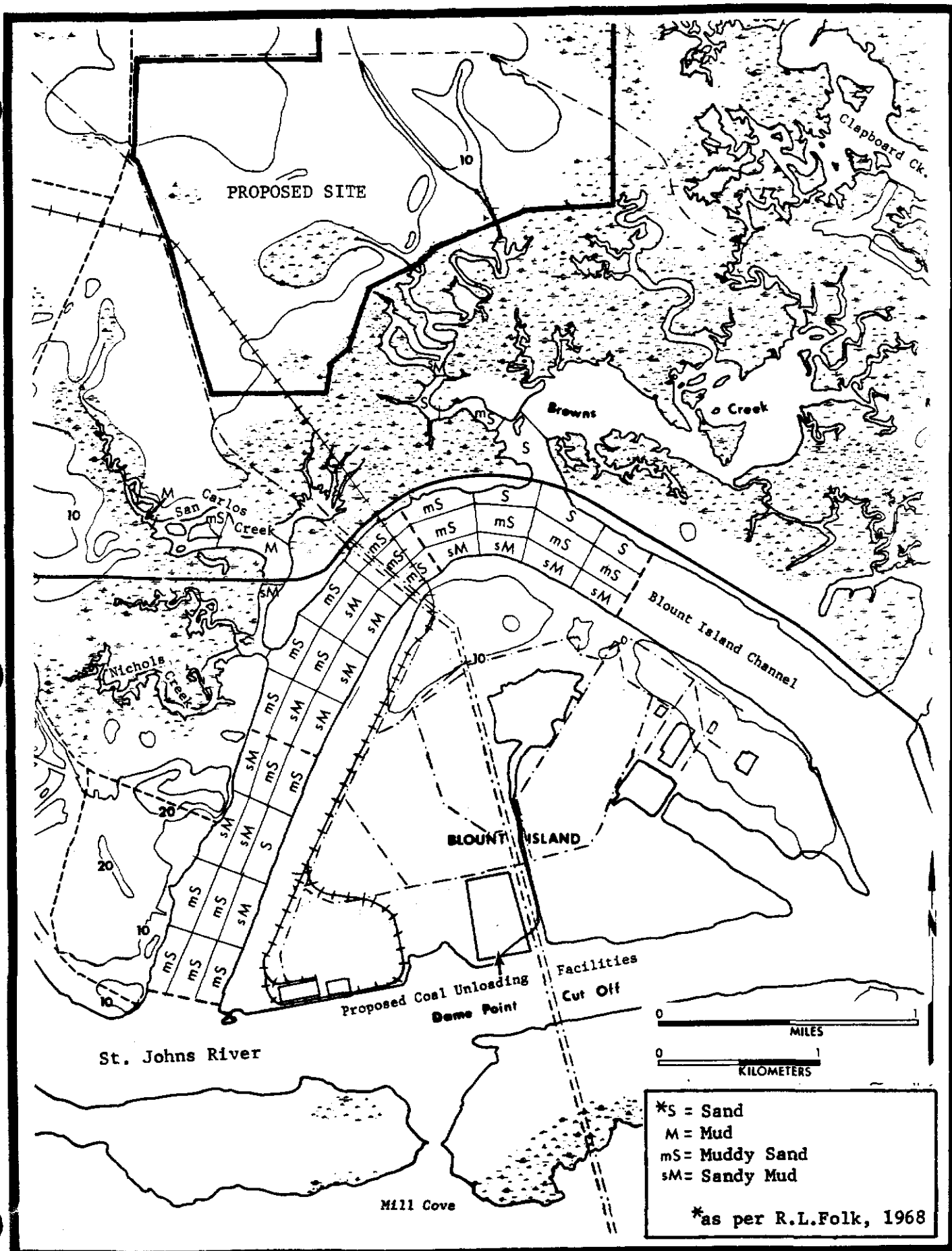
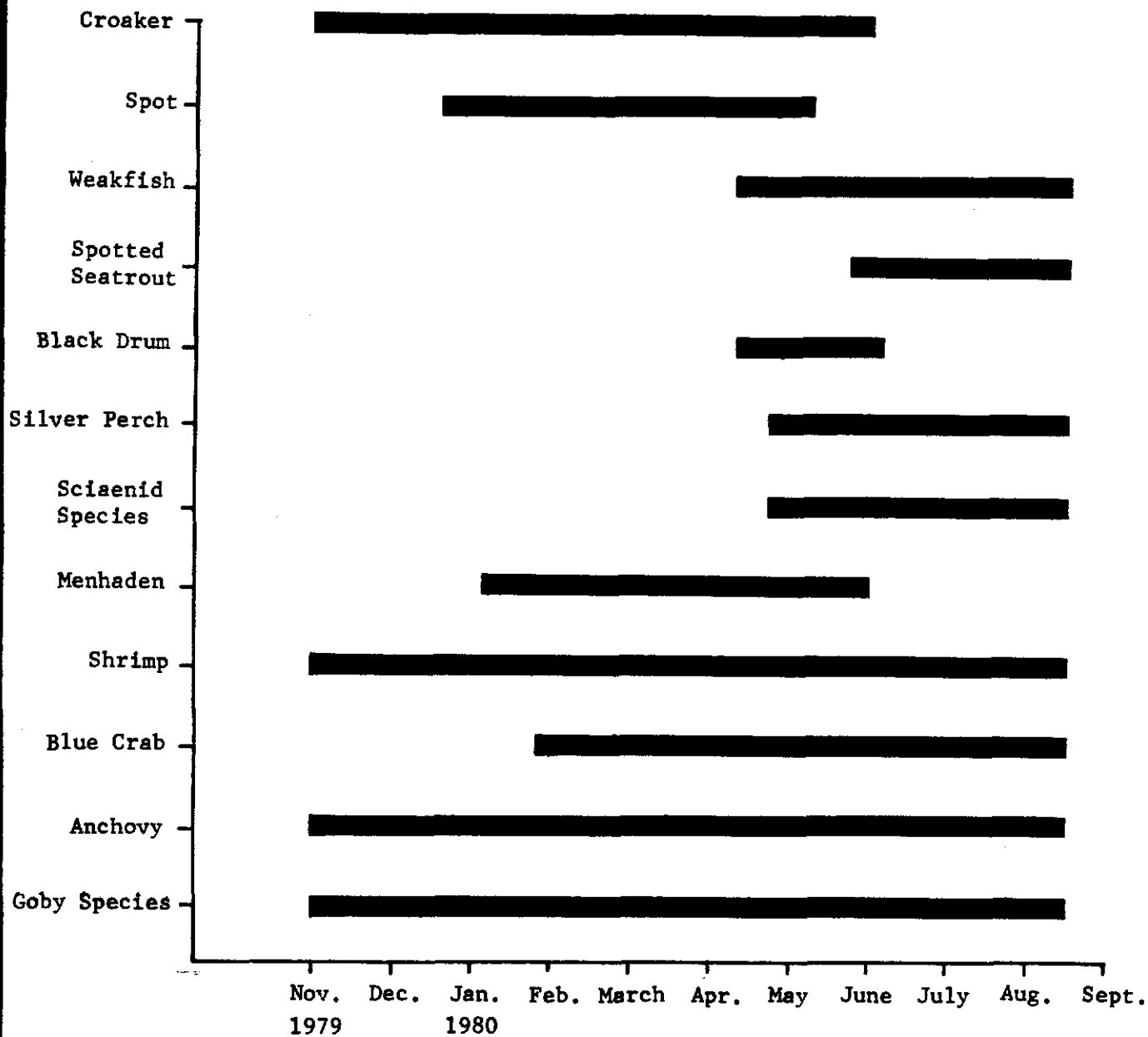


Figure 2.8-5 Sediment Types at Aquatic Sampling Sites



Source: 1979-1980 Preapplication
Monitoring Program

Figure 2.8-6 Annual Occurrence of Selected Ichthyoplankton Species of the St. Johns River, November, 1979 - September, 1980

2.9 TERRESTRIAL ECOLOGY

2.9.1 General Terrestrial Ecology

2.9.1.1 Floristic Ecology

The northeastern part of Florida falls within the Southern Mixed Forest category as defined by Kuchler (1964). The physiognomy of this type is characterized as a tall forest of broadleaf deciduous and evergreen species, and a coniferous component. Dominant trees are sweetgum (Liquidambar styraciflua), southern magnolia (Magnolia grandiflora), slash pine (Pinus elliottii), loblolly pine (Pinus taeda), and oaks (Quercus sp.). Various other components include maple (Acer sp.), hickories (Carya sp.), hollies (Ilex sp.), wax myrtle (Myrica sp.), bay (Persea sp.), cabbage palmetto (Sabal palmetto) and saw palmetto (Serenoa repens).

Several vegetation types occur within the Southern Mixed Forest, including: pine forests, swamp forests and mixed deciduous and evergreen forests which are not periodically flooded. Pine forests occupy both upland well drained soils and low poorly drained soils. Upland pine forests are commonly divided into sandhill and sand pine scrub types. Sandhill forests are characteristically open and dominated by longleaf pine (Pinus palustris) and turkey oak (Quercus laevis). This type has been altered in the past through logging and clearing for citrus groves. The sand pine scrub forests are usually characterized by a sand pine (Pinus clausa) canopy with a dense shrub layer of myrtle oak (Quercus myrtifolia) and live oak (Quercus virginiana). This forest type is mostly restricted to well drained sand deposits that have been strongly washed and sorted by wind and wave action. Both the sandhill and sand pine forests are maintained by fire. Succession in these forests proceeds toward the mixed hardwood forest type when fires are excluded.

Pine forests that occur on poorly drained soils are termed pine flatwoods. The pine flatwood vegetation type is one of the most common types in Florida (Monk, 1965). A canopy of this type may be dominated by longleaf pine, slash pine or pond pine (Pinus serotina). The understory is typically composed of saw palmetto, ink berry (Ilex glabra), and running oak (Quercus pumila). The pine flatwoods vegetation type is also maintained by fire. Periodic fires kill the competing hardwood species in the understory, leaving the fire tolerant pines to develop. In the absence of fire, ecological succession in the pine flatwoods proceeds toward a hardwood forest.

Swamp forests consist of three main types in northeastern Florida: cypress swamps, mixed hardwood swamps characterized by deciduous species, and hardwood swamps characterized by evergreen species, which are commonly termed bayheads. Swamp forests occur where seasonal or continuous flooding prevails.

Cypress swamps are dominated by either bald cypress (Taxodium distichum) or pond cypress (Taxodium ascendens). The bald cypress dominated swamps typically border sloughs, lagoons, rivers, ponds and lakes. Pond cypress dominated swamps are frequently found in depressions in pine flatwoods. Succession in cypress swamps is toward the bayhead and mixed hardwood types when improved drainage is present.

Mixed hardwood swamps typically border creeks, rivers, sloughs and basins which are regularly flooded. Considerable variation in species diversity occurs from place to place. The most common species are red maple (Acer rubrum), water oak (Quercus nigra), Carolina ash (Fraxinus caroliniana), blackgum (Nyssa biflora), dahoon (Ilex cassine), sweetgum (Liquidambar styraciflua), button bush (Cephalanthus occidentalis), cabbage palmetto (Sabal palmetto), sweet bay (Magnolia virginiana), and swamp bay (Persea palustis). This forest type is considered to be climax on rich lowland sites.

Bayhead forests develop from marshes, swamps, or low pine flatwoods (particularly those dominated by pond pine). Soils on which bayheads occur are high in organic matter and subject to seasonal flooding. This vegetation type is dominated by broadleaf evergreen trees including sweet bay, swamp bay, and loblolly bay (Gordonia lasianthus). Bayheads are considered to be climax on low acidic soils which are high in organic matter and are subject to seasonal flooding. Where improved drainage occurs, some species typical to the mixed hardwood forest type frequently occur.

The hardwood hammock (also referred to as southern mixed forest, upland mixed hardwood forest or hardwood forest) occurs on fairly rich sandy soils and exhibits best growth and development in areas where limestone and phosphatic deposits outcrop. This vegetation type can also occur in less fertile areas when fire has been eliminated or retarded long enough to permit succession beyond the subclimax pine stage. The hardwood hammock is considered to be climax vegetation of northern and central Florida (Monk, 1965) and is characterized by southern magnolia (Magnolia grandiflora), laurel oak (Quercus hemispherica), scrub holly (Ilex opaca), and ironwood (Carpinus caroliniana).

Four vegetation types have been described for Duval County, Florida (Davis, 1967), including pine flatwoods, longleaf pine ridges, coastal marshes, and cypress swamps. The pine flatwood is the most extensive type, covering about 85 percent of the county. The pine flatwood within Duval County is typical of pine flatwoods in Florida. Coastal marshes border portions of the St. Johns River and Nassau River and comprise about 10 percent of the county. Longleaf pine ridges and cypress swamps occur within the pine flatwoods, occupying less than 5 percent of the county.

2.9.1.2 Faunistic Ecology

Urbanization has left Duval County with a limited amount of habitat suitable for many game and nongame species which typically occur elsewhere in the region. However, the southeastern and western portions of the

county still have areas where wildlife is plentiful. Bobwhite Quail (Colinus virginianus), Mourning Dove (Zenaida macroura), gray squirrels (Sciurus carolinensis), fox squirrels (Sciurus niger), Wild Turkeys (Meleagris gallopavo), white-tailed deer (Odocoileus virginianus), racoons (Procyon lotor), and numerous species of waterfowl are among the game species still found in the county.

Salt and brackish marsh areas in the eastern and northern portions of the county are frequented by birds such as Clapper Rails (Rallus longirostros), Great Blue Herons (Ardea herodias), Great Egrets (Casmerodius albus egretta), and Red-winged Blackbirds (Agelaius phoeniceus). The dendritic network of tidal creeks and mudflats provide habitat for the American alligator (Alligator mississippiensis), raccoon (Procyon lotor) and marsh rabbit (Sylvilagus palustris), while hardwood hammocks which dot the marsh are inhabited by numerous additional species of wildlife.

Various types of pine forest make up a significant portion of the county. In the more xeric communities which are dominated by longleaf pine and turkey oak, armadillos (Dasypus novemcinctus) and cotton rats (Sigmodon hispidus) are among the more common mammalian species. Rufus-sided Towhees (Pipilo erythrophthalmus), Bachman's Sparrows (Aimophila aestivalis), and several species of woodpecker which utilize the snags present are among the bird species typically found. This community also supports huntable populations of Bobwhite Quail (Colinus virginianus) in certain areas.

Duval County is in the Atlantic flyway and open water habitats are used as resting or wintering areas by many species of migrating waterfowl. The furbearer population within the county does support some trapping but the size of the reported harvest indicates that it is not economically important with only 25 bobcats, 40 otter and no mink reported for 1978-79. Both the bobcat and otter are reported as absent from the more heavily developed areas in the county (Brady, 1980).

2.9.2 Specific Description of the Terrestrial Environment of the Site Area

2.9.2.1 Plant Communities

Plant Site

Nine major vegetation communities were identified within the boundaries of the proposed plant site (Figure 2.9-1), including: pine flatwoods, grassy scrub, grassy scrub/pine flatwoods, hardwood swamp, hardwood hammock, bottomland hardwood, bayhead, cypress swamp, and salt marsh. These communities occupy approximately 504, 25, 363, 100, 415, 80, 28, 40, and 41 acres, respectively. The woody and herbaceous species observed in each of these vegetation types are listed in Appendix A, Tables A-1 and A-2. The pine flatwoods, grassy scrub/pine flatwoods, hardwood hammock, and hardwood swamp comprise the largest percentage of the proposed site with 30, 22, 25, and 6 percent, respectively. Remaining types (cypress swamp, bayhead, salt marsh, grassy scrub, and bottomland hardwood) occupy a smaller percentage (2.4, 1.7, 2.5, 1.5, and 4.8 percent, respectively) of the proposed site than the others, but exhibit different characteristics. Each type is discussed in Appendix A, with emphasis given to those occupying large areas of the site and to those considered to be unique or of some ecological importance.

Rare, Threatened and Endangered Plant Species

No endangered plant species are reported to occur in Duval County (Ward, 1979). Two species, southern lip fern (Cheilanthes microphylla) and spoon flower (Peltandra sagittifolia), are listed as rare for Duval County. Spoon flower was observed on the site. One individual was found in the bayhead community which borders the hardwood swamp in the southern portion of the site. Two threatened species, Jackson-vine (Smilax smallii) and Bartram's ixia (Sphenostigma coelestinum) are reported for Duval County (Ward, 1979). Neither of these species were observed on the site.

Existing Stresses and Perturbations

Existing stresses and perturbations to naturally occurring vegetation can be divided into two categories, those induced by natural causes and those induced by human activity. The principal natural cause on the proposed site is fire. Fire tends to eliminate most hardwood and shrub species but leaves the more fire resistant long leaf pines. Logging is the principal unnatural cause on the proposed site.

Approximately 800 acres of the proposed site exhibit some evidence of fire, such as scarred tree boles or the charred remains of trees. Scarred boles are the only evidence of fire in the pine flatwoods in the northern portion of the site. This is indicative that some time, perhaps 10 years or more, has passed since the area was disturbed by fire.

Fire has had a more recent effect on the southern portion of the site. Within the last five years, approximately 400 acres were burned. Evidence of this fire consists of scarred boles as well as charred remains of trees and shrubs. This fire appears to have been contained within the drier grassy scrub/pine flatwood vegetation type. Wet conditions in the bayheads and cypress swamps apparently prevented fire from spreading into these areas.

The occurrence of fire within the pine flatwoods and grassy scrub/pine flatwoods vegetation type is not as adverse an effect as it would appear. These vegetation types require fire to maintain their successional stage. In the absence of fire, succession in these vegetation types proceeds towards a mixed hardwoods type.

Logging induces both direct and indirect effects. The removal of canopy trees is a direct effect as well as the disturbance to shrub and herbaceous species from logging equipment. The increased fire hazard from the improper disposal of slash is an indirect effect. Another indirect effect results from the removal of the forest canopy. What was once deep

shade becomes direct sunlight. This abrupt change produces changes in species composition. Logging was initiated on the proposed site in July, 1980 by the present owners (Northshore Development Corporation). The standing timber is being cut for pulp. The plan is to log the northern portion of the site first and then move to the southern half. To date a large portion of the approximately 395 acres of the pine flatwoods to the north of Island Drive has been cleared.

Blount Island

The proposed coal unloading facility will occupy an approximate 55 acre site on Blount Island. An additional 31 acres will be used to construct a rail line connecting this site to the proposed power plant. Blount Island has been severely disturbed in the last 10 to 15 years. As a result, the remaining areas of natural vegetation are restricted to the periphery of the island, primarily along the old river channel, and along the remnants of Alligator Creek. Six major vegetation types were identified on Blount Island (Figure 2.9-2), including: mixed hardwood, grassy scrub, Myrica shrub, Baccharis shrub, water/beach, and salt marsh. Five of these six (grassy scrub, myrica shrub, water/beach, Baccharis shrub and salt marsh) occur within the boundaries of the proposed unloading facility. For the purpose of summarizing the common woody and herbaceous species observed on Blount Island, the six vegetation types identified were combined into one type termed riparian and reported in Appendix A, Tables A-1 and A-2. Each of the six types is discussed in Appendix A from the perspective of Blount Island and of the proposed unloading facility site.

Rare, Threatened and Endangered Plant Species

No endangered plant species are reported to occur in Duval County (Ward, 1979). Southern lip fern (Cheilanthes microphylla) and spoon flower (Peltandra sagittifolia) are listed as rare species which may occur in Duval County. Neither species was observed on Blount Island, nor are

habitats on Blount Island conducive to their occurrence. Jackson-vine (Smilax smallii) and Barthram's ixia (Sphenostigma coelestinum) are considered to be threatened species which have been observed in portions of Duval County. Neither of these species was observed on Blount Island or within the site of the proposed unloading facility.

Existing Stresses and Perturbations

The existing stresses and perturbations to naturally occurring vegetation can be divided into two categories, those induced by natural causes and those induced by human activity. The principal natural cause of stress and perturbation to vegetation of Blount Island is storm activity and associated high tides. Several unnatural causes or those attributable to human activity commonly occur on Blount Island. Storage of cars and trucks, dredge spoil disposal, solid waste disposal and development of vacant land are the primary examples of unnatural causes attributed to human activity.

Vegetation located on the margins of Blount Island along the St. Johns River is subject to disturbances from storms. Storms exert stress from high winds, wave action, and flooding due to high tides.

Dredge spoil disposal is the one unnaturally caused stress which has had the greatest effect on the natural vegetation composition of Blount Island. Dredge spoil disposal has a wide range of effects. Typically, disposed spoil is different both chemically and physically than previously existing substrates. Spoil sites are generally diked for the disposal process; as a result the disposal area is frequently inundated giving rise to wetland species. When spoil disposal activities are complete or temporarily halted and the disposal site dries out, conditions are no longer favorable for wetland species. These frequently fluctuating conditions due to dredging activity impede the progress of ecological succession.

The use of vacant land by the Jacksonville Port Authority (JPA) for storage of imported cars and trucks exerts a continual stress on the vegetation in the storage areas. For the most part, cars are stored in large paved areas, but often the inventory is placed on open grassy areas. The movement to and from these storage areas as well as vehicular shading of vegetation disrupt the existing vegetative growth. Construction of additional paved storage areas also results in loss of naturally vegetated areas. Storage of scrap metal and various pieces of equipment associated with Offshore Power Systems (OPS) and JPA operations effectively removes natural vegetation and prevents the land from becoming revegetated.

2.9.2.2 Animal Communities

Plant Site Habitats

Nine habitat types are present on the proposed plant site. Hardwood swamp, hardwood hammock, pine flatwoods and grassy scrub/pine flatwoods make up the majority of the site comprising approximately 83 percent of the total area with the cypress swamp, bottomland hardwood, bayhead, grassy scrub, and salt marsh accounting for the remainder. Similar vegetative communities were combined because of their common use by faunal species. Mammals, birds, reptiles and amphibians observed during the course of the one year on-site study are presented in Appendix A, Tables A-21, A-22, A-23, and A-24. Each of the habitat types and their characteristic faunal species are discussed in Appendix A.

Biologically Sensitive Areas

Hardwood Swamp

Hardwood swamp is a biologically sensitive habitat. The loss of wetland habitat and associated fauna is an area of continuing concern for both state and federal agencies. As shown in Figure 2.9-1, hardwood swamp is present in two areas of the proposed site and occupies approximately 100 acres.

Salt Marsh

Only a small amount (approximately 41 acres) of salt marsh falls within the proposed site boundary (Figure 2.9-1). A much larger area exists to the east of the site. This habitat type is highly productive and depends on tides to provide nutrient and energy subsidy and waste removal for those organisms adapted to this environment. Great Blue Herons (Ardea herodias), Great Egrets (Casmerodius albus), Snowy Egrets (Egretta thula) and Louisiana Herons (Hydranassa tricolor) all use the marsh as a principal feeding area. The Clapper Rail (Rallus longirostris) was frequently seen and heard in the marsh and on the mud flats bordering the tidal creeks. An abandoned Osprey (Pandion haliaetus) nest was observed in the salt marsh off the site during the January aerial survey and on a subsequent trip, a pair of Osprey were seen and were assumed to be nesting. The marsh plays an important role in the life cycle of many organisms.

Rookery

A rookery was discovered north of Island Drive and just east of the proposed site boundary (Figure 2.9-3). The ecological sensitivity of the area stems from it being used by various wading birds as a colonial nesting site. Cattle Egrets (Bubulcus ibis), Snowy Egrets, Louisiana Herons and White Ibis (Endocimus albus) were the most common nesters with Great Egrets, Black-crowned Night Herons (Nycticorax nycticorax) and Anhingas (Anhinga anhinga) being present in lesser numbers. The largest number of active nests (1614) was found in June followed by a substantial decline in July (958) and August (206).

Great Egrets were the earliest nesters followed closely by Snowy Egrets. Loss of suitable nesting and feeding habitat has resulted in the Snowy Egret and the Louisiana Heron being listed by the Florida Game and Fresh Water Fish Commission as a "species of special concern". Appendix A, Table A-22 contains a list of the birds observed in the rookery while the results of the three censusing efforts are presented in Appendix A, Table A-27.

Important Species

A species is defined by the Florida Department of Environmental Regulation as "important" if: (1) it is commercially or recreationally valuable; (2) it is rare, endangered, threatened, or protected; or (3) it has unique ecological value. All species observed on the proposed site and falling into any of the above categories are included in the following discussion. Several additional species are also discussed even though they were not actually observed on the site.

Commercially or Recreationally Valuable Species

Whitetail Deer (*Odocoileus virginianus*)

The whitetail deer is the most important big game animal in the eastern United States. Rarely having a home range of more than one mile in diameter, this species is a browser feeding primarily on twigs, shrubs, forbs, fungi and acorns (Burt, 1976). No deer or deer sign were observed on the proposed plant site.

Eastern Gray Squirrel (*Sciurus carolinensis*)

The squirrel is an important small game animal in certain parts of its range. Home ranges vary from 2-7 acres with population sizes ranging from 2-20 per acre (Burt, 1976). Squirrels were conspicuously absent in hardwood hammock areas that seemed to have the necessary components for good squirrel habitat.

Marsh Rabbit

The marsh rabbit is another popular game animal in many areas. Preferring wetter habitats, this small mammal was much in evidence by its droppings in the less mature of the two bayhead areas.

Furbearers

Evidence of several furbearers was found on the proposed plant site. Raccoons which are chiefly nocturnal were not encountered during the course of the field work but their footprints were found in both the salt marsh and bayhead habitats. The marshes abundant fiddler crab population is probably an attractive food item for the resident population of raccoons.

Several opossums (Didelphis marsupialis) were observed on the site. Opossums are occasionally hunted for sport but are not as economically important as certain other furbearers. One river otter (Lutra canadensis) was observed. However, this aquatic mammal is not thought to be present in sufficient numbers to be considered commercially significant. There did not appear to be any evidence that there was a significant amount of hunting or trapping on the site.

Bobwhite Quail

The Bobwhite Quail is a popular game bird which thrives in the open fields and pine flatwoods of the southeast. Because they favor early succession stages, quail have undoubtedly benefited from the conversion of forested land to farmland. A covey of approximately eight birds was flushed during the field study. However, the proposed plant site currently supports only a small population of this game bird.

Endangered or Threatened Species

Several species of wildlife observed on the proposed plant site enjoy some degree of protective legal status at either the state or federal level. Species known to occur or with a high probability of occurrence along with their status are presented in Appendix A, Table A-28.

American Alligator (Alligator mississippiensis)

Alligators are found in various wetland types throughout the state of Florida. This reptile is adaptive and seems equally suited to inhabiting ponds, rivers, the edges of large lakes and the interiors of swamps and freshwater marshes. The individual encountered on the proposed site was found at the mouth of a stream that meanders through the area.

Hunting has greatly reduced the alligators numbers during recent years. Through protection, the species has recovered in numbers along much of the coastal southeast (McDiarmid, 1978).

Gopher Tortoise (Gopherus polyphemus), Eastern Indigo Snake
(Drymarchon corais couperi)

Numerous gopher tortoise burrows and several gopher tortoises were observed on the proposed plant site. The xeric pine flatwoods have the dry, well-drained soils that are a major requirement for "preferred" gopher tortoise habitat.

The gopher tortoise constructs long burrows (up to 35 feet in length) which may be used by a variety of different vertebrates. The eastern indigo snake which normally prefers moister habitats may seek shelter in tortoise burrows when inhabiting these dryer areas. The pine flatwoods are not the prime habitat of the snake and Duval County is thought to support only a small population of this reptile (Moler, 1980). No eastern indigo snakes were observed on the proposed plant site.

Wood Stork (Mycteria americana)

This large wading bird was observed on several occasions flying over the marsh to the east of the proposed site. This species is highly colonial and nests in large rookeries and averages two young fledged per successful nest. Wood storks typically feed in shallow water (6-10 inches

deep) where they probe with their bills partly open for small fish. Because of his specialized feeding technique, the species is more adversely affected than other waders by drainage or altered hydroperiod in marshes (Kale, 1978).

Bald Eagle (*Haliaeetus leucocephalus*)

This species was once common in Florida, nesting along most of the state's coastline. Eagles nest in tall pine or cypress trees with nests typically located in the crown of the dominant tree in a stand. Nests are repaired in early fall with a clutch of two or three eggs being laid as early as late October (Kale, 1978).

The slash pine (*Pinus elliottii*) bordering the proposed site at the edge of the salt marsh is potential nesting habitat for eagles. However, no evidence of recent or active nests was observed within several miles of the proposed site during two aerial surveys and an extensive ground reconnaissance effort.

Species with Unique Ecological Value

No species found on the proposed plant site are seen as possessing unique ecological value.

Blount Island

Blount Island, the site of the proposed unloading facility, has a number of wildlife habitats including: ponds, salt marsh, grassy areas, and beach. The habitats are disturbed but still provide niches for a variety of bird fauna. The ponds, which are remnants of dredge spoil areas, provide suitable areas for a number of wading birds such as Great Blue Herons, Snowy Egrets, Louisiana Herons, and Great Egrets. *Juncus spartina* communities border these ponds as well as portions of the St. Johns River and Alligator Creek. These salt marsh areas provide habitat for Clapper Rail and Red-winged Blackbirds. The grassy areas provide

habitat for Killdeer and Cattle Egrets, while various plovers, sandpipers, gulls, and terns are common along the beaches at low tide. A number of snakes, including diamond back rattlesnake, cottonmouth, southern black racer and corn snakes are reported as inhabiting many of the habitats on Blount Island. The marsh rabbit was the only mammal actually sighted on the island. A description of the wildlife habitat on Blount Island is provided in Appendix A.

Biologically Sensitive Areas

Least Tern Nesting Area

Nesting Least Terns (Sterna albifrons) and their eggs were observed in three areas on Blount Island with each area (Figure 2.9-2) being characterized by sparse vegetation and a certain degree of remoteness. A decline in suitable nesting sites has prompted the Florida Game and Fresh Water Fish Commission to list the Least Tern as threatened. Man-made spoil banks are now important nesting areas for this bird and help offset the loss of much of the tern's natural nesting habitat (Downing, 1973). Wilson's Plovers (Charadrius wilsonia) and Killdeer were also thought to be nesting in these areas but no nests were actually located.

Important Species

A species is defined by the FDER as "important" if: (1) it is commercially or recreationally valuable; (2) it is rare, endangered, threatened or protected; or (3) it has unique ecological value. Species observed on Blount Island and falling into any of the above categories are included in the following discussion.

Commercially or Recreationally Valuable Species

The marsh rabbit and Bobwhite Quail, both popular game animals, were observed on Blount Island. However, because the island has only limited access, none of the island's fauna are considered commercially or recreationally important.

Endangered or Threatened Species

Several species of wildlife observed on Blount Island enjoy some degree of protective legal status at either the state or federal level. The species along with their status are presented in Appendix A, Table A-28.

Least Tern

Least Terns were found nesting in three different locations (Figure 2.9-2) on Blount Island.

Wood Stork

Wood Storks, in groups of 6-8, were observed on several occasions feeding in the ponds and drainage ditch on Blount Island.

Species with Unique Ecological Value

No species found on Blount Island are seen as possessing unique ecological value.

2.9.3 References

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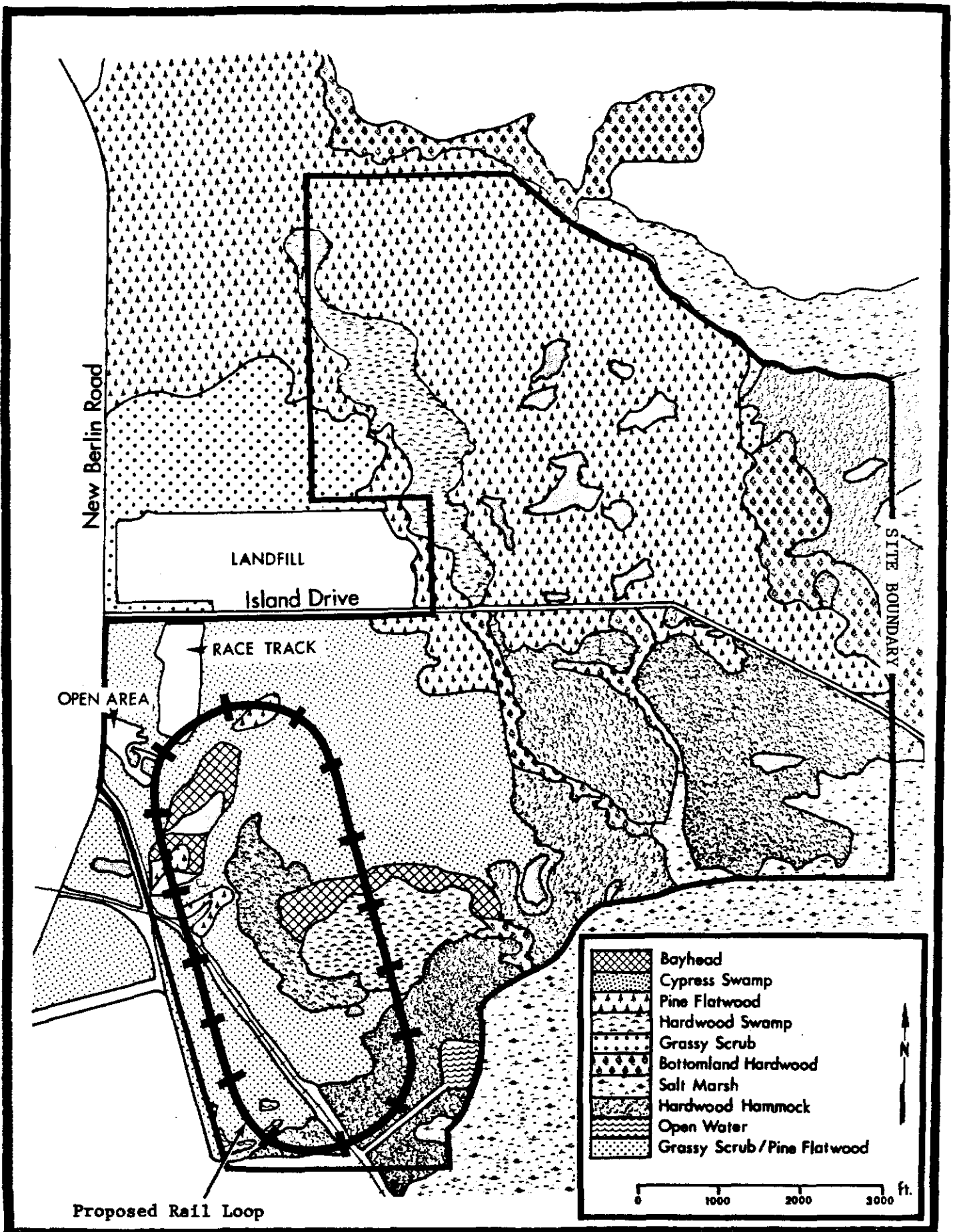


Figure 2.9-1 Vegetation Communities of the Proposed Plant Site

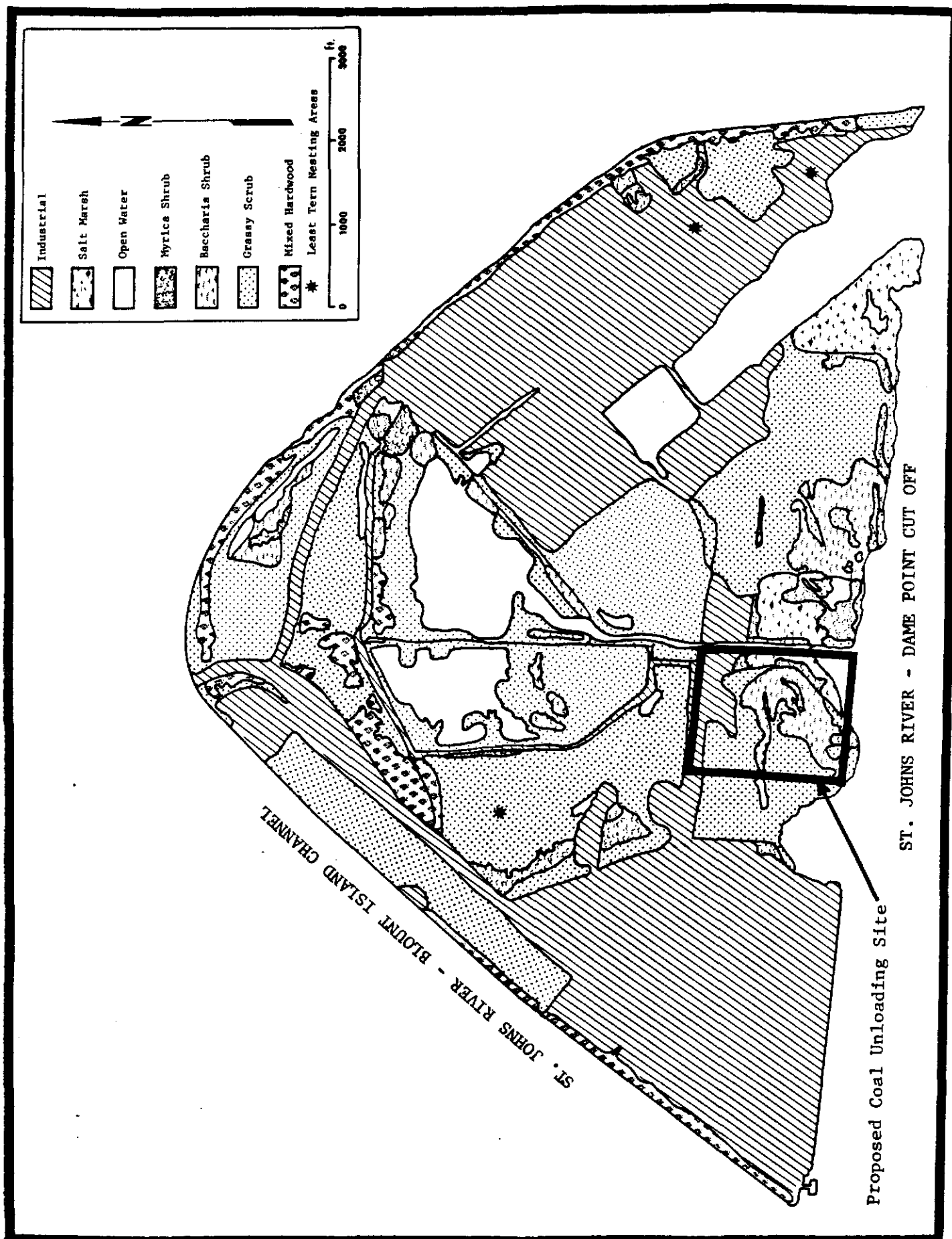


Figure 2.9-2 Vegetation Communities and Wildlife on Blount Island

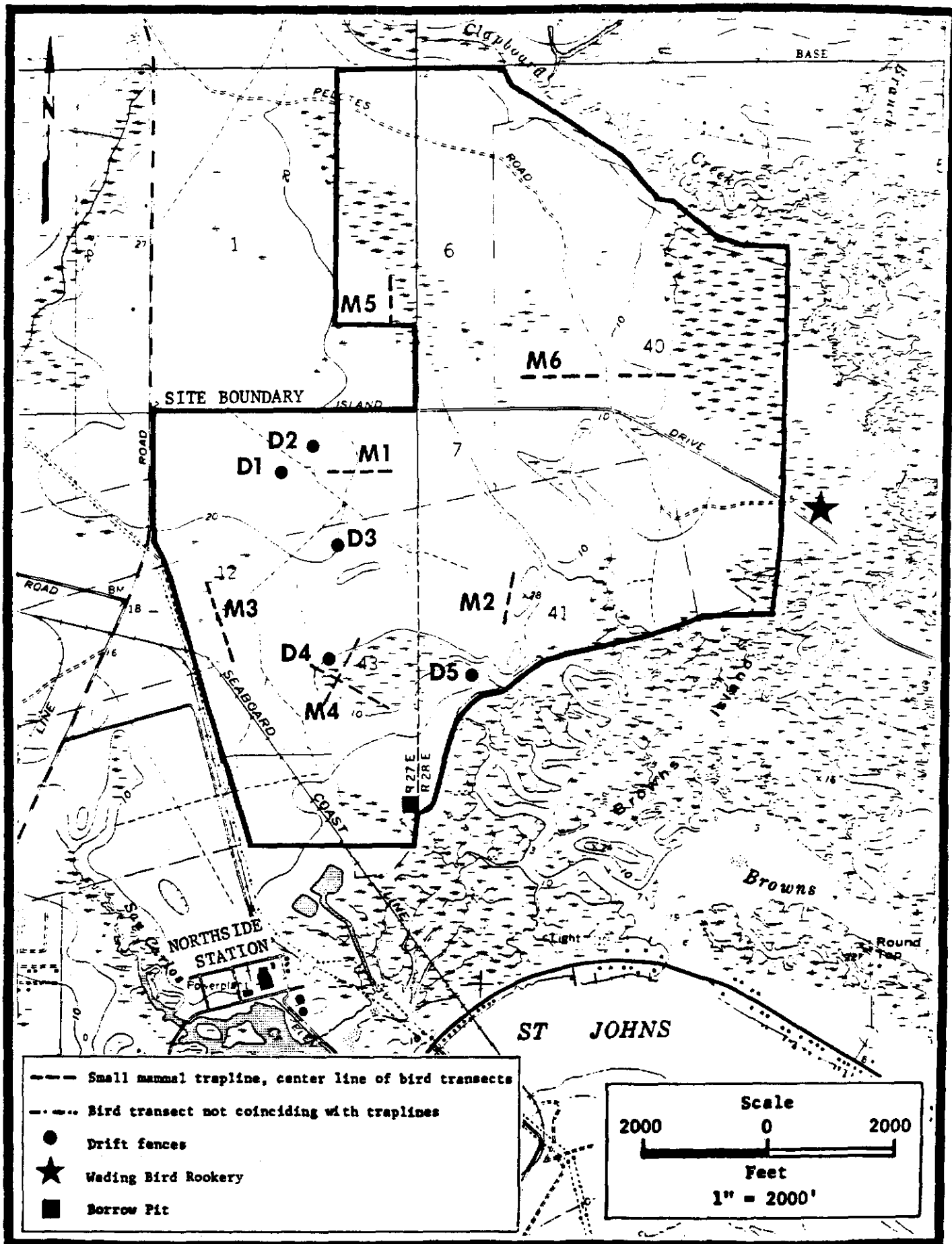


Figure 2.9-3 Wildlife Sampling Locations

2.10 OTHER ENVIRONMENTAL FEATURES

2.10.1 Noise

In order to describe the existing noise environment, a two season monitoring program was conducted. Noise levels were monitored at six locations on and around the proposed plant site during the first survey, which was in the winter. Three additional locations were added to the summer survey to describe the existing noise environment around the proposed coal unloading facility on Blount Island. (Plans for the coal unloading facility were not far enough along to allow inclusion of this site in the winter noise survey.) The locations of all nine monitoring locations are shown on Figure 2.10-1.

The results of the survey are presented in Tables 2.10-1, 2.10-2, and 2.10-3. Table 2.10-1 presents the equivalent sound levels (L_{eq}) and EPA's day/night sound level (L_{DN}) over each 24-hour survey period for the winter and summer surveys. The equivalent sound level is the steady state sound level which contains the same amount of energy as the real time - varying sound level over the same period. The mathematical definition of L_{eq} for a time interval defined as occupying the period between two points in time t_1 and t_2 is:

$$L_{eq} = 10 \log \left[\frac{1}{t_2 - t_1} \int_{t_1}^{t_2} \frac{P^2(t)}{P_o^2} dt \right]$$

where $P(t)$ is the time varying sound pressure and P_o is a reference sound pressure. The monitoring equipment utilized in the surveys computed hourly L_{eq} 's internally. The L_{eq} for each 24-hour period was determined from the hourly L_{eq} values monitored by the continuous analyzer using the following equation:

$$L_{eq} = 10 \log \left[\frac{1}{n} \sum_{i=1}^n 10^{x_i/10} \right]$$

where: x_i = hourly L_{eq} in dB(A)
n = number of hourly values

EPA's day/night sound level (L_{DN}) is calculated the same as the L_{eq} except that a 10 decibel penalty is added to the hourly L_{eq} values between 10 p.m. and 7 a.m. This is done to emphasize the need for a quieter noise environment during normal sleep hours. In mathematical terms, L_{DN} is related to L_{eq} as follows:

$$L_{DN} = 10 \log \frac{1}{24} \left[15 (10^{L_d/10}) + 9 (10^{(L_n + 10)/10}) \right]$$

where $L_d = L_{eq}$ for the daytime (7 a.m. to 10 p.m.)

$L_n = L_{eq}$ for the nighttime (10 p.m. to 7 a.m.)

It significant seasonal variations in noise levels exist, a winter versus summer survey would be most likely to show the variation. The L_{eq} and L_{DN} figures presented in Table 2.10-1 indicate that no significant seasonal variation exists at the proposed site. Noise levels at some monitoring locations were slightly quieter in the winter while at others, they were quieter in the summer. Overall, the time of year appears to make little difference in the ambient noise levels at the site.

The noise levels do vary, however, between the different monitoring locations. This variation can be seen in the values presented in Table 2.10-1. The loudest monitoring location was, as expected, at the Northside Station. The $L_{eq}(24)$ was 69 and 64 dB(A) during the winter and summer surveys, respectively. The quietest location was at the nearest residence to the northeast, approximately 2 miles from the location of the proposed plant. The $L_{eq}(24)$ was 50 and 51 dB(A), respectively, during the two surveys.

The USEPA's noise level guidelines are presented in Table 2.10-4 for comparison. All of the monitoring locations except the Northside Station, the north site boundary, and Blount Island would be included in the first

category listed; that is, "Residential with Outside Space and Farm Residences". The outdoor noise guideline levels are an L_{DN} of 55 dB(A) or less to protect against activity interference and an $L_{eq}(24)$ of 70 dB(A) for hearing loss considerations. The L_{DN} of 55 dB(A) is equalled or exceeded at all locations except the nearest northeast residence which is 2-3 dB(A) below the guidelines. However, none of these locations have noise levels approaching the 70 dB(A) hearing loss consideration level.

The monitoring locations at the NGS, the north site boundary, and Blount Island would be classified as "industrial" and only EPA's $L_{eq}(24)$ guideline of 70 dB(A) for the hearing loss consideration would apply. The equivalent 24-hour noise levels [$L_{eq}(24)$] at these locations were 64-69, 48-53, and 60 dB(A), respectively. All are below the 70 dB(A) guideline. The loudest noise source in the site area appears to be diesel trucks on New Berlin Road going to and from the city landfill, diesel trucks on Heckscher Drive servicing the many industrial facilities in the area, and dirt bikes in the community of New Berlin. This community, about 2-1/2 miles south of the proposed plant site, is also subject to noise from activities at the car import facility on Blount Island immediately across the river.

Tables 2.10-2 and 2.10-3 present a summary of the L_{10} , L_{50} and L_{90} decile levels obtained during the two surveys. These decile levels are the dB(A) levels exceeded 10, 50 and 90 percent of the time, respectively, and were calculated hourly for a 24-hour period at each monitoring location. The hourly data are presented in Appendix N.

The summary includes the arithmetic mean of each decile level and the standard deviation of the hourly values. These values describe the variability of the noise environment at the monitoring locations over the 24-hour period. In general, all of the noise levels obtained fall within two standard deviations of the mean level. For example, at New Berlin, during the winter survey (Table 2.10-2), the L_{10} mean was 55 dB(A) with a

standard deviation of 5.2. Therefore, most of the 24 L_{10} levels obtained were between 44.6 and 65.4 dB(A). This is a moderately variable L_{10} noise level. By contrast, the summer survey at the Northside Generating Station (Table 2.10-3) indicates the noise level was almost steady state with the L_{10} ranging only between 62 and 66 dB(A).

Further indication of the variability is obtained by comparing the L_{10} and L_{90} noise levels. A slight difference indicates almost steady state noise caused either by a high background level, such as at the Northside Station, or by a lack of intrusive sounds which were not apparent at any of the locations. Even the quietest monitoring location (at the nearest northeast residence) was affected by aircraft noise from flyovers and takeoffs and landings at Jacksonville International Airport, located about 8 miles west of the monitoring site. Jet noise from takeoffs and landings was apparent only under certain atmospheric conditions, however. This location was affected very little by truck noise.

The values presented in Tables 2.10-2 and 2.10-3 are not statistically comparable with any known guidelines, and should be used only in describing the noise environment in general terms.

2.10.2 Aesthetics

The proposed site is in a relatively flat area, located on the eastern boundary of an area suitable for industrial development and the western boundary of tidal marshes. The general vista to the east of the plant site is open due to the marshes. The vista is mixed to the west of the site with spotty industrial development and forest vegetation between developments. Located adjacent to the proposed site is the Northside Station, which has three stacks of various height. The tallest stack stands 360 feet high. Other significant structural features in proximity to the proposed site include the NGS transmission towers, the shipping cranes and the Offshore Power Systems crane on Blount Island, and the St. Regis Paper Company plant and water tower.

The viewshed, centered on the proposed site, extends mostly to the south due to openness of the St. Johns River and marshes (Table 2.2-2). On the southern shore of the St. Johns River, homes adjacent to the river are most affected. The majority of homes and commercial districts in the area do not have a view of the existing industrial structures because of tree cover height. The only major road south of the river that offers a view of the industrial structures in proximity to the proposed site is Fort Caroline Road where it runs contiguous up to the marshes and Mill Cove. Due to the speed limit on Fort Caroline Road and limited openness of the views, viewing time is brief. The view from the Fort Caroline National Memorial is that of an industrial area including the Offshore Power Systems crane, NGS transmission towers, and the St. Regis Paper Company plant.

On the north side of the river approximately 0.5 mile south of the proposed site along Heckscher Drive at Nichols Creek, there is another viewing opportunity. With the NGS in the foreground, the view is typical of an industrialized section of Heckscher Drive.

West of the proposed site, there are only limited views of structures in the site vicinity due to the height and nearness of trees. Those views that do occur are along roads where trees are either small or located back from the road. Heckscher Drive runs parallel to the St. Johns River in an east-west direction, and provides the means for obtaining views from the east, as well as some views from the west approach. To the east, marsh borders much of the road on its northern side. Consequently, openness of the marsh allows a significant exposure of the NGS from Heckscher Drive.

2.10.3 References

U.S. Environmental Protection Agency, 1974. Information Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. 550/9-74-004. Washington, D.C. 20460.

Table 2.10-1
COMPARISON OF WINTER AND SUMMER EQUIVALENT (L_{eq})
AND DAY/NIGHT (L_{DN}) SOUND LEVELS

<u>Station Number^a</u>	<u>Location</u>	<u>L_{eq} (24) dB(A)</u>		<u>L_{DN} dB(A)</u>	
		<u>Winter</u>	<u>Summer</u>	<u>Winter</u>	<u>Summer</u>
1	New Berlin	56	58	59	62
2	North Site Boundary	53	48	54	56
3	Nearest Residence (NW)	55	54	57	56
4	Nearest Residence (NE)	50	51	52	53
5	Browns Creek	64	61	65	65
6	Northside Station	69	64	71	71
7	Blount Island	-	60	-	65
8	Dames Point	-	62	-	63
9	Beacon Hills	-	52	-	56

^a See Figure 2.10-1

Table 2.10-2
MEAN AND STANDARD DEVIATION OF DECILE SOUND LEVELS (dBA)
WINTER SURVEY

<u>Station Number^a</u>	<u>Location</u>	<u>L₁₀</u>		<u>L₅₀</u>		<u>L₉₀</u>	
		<u>Mean</u>	<u>S.D.</u>	<u>Mean</u>	<u>S.D.</u>	<u>Mean</u>	<u>S.D.</u>
1	New Berlin	55	5.2	49	3.0	47	1.8
2	North Site Boundary	49	5.6	44	4.1	40	2.7
3	Nearest Residence (NW)	52	6.2	43	4.3	40	2.8
4	Nearest Residence (NE)	48	5.8	41	4.8	37	3.0
5	Browns Creek	48	8.6	52	8.0	48	5.2
6	Northside Station	65	6.9	61	4.5	59	2.3

^a See Figure 2.10-1

Table 2.10-3
MEAN AND STANDARD DEVIATION OF DECILE SOUND LEVELS (dBA)
SUMMER SURVEY

Station Number ^a	Location	L ₁₀		L ₅₀		L ₉₀	
		Mean	S.D.	Mean	S.D.	Mean	S.D.
1	New Berlin	57	4.2	52	1.8	50	1.5
2	North Site Boundary	48	5.3	40	4.4	36	4.1
3	Nearest Residence (NW)	52	6.3	45	6.3	40	5.3
4	Nearest Residence (NE)	49	5.8	44	3.6	40	2.3
5	Browns Creek	60	4.3	54	2.7	52	1.4
6	Northside Station	64	1.0	63	0.8	62	0.7
7	Blount Island	59	6.2	50	4.6	43	4.2
8	Dames Point	59	4.9	52	3.5	47	1.5
9	Beacon Hills	54	2.1	50	2.5	45	4.6

^a See Figure 2.10-1

Table 2.10-4
ENVIRONMENTAL PROTECTION AGENCY NOISE LEVEL GUIDELINES^a

Yearly Average^b Equivalent Sound Levels Identified as
Requisite to Protect the Public Health and Welfare with
an Adequate Margin of Safety

Measure	Indoor			Outdoor		
	Activity Inter- ference	Hearing Loss Considera- tion	To Protect Against Both Effects	Activity Inter- ference	Hearing Loss Considera- tion	To Protect Against Both Effects ^d
Residential with Out- side Space and Farm Residences	45	70	45	55	70	55
Residence with No Outside Space	45	70	45			
Commercial	(c)	70	70 (e)	(c)	70	70 (e)
Inside Transportation	(c)	70	(c)			
Industrial	(c)	70	70 (e)	(c)	70	70 (e)
Outside Space	45	70	45	55	70	55
Educational	45	70	45	55	70	55
Recreational Areas	(c)	70	70 (e)	(c)	70	70 (e)
Farm Land and General Unpopulated Land				(c)	70	70 (e)

Table 2.10-4 (Continued)
ENVIRONMENTAL PROTECTION AGENCY NOISE LEVEL GUIDELINES^a

- a USEPA, 1974
- b Refers to energy rather than arithmetic averages.
- c Since different types of activities appear to be associated with different levels, identification of a maximum level for activity interference may be difficult except in those circumstances where speech communication is a critical activity. [See Figure D-2 (USEPA, 1974) for noise levels as a function of distance which allow satisfactory communication.]
- d Based on lowest level.
- e Based on hearing loss.
- f An $L_{eq}(8)$ of 75 dB may be identified in these situations so long as the exposure over the remaining 16 hours per day is low enough to result in a negligible contribution to the 24-hour average, i.e., no greater than an L_{eq} of 60 dB.

Note: Explanation of identified level for hearing loss: The exposure period which results in hearing loss at the identified level is a period of 40 years.

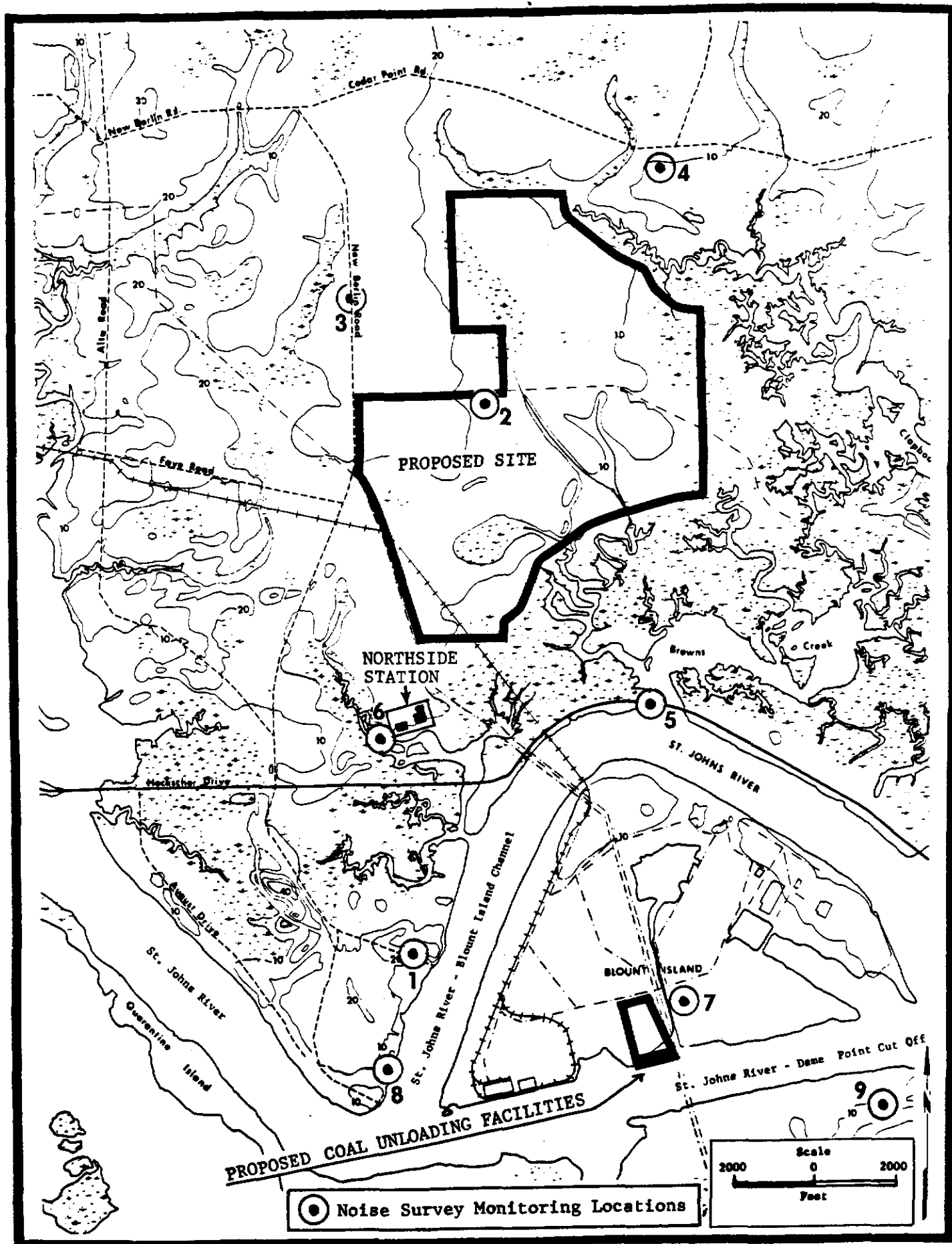


Figure 2.10-1 Noise Survey Monitoring Locations

2.11 ENVIRONMENTAL SETTING OF TRANSMISSION CORRIDOR

Section 9.6 describes the process by which a 0.5-1 mile wide preferred corridor (Figure 2.11-1) between the proposed plant and the Robinwood, Fort Caroline and Normandy Substations was selected. Following certification of the corridor, the applicant will select a precise right-of-way (ROW) within the approved corridor with known widths (200 feet or less) and probable tower locations. Route specific field examinations will then be made to identify and characterize any highly sensitive areas (as defined in Section 9.6.3) within the ROW.

The preferred corridor includes an existing transmission ROW. It is expected that the new ROW will be routed adjacent to the existing ROW for over 90 percent of its length.

2.11.1 Corridor Description

The region through which the preferred corridor passes is characterized by abundant and diverse wetland types, large farm and agricultural acreage, and extensive natural upland communities such as pine flatwoods. No agricultural lands in the area are considered prime or unique by the Duval County Soil Conservation Service (J. Mitchell, 1980). Rapidly expanding commercial, industry and residential sectors are on the south side of the St. Johns River, in the general Robinwood Substation vicinity, and in western and southwestern Jacksonville. The preferred corridor requires crossing of only one major river, the St. Johns River. Several towers will be located in Mill Cove in a shallow area occasionally exposed at low tide. Appendix K provides a photographic depiction of the preferred corridor and its immediate vicinity.

Table 2.11-1 shows percentages of land cover types by corridor segment. The first segment from the proposed plant to the Robinwood Substation (Segment A') is predominantly wetland and open water. The upland area is primarily Blount Island, a highly disturbed habitat. Three

Least Tern (Sterna albifrons) colonies were found nesting there during 1980 (see Section 2.9.2.2). The remaining corridor to the Robinwood Substation (Segments B', C', D, E) contains a large amount of wetlands according to a Jacksonville land cover map (Jacksonville Area Planning Board, 1975). The area adjacent to the existing ROW includes little wetland acreage, however. Several large drainage canals in the corridor, as observed from ground and aerial surveys, are contributing to the degradation of wetlands within the area.

The corridor for the proposed plant toward the Normandy Substation initially (Segment G) passes through a diverse array of land use and habitat types. Most of this area is upland, and a portion near Pulaski Road (Figure 2.11-1) includes low and medium population density. The next segment (H) is primarily upland and agricultural. More wetlands occur in the northern half of this mile-wide corridor than in its southern half. The final segments (I' and J) are also largely upland and agricultural lands. About 20 percent of these corridor segments are made up of several wetland types. The preferred corridor avoids all large wooded wetland stands.

2.11.2 Sensitive Areas and Habitats

The most sensitive land cover types in the preferred corridor include populated areas, wetlands and nesting areas for Osprey (Pandion haliaetus) and Least Terns. Osprey nests are common to the region and have been constructed on transmission towers near the NGS and on Blount Island. It was assumed that the maximum width of the new right-of-way will be a conservative 200 feet throughout its length and located adjacent to the existing ROW. The population sensitive, wetland and open water acreage that would be included within the new ROW are shown on Table 2.11-2.

No species classified by the U.S. Fish and Wildlife Service as threatened or endangered are known to use the preferred corridor for nesting, breeding, or for major life history requirements (Palmer, 1980). The more mobile sensitive species such as the Manatee (Trichechus manatus),

Eastern Brown Pelican (Pelicanus occidentalis) and Southern Bald Eagle (Haliaeetus leucocephalus) likely cross portions of the corridor, but do not specifically require habitats located within the corridor. Due to open habitat and dry, friable soil, potential exists for the gopher tortoise (Gophers polyphemus) and gopher frog (Rana areolata aesopus) to occur along the ROW. No burrows were located, however, during ROW searches.

Likewise, with the exception of the Least Tern, no species classified as rare and endangered by the State of Florida, are known to require habitats in the corridor area. Least Terns, which are classified as threatened in the State of Florida (Kale, 1978), nest on sandy spoil banks in the coastal area. No rare and endangered plant species are known to occur in the corridor.

2.11.3 References

- Jacksonville Area Planning Board, 1975. Land Cover and Selected Characteristics, Duval County (Map).
- Kale, H.W., II, 1978. Rare and Endangered Biota of Florida, Volume Two, Birds. University Presses of Florida. Gainesville, Florida.
- Mitchell, J., 1980. Personal Communication. Duval County Soil Conservation Service. Jacksonville, Florida.
- Palmer, D., 1980. Personal Communication. U.S. Fish and Wildlife Service. Jacksonville, Florida.

Table 2.11-1

LAND COVER (PERCENT) IN THE PREFERRED CORRIDOR

Land Cover Category ^a	Corridor Segments ^b to Robinwood and Fort Caroline Substations (Length)						Corridor Segments ^b to Normandy Substation (Length)			
	A' (7.0 mi)	B' (0.5 mi)	C' (2.7 mi)	D (0.7 mi)	E (1.5 mi)	G (8.3 mi)	H (7.1 mi)	I' (7.9 mi)	J (5.4 mi)	
Urban										
Open Land	5.0	-	-	-	-	-	-	-	-	-
Recreation	6.2	-	-	-	-	1.5	-	-	-	-
Residential Low Density	1.2	-	-	-	-	4.6	0.9	2.9	-	-
Residential Medium Density	-	-	-	-	-	5.5	-	1.9	-	-
Industrial	21.5	-	-	-	-	-	-	-	0.3	-
Mined Land	-	-	-	-	-	1.8	-	0.2	1.2	-
Commercial/Service	-	-	-	-	-	1.8	-	-	3.7	-
Institutional	-	-	-	-	-	-	-	-	-	-
Utility	-	-	-	-	-	-	-	-	-	0.5
Agriculture	3.3	-	-	-	-	12.7	50.1	41.5	17.3	-
Upland (Natural Biological Communities)	21.9	41.1	59.8	16.7	22.0	59.8	35.7	31.6	69.6	-
Wetland/Coastal										
Swamp Hammock	-	-	2.0	14.0	1.9	9.7	0.3	6.6	5.0	-
Hardwood Swamp	0.4	58.9	38.2	66.9	76.1	-	11.7	9.2	-	-
Riverine Cypress	-	-	-	-	-	-	-	1.2	-	-
Cypress Pond	-	-	-	-	-	0.2	0.9	2.5	0.7	-
Bayheads and Bogs	-	-	-	-	-	-	-	2.2	1.2	-
Freshwater Marsh	2.9	-	-	2.4	-	-	0.2	-	-	-
Salt Marsh	7.9	-	-	-	-	-	-	-	-	-
Coastal Hammock	-	-	-	-	-	1.5	-	-	-	-

Table 2.11-1 (Continued)

LAND COVER (PERCENT) IN THE PREFERRED CORRIDOR

Land Cover Category ^a	Corridor Segments ^b to Robinwood and Fort Caroline Substations (Length)						Corridor Segments ^b to Normandy Substation (Length)			
	A' (7.0 mi)	B' (0.5 mi)	C' (2.7 mi)	D (0.7 mi)	E (1.5 mi)	G (8.3 mi)	H (7.1 mi)	I' (7.9 mi)	J (5.4 mi)	
Open Water	-	-	-	-	-	-	-	-	-	-
Borrow Pit	-	-	-	-	-	-	-	-	-	-
Rivers/Streams	-	-	-	-	-	-	-	-	-	-
Oligohaline System	-	-	-	-	-	-	-	-	-	-
Medium Saline Estuary	21.9	-	-	-	-	-	-	-	-	-
Spoil Bank	7.0	-	-	-	-	-	-	-	-	-
Tidal Flat	0.8	-	-	-	-	-	-	-	-	-

^a Categories modified from (Jacksonville Area Planning Board, 1975); computations based on same reference.

^b Corridor segments are shown in Figure 2.11-1.

Table 2.11-2

POPULATION-RELATED AND WETLAND LAND COVER TYPES AND
ACREAGES IN AN ASSUMED NEW ROW^a ADJACENT
TO THE EXISTING ROW IN THE PREFERRED CORRIDOR

Site to Robinwood Substation^b

<u>Land Cover Type</u>	<u>Acreage</u>
Recreational Area	10.0
Populated Area (low density)	1.2
Freshwater Marsh	0.4
Salt Water Marsh	29.5
Beach and Dune	2.7
Spoil Area	12.3
Open Water	24.5

Site to Normandy Substation^b

<u>Land Cover Type</u>	<u>Acreage</u>
Populated Area (medium density)	9.6
Proposed Pop Area (medium density)	15.3
Archaeologically Sensitive Area	131.3
Hardwood Swamp	23.0
Cypress Swamp	0.9
Salt Water Marsh	2.7

^a 200 feet wide - represents maximum ROW width

^b See Figure 2.11-1 for corridor route. Photographic description of corridor and sensitive areas are in Appendix K.

Note: This table was prepared to illustrate sensitive land cover acreages that potentially could be included in a new 200 foot wide ROW if located adjacent to the existing ROW for its entire length. At the present time, it is anticipated that the new ROW will be adjacent over approximately 90 percent of its length. During the ROW selection process, highly sensitive areas will be characterized and avoided to the extent possible.

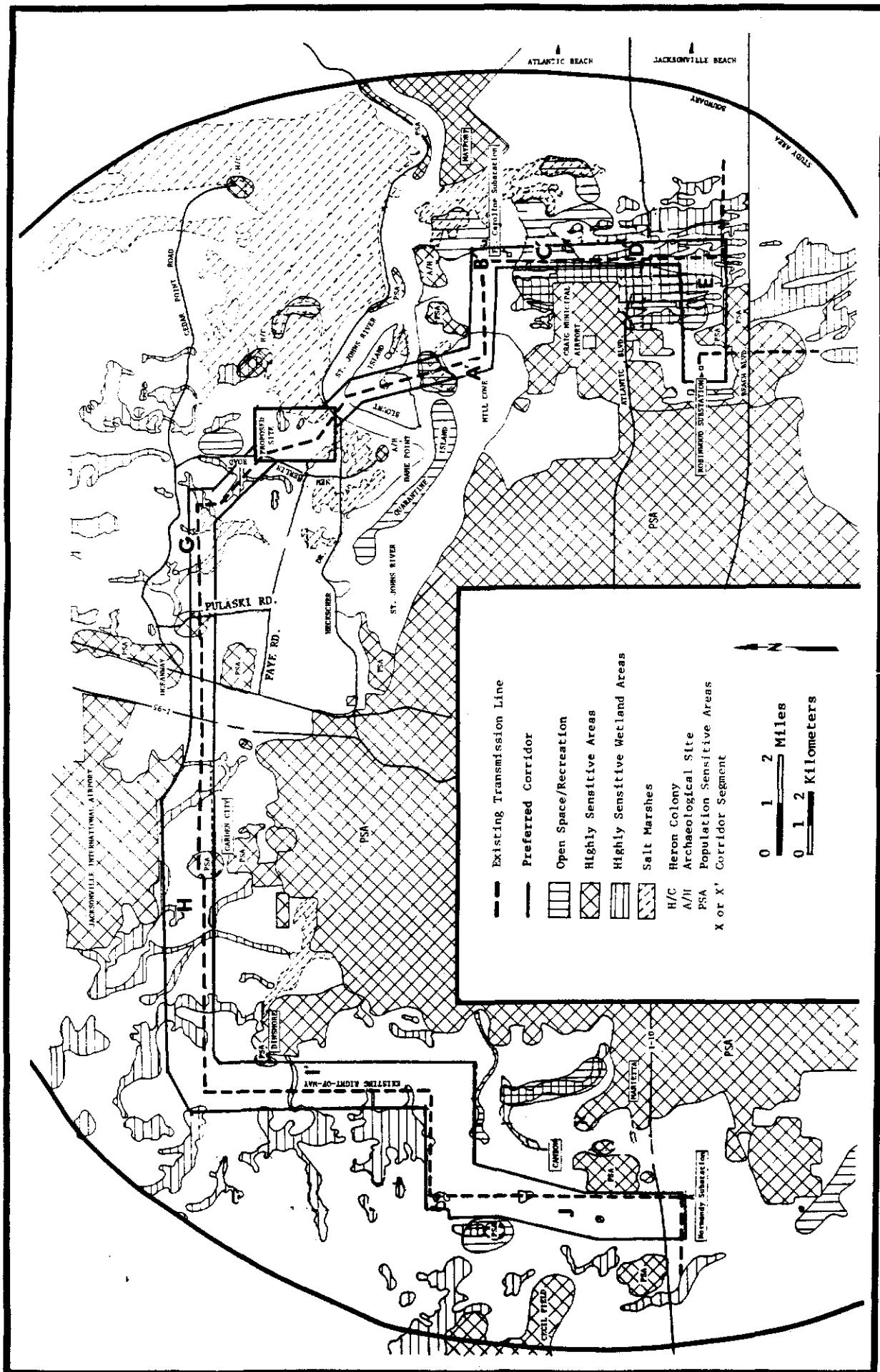


Figure 2.11-1

Preferred Transmission Line Corridor

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3. THE PLANT

3.1 EXTERNAL APPEARANCE

The rendering of the two proposed 600 megawatt (MW) coal-fired units, found on the cover, conceptualizes the plant's finished appearance and aesthetic qualities. The depiction is a view from northwest to southeast. Brown's Creek marsh which is not distinguishable in the rendering is located in the background on the horizon. The industrial district is to the south of the St. Johns River which shows up just right of the chimney. Blount Island can be seen on the opposite shore of the river.

Wherever practicable trees and other vegetation will be preserved along roads to serve as a visual buffer or screen. The buffer will vary between 100 and 200 feet in width. The cooling towers (425 feet high) and chimney (640 feet high) are the two tallest facility structures. The degree to which the cooling towers and chimney will be noticeable will be partially dependent on the weather. Cloudy skies will tend to blend with the light colored cooling towers, the water vapor plumes from the cooling towers, and the natural concrete shade of the chimney. The chimney and cooling tower will be fitted with flashing stroboscopic lights for aircraft warning purposes and therefore will always be a noticeable feature both from the ground and the air.

The switchyard and transmission lines in the plant vicinity will be screened by trees and by the dikes of the bottom ash disposal area which is located behind the cooling towers as depicted in the rendering.

For comparison, the rendering should be studied along with the plant layout (Figure 3.1-1) as well as the station profile (Figure 3.1-2). A comparison of these drawings will demonstrate the relationship of the plant structures to their surroundings.

Chapter 2, Sections 2.1.1 and 2.1.2 present information concerning the acreages involved for plant components and facilities, and for undisturbed areas.

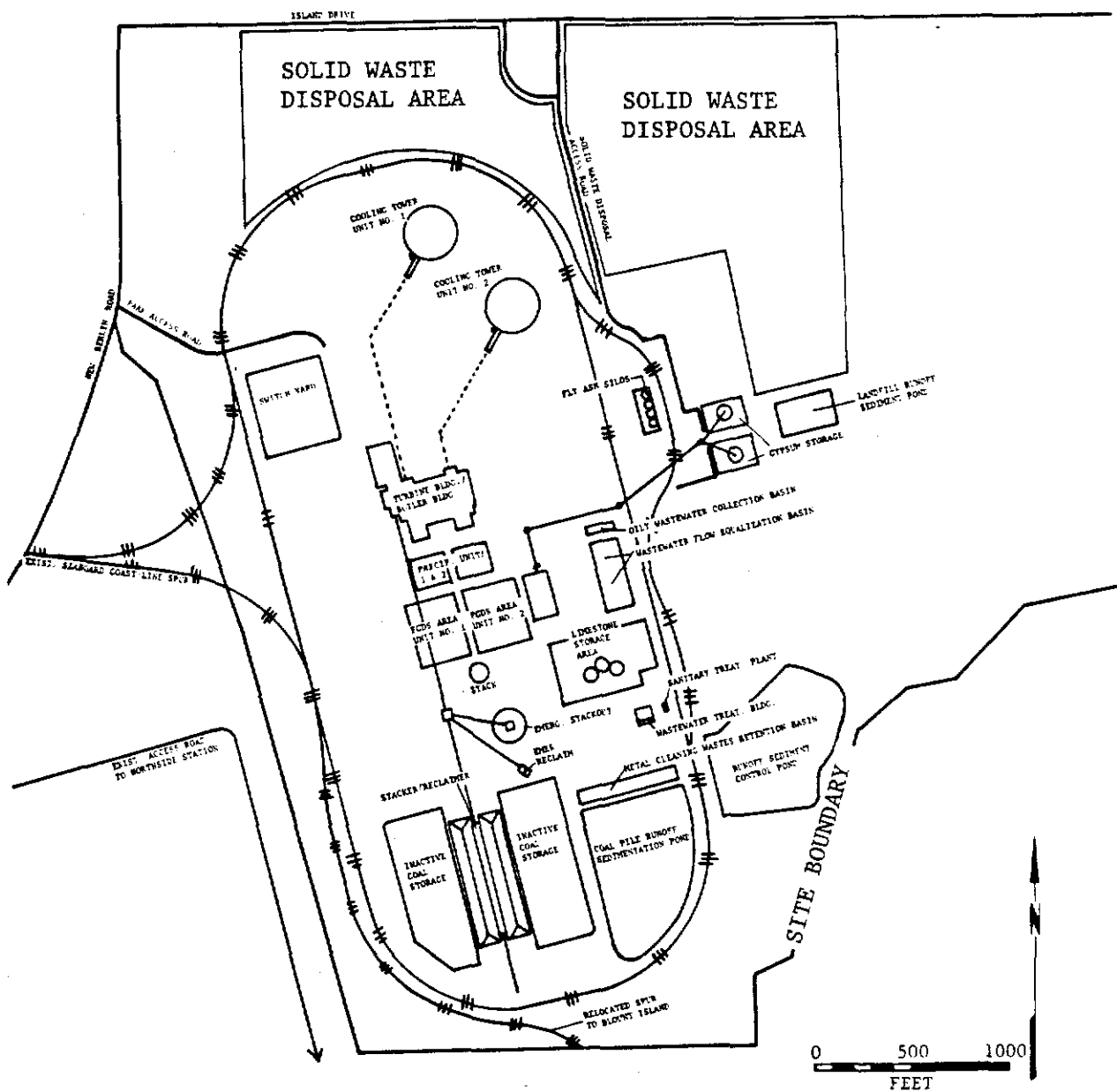


Figure 3.1-1 Plant Layout

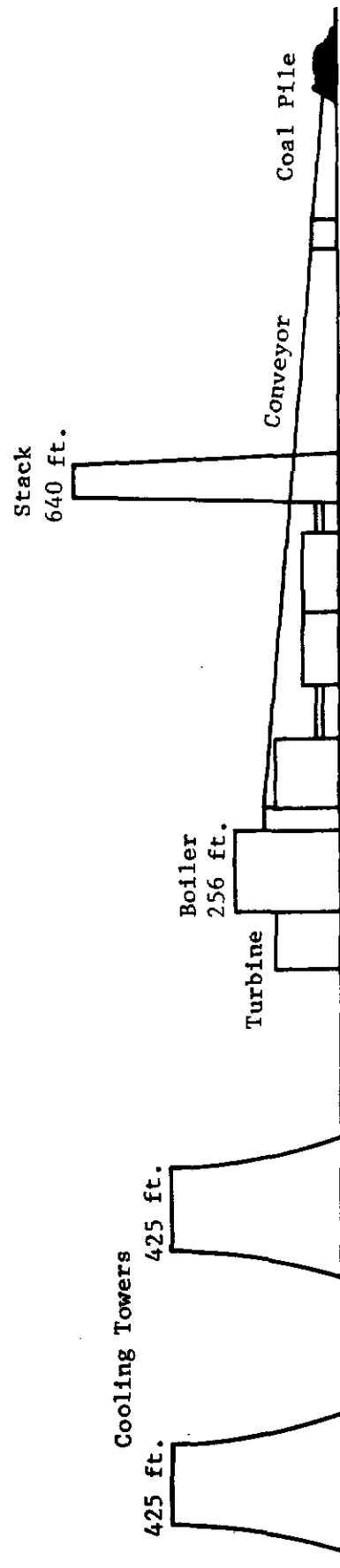
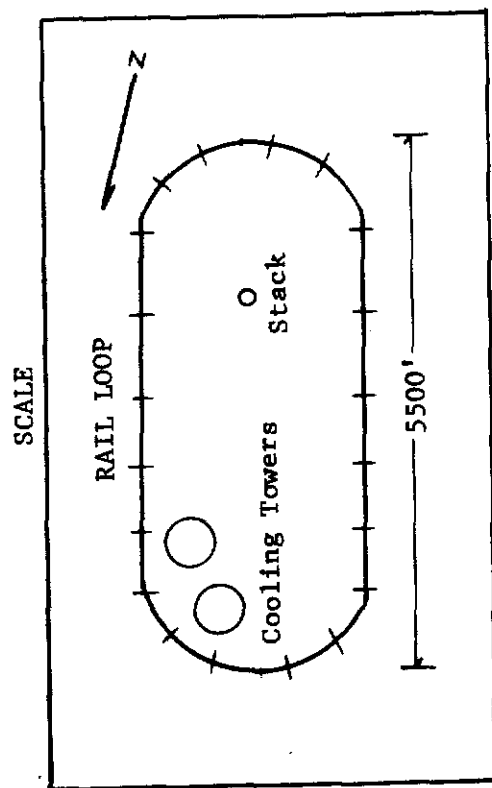


Figure 3.1-2 Station Profile

3.2 FUEL

3.2.1 Fuel Type

The units are planned for coal-fired operation; however, provisions are being made in the design to allow for possible conversion to oil, gas or refuse firing (Ebasco, 1980a and 1980b). Based on a study of availability of coal, over the anticipated life of the project, east of the Mississippi River (Ebasco, 1980c), there are practical sources of coal adequate to meet the plant's needs (approximately 3,500,000 tons per year). The above referenced study has identified coal supplies in Tennessee, Kentucky, and Ohio as the most likely sources. In addition, partial supplies could be obtained from several foreign sources.

The plant is designed to retain the flexibility to change its coal supply (to insure against disruptions in supply, local market upsets and to maintain competitive prices) with the minimum reduction in efficiency and without violating air quality standards. Analyses of potential coal supplies were therefore necessary so that the plant could be designed to accommodate coals with a variety of characteristics. Coals from the above sources were analyzed to determine the ranges of constituents. The coal analyses' specified ranges are listed in Table 3.2-1.

The air quality control system is designed on a "worst case" basis assuming maximum sulfur (4 percent) and ash (18 percent) in the coal and a minimum heating value (10,500 Btu/lb). This approach assumes the sulfur and ash contents of the coal are 3.8 lb/MMBtu (million Btu) and 17.1 lb/MMBtu, respectively. The ash remaining after the coal is burned is assumed to be 80 percent fly ash and 20 percent bottom ash. The above values were used to develop collection efficiencies, investment estimates and long and short-term ground level ambient air quality concentrations. This approach requires a more sophisticated, complex, efficient and costly air quality control system than would be required on the basis of average coal characteristics.

The solid waste disposal requirements (discussed in Section 3.5.2) have been based on the anticipated average coal characteristics over the 40 year life of the plant. These are 2.3 lb/MMBtu (2.7 percent) and 7.9 lb/MMBtu (9.2 percent) for sulfur and ash contents respectively. Average coal characteristics were used to determine solid waste disposal requirements because average conditions, in the main, will prevail over the plant life, whereas worst case conditions are only a short term phenomenon.

It is anticipated that the steam generator will burn No. 2 fuel oil for light-off and flame stabilization during start-up and low load operation. This light oil will be stored on site and pumped to the steam generator as required. Approximately 1,000,000 gal/yr will be utilized on an intermittent basis, which represents less than 2 percent (by heat input) of the steam generator annual fuel consumption. The fuel oil is expected to have a maximum sulfur content of 0.76 percent by weight, a maximum ash content of 0.01 percent by weight, and a heating value of 19,000 Btu/lb.

3.2.2 Fuel Handling and Storage

The coal handling system will provide for delivery of coal by ocean vessel to a marine terminal on Blount Island with shuttle train delivery to the plant, as well as rail delivery directly to the plant by unit train or in trainload lots. A rotary car dumper will be used to unload coal from the trains. The system will also include the yard area coal storage, transfer system, coal silos, and the tripper floor distribution system.

Off-Site Facilities

The ocean vessel coal unloading facility will be located on Blount Island and will be capable of handling up to 3,500,000 tons of coal per year (the entire annual requirement of the plant). A 30-acre coal pile located on Blount Island will be required. Coal will be transferred from this facility to the plant site by a shuttle train. Figure 3.10-2 depicts the proposed layout for this facility. Section 3.10 discusses the ocean vessel coal unloading facilities in greater detail.

On-Site Facilities

A train track will be looped around the plant and coal storage area. The train unloading facility will be capable of handling approximately 3,500,000 tons of coal per year. The coal will be unloaded at the coal rotary car dump as shown in Figure 3.1-1.

The function of the coal handling equipment located in the yard area is to transport the coal from the unloading area to either the plant island coal silos or to the active storage piles, or to both. As indicated on the plant layout, there will be an active coal pile of about 8 acres and two inactive coal piles of about 15 acres each. At the present time it is planned to line the coal pile storage area. If the coal leachate characteristics expected for the purchased coal are better than those assumed in the present analysis (Appendix D, Table D-21), the validity of the liner concept will be re-evaluated.

The coal for each unit will be delivered to the tripper floor transfer point which is located in the head structure of the boiler auxiliary bay. Chutes transfer the coal from the yard conveyors to the two trippers located on the tripper floor. Each tripper will be capable of distributing the coal to the seven coal storage silos of each unit. The coal is then conveyed from the coal storage silos to the pulverizer, and the pulverized coal pneumatically delivered to the furnaces.

The No. 2 fuel oil will be delivered to the plant by barge, rail, or truck and will be stored on site in one 600,000 gallon fixed roof fuel oil storage tank. This tank will be designed to utilize a vapor recovery system during refilling operations to minimize hydrocarbon emissions.

The No. 2 fuel oil will be delivered to the plant by barge, rail, or truck and will be stored on site in one 600,000 gallon fixed roof fuel oil storage tank. This tank will be designed to utilize a vapor recovery system during refilling operations to minimize hydrocarbon emissions.

3.2.3 References

Ebasco Services Incorporated, 1980a. Conceptual Engineering for Future Conversion to Alternate Fuels. For Jacksonville Electric Authority. Norcross, Georgia.

Ebasco Services Incorporated, 1980b. Refuse Co-firing System Study. For Jacksonville Electric Authority. Norcross, Georgia

Ebasco Services Incorporated, 1980c. Coal Procurement Study - Phase I (Preliminary) for Jacksonville Electric Authority. Norcross, Georgia

Table 3.2-1

PROJECT COAL ANALYSIS RANGES

Proximate Analysis - weight percent, as received from coal supplier

Moisture	4.0 to 15.0
Ash	6.0 to 18.0
Volatile Matter	23.0 to 40.0
Fixed Carbon	37.0 to 57.0

Ultimate Analysis - weight percent, as received from coal supplier

Moisture	4.0 to 15.0
Carbon	49.3 to 78.0
Hydrogen	3.4 to 5.8
Nitrogen	0.9 to 1.9
Chlorine	0.1 to 0.3
Sulfur	0.5 to 4.0
Ash	6.0 to 18.0
Oxygen	3.4 to 9.8

Heating Value (Btu/lb) 10,500 to 13,250

Hardgrove Grindability Index 40 to 80

Ash Mineral Analysis - weight percent

Phosphorus Pentoxide, P_2O_5	0.04 to 3.0
Silica, SiO_2	30.0 to 58.0
Ferric Oxide, Fe_2O_3	2.9 to 45.0
Alumina, Al_2O_3	18.0 to 36.0
Titania, TiO_2	0.3 to 3.0
Lime, CaO	0.9 to 9.0
Magnesia, MgO	0.2 to 2.0
Sulfur Trioxide, SO_3	0.1 to 7.0
Potassium Oxide, K_2O	0.4 to 4.0
Sodium Oxide, Na_2O	0.2 to 2.0

3.3 PLANT WATER USE

The two primary sources of water for the plant will be surface water from the St. Johns River and groundwater from the Floridan aquifer. Surface water, withdrawn from the existing NGS discharge channel, will be used as makeup to the recirculating cooling water system. Groundwater, from on-site deep wells, will be used for plant potable water supply, fire protection system, plant service water system, influent to the demineralized water system, and as makeup to the flue gas desulfurization system (FGDS). In addition, plant effluents will be reused where feasible. Quantitative estimates for water requirements (i.e., water use) are expressed as annual average and/or maximum flows, whichever best describe system operation. In all cases, water requirements are for full load (two unit) plant operating conditions. Water use variations for plant operation at less than full load are discussed in Section 3.3.9. The water requirements for the two units will be approximately as follows:

<u>Plant Makeup/Withdrawals</u>	<u>Gallons per Minute (gpm)</u>	
	<u>Annual Average</u>	<u>Maximum</u>
Surface Water from Northside		
Generating Station's (NGS) Discharge	34,400	34,400
Groundwater from Deep Wells	2,600	5,400
<u>Consumptive Use</u>	12,000	12,900
<u>Plant Discharge to NGS Discharge</u>	25,900	28,100

For the sake of clarity, water requirements listed above are approximated to the nearest 100 gpm. Also, consumptive use is the sum of water lost in evaporation, water contained in solid wastes and water used for coal dust suppression. Because of rainfall runoff contributions, plant discharge is not equal to surface water and groundwater makeup minus consumptive use.

The overall plant water management plan is presented schematically in Figure 3.3-1. The anticipated water quality for the plant water sources (St. Johns River and Floridan aquifer) is discussed in Chapter 2, Section 2.5. Water requirements for various plant systems are discussed in the following sections. Unless otherwise noted, the flow quantities are total flows for both Units 1 and 2.

3.3.1 Makeup Demineralizer System

The boiler makeup water supply system produces high quality water for use in the steam generating cycle. Because the boiler operates at high-pressures and temperatures, certain constituents in the makeup water, such as dissolved salts (mainly calcium and magnesium), must be maintained at very low levels to prevent scaling of the boiler tubing. Demineralized water is required for initial boiler fill, soot blowing, boiler fill after routine cleaning operations, demineralizer and condensate polisher regeneration, and makeup for small losses through boiler blowdown and evaporation.

The makeup demineralizer trains will consist of two separate trains rated at 340 gpm each. These trains will consist of cation exchangers followed by anion exchangers, and mixed-bed polishing demineralizers. Water from deep wells will be demineralized and stored in condensate storage tanks. Average groundwater requirements are expected to be approximately 91 gpm for the boiler/steam cycle and an additional 64 gpm for boiler soot blowing. The 64 gpm is lost to the atmosphere through evaporation. The 91 gpm boiler blowdown will be reused in the FGD system. An average of 22 gpm will be required for demineralizer and condensate polisher regeneration. Makeup demineralizer regeneration will occur approximately once every three days for each train. Condensate polisher regeneration will be infrequent, occurring primarily during start-up.

3.3.2 Cooling Water System

A recirculating cooling water system will be employed to remove waste heat from the steam cycle. Two evaporative natural draft cooling towers will be utilized to dissipate heat from the main condenser and auxiliary cooling water systems. Approximately 425,000 gpm of surface water will be recirculated through the main condensers of both units. On an annual basis, the average rate of evaporation is expected to be approximately 10,500 gpm, and the maximum monthly rate will be about 11,300 gpm.

Due to the highly saline nature of the makeup water, a maximum of 1.5 cycles of concentration has been established for the proposed plant, a typical level for saline water systems. At this level, the water may have a tendency toward scale formation. Therefore, provisions will be made for addition of sulfuric acid to the makeup water to reduce the level of bicarbonate alkalinity and minimize the potential for calcium carbonate scale formation. Preliminary calculations indicate that approximately 25 to 50 ppm sulfuric acid may be required in the cooling tower makeup water for alkalinity removal.

Chlorine also will be added to the main condenser cooling systems to prevent biological fouling. Control is achieved by adding sufficient chlorine to obtain a biocidal residual which must be maintained throughout the system long enough to control microorganisms. To comply with EPA regulations, an intermittent chlorination system will be used. Alternative chlorination operating schemes to determine the optimal chlorine levels for each unit will be studied when the plant becomes operational.

Auxiliary cooling water prevents excess operating temperatures in the auxiliary equipment. Major auxiliary equipment includes main turbine lube oil coolers, condenser vacuum pump coolers, duplex alternator air coolers, soot blower air compressor inter and after coolers, and hydrogen coolers. Cooling this equipment is accomplished by a completely closed system utilizing heat exchangers. Stored condensate water (closed cooling water)

cools the equipment and heat exchangers cool this water using main condenser cooling water, which is returned to the cooling tower, thus completing the cooling loop.

Because this system is completely closed and utilizes the same circulating water as the main condenser cooling system, there are no additional water usage requirements.

To limit the cycles of concentration at 1.5 with a maximum design evaporation rate of 11,500 gpm, a makeup of 34,400 gpm and a blowdown of 22,900 gpm will be required. Makeup to the cooling towers will be maintained at 34,400 gpm and average blowdown will be approximately 23,900, based on an average evaporation rate of 10,500 gpm. See Section 3.4 for detailed discussions of evaporative losses.

3.3.3 Coal Handling System

Reclaimed water from other plant systems will be used for dust suppression at the coal handling facilities. Average requirements are expected to be about 50 gpm, with some consumptive loss occurring. An instantaneous maximum demand of up to 350 gpm is anticipated.

Water requirements for coal handling at the Ocean Vessel Coal Unloading Facility are discussed in Section 3.10.2, and dust control for the various systems is discussed further in Section 3.8.2.8.

3.3.4 Ash Handling System

Should a market exist for fly ash as a recoverable resource, trucks or railroad cars will transport the fly ash, from the silo area, off-site. On-site disposal is provided, however, should a market not materialize or if sale of the ash should be interrupted for periods exceeding the three day temporary storage capacity.

Recommended disposal practices are discussed in detail in Section 3.5.2.2. Water requirements for fly ash should be minimal as only small quantities of water will be required for dust suppression at the on-site disposal area. This water will be supplied from the bottom ash system.

Bottom ash produced from the combustion of coal is collected continuously in a water impounded bottom ash hopper located directly beneath the boiler. To reduce water requirements, the bottom ash sluicing system has been designed to be a recirculating system. A continuous source of low-pressure water will be required for cooling as well as for makeup to the water impounded equipment. Intermittent high-pressure water flow of about 400 gpm will be required for equipment sprays and flushes and for sluicing pyrites from the pyrites pulverizing hoppers to the pyrites storage tank. Pyrites from the storage tank and bottom ash from the bottom ash hoppers periodically will be sluiced separately to dewatering bins for dewatering at an average rate of 650 gpm. In addition, bottom ash hopper cooling and sealing flow of about 1200 gpm also will be conveyed to the dewatering bins.

Despite the high system flow rates, a fresh water demand of only 200 gpm groundwater will be needed because this is a recirculating system. An average of approximately 2250 gpm sluice water will be recirculated from the dewatering system. Approximately 100 gpm of the groundwater flow will be used as makeup, as some water is lost through evaporation and by binding to the ash particles. The "dry" bottom ash produced is actually about 20 percent water. In addition, about 100 gpm will be drawn from the dewatering system for wetting fly ash which must be disposed of on-site.

3.3.5 Flue Gas Desulfurization System

Water used in the flue gas desulfurization (FGD) system to remove sulfur dioxide and hydrogen chloride from the hot gases is expected to average 2150 gpm with a maximum of 3150 gpm. Although the system will recycle quench water, makeup water will be needed continually to replace

that lost through evaporation, approximately 1000 gpm. In addition, water will be periodically blown down at an average rate of about 1000 gpm to remove excess chlorides from the system. The chloride concentration of water circulating in the FGD system is critical because chlorides are highly corrosive. Acceptable chloride levels for reliable system operation can be maintained with the aforementioned quantity of fresh water available. Higher chloride concentrations would require use of yet to be developed technology, including exotic metallurgy to prevent corrosion. The FGD system has been designed to produce wallboard grade gypsum for which chloride concentration also must be made fairly low. Too high chloride and total dissolved solids concentrations in the gypsum cake wash water creates an inferior quality product. Approximately 50 to 180 gpm of makeup water will be removed from the FGD system with the gypsum by-product.

3.3.6 Service Water System

Other than FGD system requirements, miscellaneous service water uses at the proposed plant include pump bearing cooling, pump seals, air preheater washing, equipment maintenance cleaning, and other miscellaneous plant uses. Groundwater will supply the service water system serving these uses with an estimated average flow of 113 gpm and a maximum flow of approximately 1215 gpm. For infrequent events or during an emergency (e.g., during air preheater washing or for air preheater fire control), service water maximum flow requirements will be much higher. See Figure 3.3-1.

3.3.7 Potable Water System

Potable water for domestic and sanitary use will be supplied from deep wells via the main plant storage tanks at an average rate of 11 gpm. Maximum demand is expected to be 240 gpm. These figures are based on a total plant staff of 375 people and an average potable water requirement of 40 gallons per capita per day. All lines leading from the storage tanks for uses other than potable water will be provided with backflow preventers

to prevent return flow into the storage tanks and eliminate potential contamination of the potable water source. Potable water receives secondary chlorination treatment prior to distribution, in accordance with state requirements.

3.3.8 Fire Protection System

Large quantities of water must be available for fire protection at the plant. Although average demand is zero, maximum instantaneous demand can be as high as 2500 gpm. Approximately 600,000 gallons of water will be stored on site for fire protection, with a maximum makeup rate of 625 gpm required during actual use. The fire protection system will be a closed-loop system except during actual use in extinguishing fires. The system will be tested periodically to ensure proper operation. Water will be pumped through the main system pumps and recirculated back to the storage tanks without circulating through the entire system. Thus, no consumptive use of water will occur. After installation of the system, a small amount of water, about 30 gpm for several minutes, will be released during the initial test of the sprinkler system. Water released through the system cannot return to the storage tanks since backflow preventers will be installed in the fire protection lines. Sprinkler valves and other components throughout the fire protection loop will be tested locally at regular intervals during plant operation, without the use of water.

3.3.9 Water Use Variations

Depending on varying conditions at the plant, there will be variations in the water use requirements of plant systems. All water requirements discussed in the preceding sections are either average or maximum requirements for the plant operating at full load. When the plant operates at less than full load, the evaporative losses from the cooling towers will decrease in direct proportion to the plant load. Since the cooling towers' makeup remains constant, the smaller evaporative losses will result in an increase in blowdown to keep the system in balance. However, when the

cooling towers are shut down because of prolonged plant shutdown, no makeup or blowdown will be necessary, eliminating the withdrawal of surface water. With one unit shut down, fresh water requirements also will be reduced as one FGD system will not be operating. In addition, variations in the amount of FGD system blowdown will occur due to varying chloride concentrations in the coals burned. Other plant water requirements are not expected to change significantly with plant load variations. Some maximum service water uses will not occur concurrently with others. For example, during an air preheater fire, the generating unit will be shut down; thus, although water will be required for fire control, normal unit water requirements will not be present.

In summary, total plant water requirements are not expected to change significantly with variations in plant load except in the case of prolonged plant shutdown. During these shutdown periods, no surface water requirements are anticipated. Although no groundwater makeup will be required by the FGD system during shutdowns, other systems' (i.e., demineralizer, equipment cleaning, etc.) water usages will increase. Therefore, overall groundwater use is not expected to change significantly during plant shutdown.

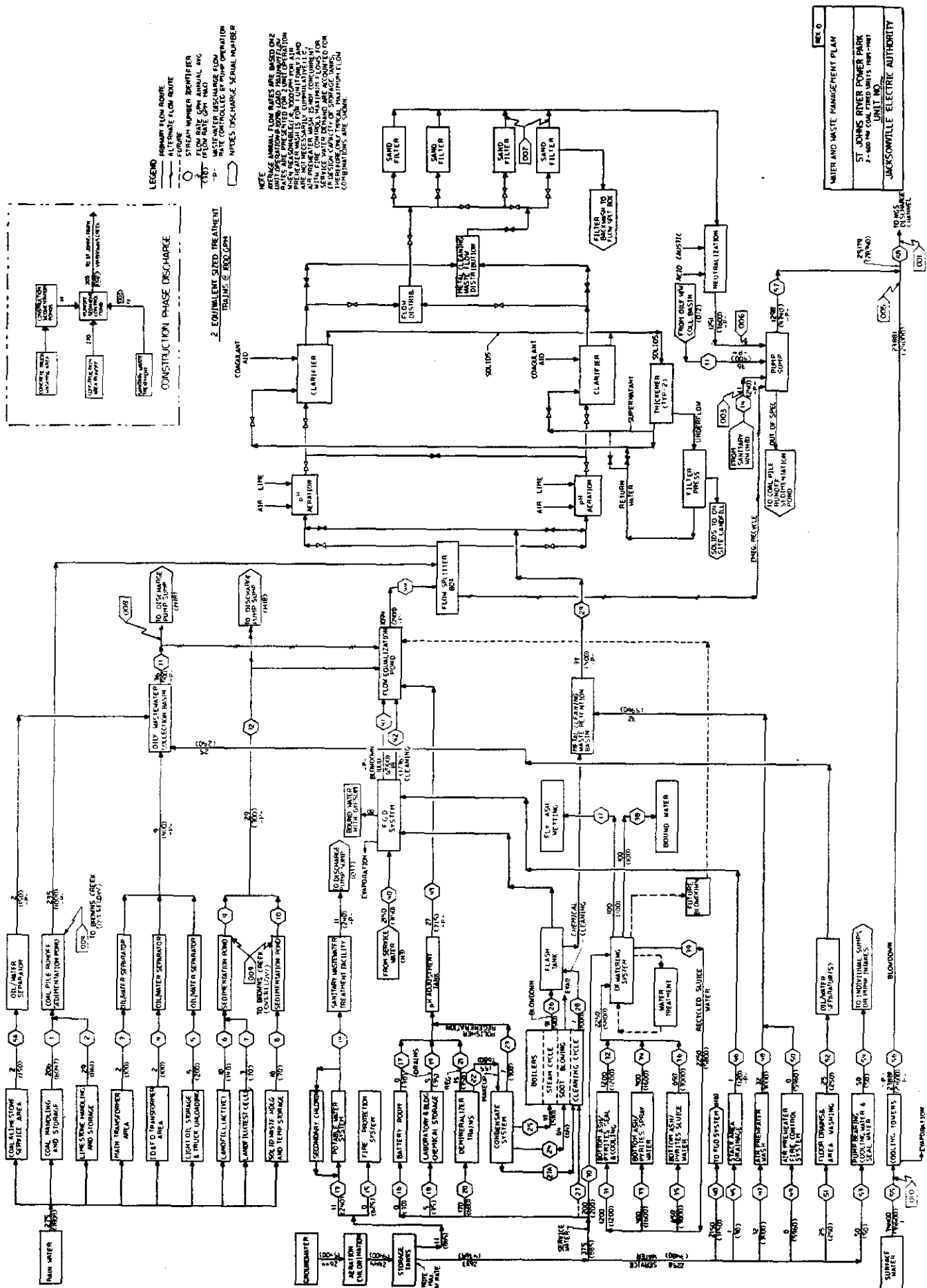


Figure 3.3-1 Water Management Plan

3.4 HEAT DISSIPATION SYSTEM

The heat dissipation system design presented in this section is conceptual in nature. Although the detailed design of this system may require some changes, such changes will be minor with respect to the system's construction and operation. Therefore, the system as it will be built will not be significantly different from the description presented herein.

3.4.1 Circulating Water System

Each of the two units will operate with a steam supply system of approximately 2,400 psig pressure and 1000°F temperature. Each turbine-generator is to be rated at 612 MWe at a turbine exhaust pressure of 3.5 inches of mercury. This will result in a heat rejection rate of about 2.33×10^9 Btu per hour per unit, at 100 percent load, to the condenser.

Each unit's circulating water system will include 183,500 gpm of condenser cooling water, 10,900 gpm of component cooling water and 800 gpm of mechanical vacuum pump cooling water. In addition to these flows there will be 17,200 gpm of makeup water, for a total of 212,400 gpm, the design flow rate for each cooling tower.

One natural draft counterflow cooling tower has been selected to dissipate the heat from each unit. At the design wet bulb temperature of 80°F, dry bulb temperature of 93°F, and 100 percent plant load, the design parameters for each tower will be as follows:

Cooling Range	25.8°F
Approach	10.0°F
Cold Water Temperature	90.0°F
Hot Water Temperature	119.6°F
Heat Load	2.75×10^9 Btu/hour
Drift and Blow-Through Rate	0.002 percent of total tower flow

The natural draft towers will be located north of the power plant, approximately 1,650 feet from the centerline of the boilers (see Figure 3.1-1). Each tower will have a base diameter of approximately 340 feet and a height of about 425 feet.

Two one-half capacity vertical wet pit pumps will serve each cooling tower. Each pump will have a design capacity of 110,650 gpm at a rated total dynamic head of approximately 84 feet. The pump pits will be connected to the reinforced concrete basin provided below each cooling tower by a rectangular concrete intake channel. A cast-in-place concrete transition block will connect each pair of pumps to its respective circulating water piping. The circulating water pipe between the pumps and each condenser, as well as the return pipe from each condenser to its respective cooling tower, will be approximately 9 feet in diameter and approximately 1600 feet long. The residence time within the circulating water system is expected to be on the order of 25 minutes.

Makeup for each cooling tower will be withdrawn from the existing Northside Generating Station (NGS) discharge channel. Blowdown from each cooling tower will be discharged to the NGS discharge channel as well, at a location downstream of the makeup withdrawal point (see Chapter 9, Figure 9.1-1).

3.4.2 Makeup Intake System

Plant makeup will be withdrawn from the western end of the NGS discharge channel through perforated pipes or a screened channel with a design average entrance velocity of 0.25 feet per second. Because of the intake location, no trash is expected to be present. The design cooling tower makeup flow rate is to be 17,200 gpm per unit. Makeup is considered to be a constant flow rate producing a maximum of 1.5 cycles of concentration in each cooling tower. Because of the intake location, the makeup water is considered for design purposes to be salt water.

From the makeup pumps, a header will connect to a pipe which will run to the condenser discharge blocks. The retention time within the makeup system will be about 14 minutes.

Best technology available will be used for the location, design, construction and capacity of the cooling water intake structure for the purpose of minimizing adverse environmental impact in accordance with the requirements of Section 316(b) of P.L. 92-500. In summary, the circulating water system will include the following features:

- . Intake Location - NGS discharge channel.
- . Design - Closed recirculating system with perforated pipes, or screened channel with a design average entrance velocity of 0.25 feet per second.
- . Construction - Dredging for and construction of new intake and/or discharge structures in the St. Johns River will not be required.
- . Capacity - Approximate annual withdrawal of 0.2 percent of the average St. Johns River flow.

3.4.3 Blowdown Discharge System

The cooling tower blowdown will be pumped to a common discharge line to the NGS discharge channel by 2 wet pit pumps at each tower. The design maximum flow rate is 24,000 gpm per tower.

The blowdown is the difference between the makeup and the evaporation (ignoring drift). Estimates of average monthly evaporation rates (for both units at 100 percent load) have been made, and corresponding blowdown rates calculated, as well as blowdown cycles of concentration. They are presented in Table 3.4-1.

Estimates of average monthly blowdown temperatures have also been made for the historical period from November, 1978 through October, 1979. Table 3.4-2 presents these blowdown temperatures, as well as the NGS average monthly discharge and intake temperatures which occurred during that period.

Using the same procedure for extreme monthly wet bulb temperatures, the corresponding evaporation and blowdown rates and concentrations have been estimated and are presented in Table 3.4-3. Similarly, extreme blowdown temperatures have been estimated, assuming both NGS and the proposed plant are in operation, and are presented in comparison to NGS minimum intake and discharge temperatures which actually occurred during the period November, 1978, through October, 1979, in Table 3.4-4.

The design of the blowdown discharge system includes a discharge line with a 42-inch diameter and a length of approximately 10,800 feet. The system retention time, from the towers to the NGS intake channel, will be about 17 minutes.

3.4.4 Other Heat Dissipation Systems

At this time, the heat load from all water-cooled heat dissipation systems will be dissipated in each unit's main cooling tower, as well as a portion of the NGS heat load which enters through the makeup system.

Table 3.4-1

AVERAGE MONTHLY EVAPORATION, BLOWDOWN AND
BLOWDOWN CONCENTRATIONS
TWO UNITS

<u>Month</u>	<u>Dew Point (°F)</u>	<u>Dry Bulb (°F)</u>	<u>Evap^a (gpm)</u>	<u>Blowdown^b (gpm)</u>	<u>Blowdown^b Concentrations</u>
J	47.0	65.0	10294	24106	1.43
F	43.0	56.0	9679	24721	1.39
M	52.0	67.0	10336	24064	1.43
A	56.0	72.0	10610	23790	1.45
M	63.0	75.0	10652	23748	1.45
J	69.0	80.0	10840	23560	1.46
J	71.0	82.0	10920	23480	1.47
A	72.5	82.0	10876	23524	1.46
S	71.5	81.0	10836	23564	1.46
O	64.0	74.0	10552	23848	1.44
N	50.0	67.0	10381	24019	1.43
D	48.5	66.0	10254	24146	1.42

a Estimated

b Calculated based on estimated evaporation rate

Table 3.4-2

AVERAGE MONTHLY BLOWDOWN SYSTEM AND RELATED TEMPERATURES^a
(Degrees F)

<u>Month</u>	<u>St. Johns River Power Park^b Blowdown</u>	<u>Northside^c Discharge</u>	<u>Northside^c Intake</u>
N	78.0	78.8	70.9
D	77.3	76.1	67.0
J	76.7	70.3	59.5
F	72.6	67.4	57.1
M	78.3	70.3	61.8
A	81.0	80.8	70.8
M	83.6	87.5	76.5
J	86.8	90.7	79.6
J	88.0	96.5	83.6
A	88.4	97.7	84.0
S	87.8	99.1	82.7
O	83.4	91.8	77.1

a Dew Point and Dry Bulb as in Table 3.4-1

b Estimated

c Northside Generating Station records November, 1978 to October, 1979.

Table 3.4-3

EXTREME MONTHLY EVAPORATION, BLOWDOWN AND
BLOWDOWN CONCENTRATIONS
TWO UNITS

Month	Dew Point (°F)	Dry Bulb (°F)	Evap ^a (gpm)	Blowdown ^b (gpm)	Blowdown ^b Concentrations
J	67	68	9985	24415	1.41
F	69	76	10549	23851	1.44
M	66	78	10783	23617	1.46
A	71	82	10921	23479	1.47
M	77	85	10944	23456	1.47
J	76	90	11307	23093	1.49
J	79	86	10945	23455	1.47
A	78	89	11184	23216	1.48
S	80	88	11051	23349	1.47
O	74	83	10900	23500	1.46
N	70	74	10363	24037	1.43
D	73	74	10254	24146	1.42

a Estimated

b Calculated based on estimated evaporation rate

Table 3.4-4

EXTREME MONTHLY BLOWDOWN SYSTEM AND RELATED TEMPERATURES^a
(Degrees F)

<u>Month</u>	<u>St. Johns River Power Park^b Blowdown</u>	<u>Northside^c Discharge</u>	<u>Northside^c Intake</u>
J	82.2	64.1	55.3
F	85.4	62.2	52.4
M	85.3	66.3	56.0
A	88.0	77.1	68.6
M	90.7	84.2	75.2
J	92.0	86.4	77.3
J	91.6	93.1	80.3
A	92.3	94.5	81.7
S	92.6	96.0	81.5
O	89.1	86.6	75.9
N	85.0	74.1	69.0
D	85.9	70.6	64.3

a Dew Point and Dry Bulb as in Table 3.4-3

b Estimated

c Northside Generating Station records November, 1978 to October, 1979.

3.5 CHEMICAL AND BIOCIDES WASTES

3.5.1 Liquid Wastes

Plant liquid wastes will be incorporated into an overall plant water management plan (see Appendix O). The plan integrates water requirements and effluents for the various systems to minimize total plant makeup and discharge and to comply with applicable regulations. The proposed water management plan is presented schematically in Figure 3.3-1.

A portion of the discharge from the circulating water system of the existing NGS will be used as makeup to the recirculating cooling water system. The blowdown from the cooling towers will be discharged to the existing NGS discharge channel. Groundwater will be utilized for the plant potable water supply, demineralized water systems, flue gas desulfurization system, fire protection system, and plant service water.

Plant systems' effluents will be reused where feasible, within operating or regulatory constraints and when necessary, treated prior to reuse. Those effluents unsuitable for reuse, other than cooling tower blowdown, will be directed to one of several wastewater treatment facilities, including sedimentation ponds, oil/water separators, retention basins, or a central wastewater treatment facility. These facilities are described below and in the following subsections, with respect to the liquid wastes being treated. In all cases, the facilities have been designed to produce an effluent in compliance with existing effluent limitations for steam electric generating stations. All plant effluents will be discharged via the common cooling tower blowdown line to the NGS discharge channel.

The central wastewater treatment facility will treat plant wastewaters unsuitable for further reuse or direct discharge into the St. Johns River via the NGS discharge channel. A schematic diagram of the central facility is presented in Figure 3.3-1. This figure also indicates the major wastewater sources to be treated in the central facility. The wastewater

treatment system will be designed to treat contaminated rainfall runoff and miscellaneous plant effluents at a maximum design flow rate of 3600 gpm total or 1800 gpm through each of two parallel treatment trains.

Both trains will operate at or near design capacity under conditions of increased flow such as may happen during electrostatic precipitator and air preheater washdowns and during periods of excessive rainfall.

The central treatment facility will be designed to remove suspended solids and iron from, and adjust the pH of, the plant effluent. Treatment methods consist of a combination of neutralization, precipitation, coagulation, gravity separation, and media filtration. To meet effluent standards for new sources, the final effluent will meet or surpass the following on a daily average basis:

Total suspended solids	30 mg/l
pH	6 to 9.0
Total iron	1.0 mg/l
Total copper	1.0 mg/l

Major components of the central wastewater treatment facility will include pH adjustment/aeration tanks, flocculator clarifiers, chemical feed equipment, dual media sand filters, solids thickeners, and a dewatering facility.

The two identical treatment trains allow segregated, yet concurrent, treatment of metal cleaning wastes and other plant wastes. As shown in Figure 3.3-1, all plant wastes except those generated by metal cleaning operations first will be directed to a flow splitter box for distribution to the treatment facility. Metal cleaning wastes will enter the system through a separate line which can direct the wastewater to either of the two treatment trains. Whichever train is not being used to treat the metal cleaning wastes will treat all remaining plant wastewaters. This segregation of wastes will be maintained throughout the treatment system,

including the sand filters, up to the point of final neutralization. Treatment of metal cleaning wastes generally will be accomplished at a time when other plant waste flows are relatively low.

Treated effluent from the chemical wastewater facility will be reused when appropriate within the facility for reactor clarifier backflush water, line slurry makeup, and cooling of some pump bearings. Effluent reuse pumps will withdraw water from the final effluent pump sump and return it to a hydropneumatic tank at the treatment facility for use when required by the aforementioned systems. Service water will be interconnected with this system as a backup water supply.

3.5.1.1 Low Volume Wastes

The low volume wastes are comprised of the demineralizer regeneration wastes, coal dust suppression drainage, and miscellaneous wastes.

Regeneration wastes result from the operation of the demineralizer trains. The regeneration cycle consists of backwashing, acid and caustic regeneration and rinsing of the demineralizer beds. The ion exchange beds must be periodically regenerated to strip adsorbed ions from the resin surface and replace them with hydrogen and hydroxyl ions for the cation and anion exchangers, respectively. This process is achieved by adding the regenerating chemicals, e.g., sulfuric acid (H_2SO_4) and sodium hydroxide (NaOH), in quantities in excess of the exchange capacity of the bed. Thus, demineralizer wastes are characterized by extremes in pH (i.e., from 2 to 12 pH units) and a high dissolved solids concentration. Suspended solids may also be present due to inefficient pretreatment or precipitation reactions. Average total dissolved solids levels in the neighborhood of 12,000 mg/l would be typical, composed of anions and cations in nearly the same proportion as the influent raw water. With certain exceptions (i.e., sodium, sulfates, carbonate), the average concentrations of constituents in the regeneration wastes will be approximately equal to 7 times the respective concentrations in the makeup groundwater. Estimated characteristics are presented in Table 3.5-1.

The volume of regeneration wastes is estimated to be 44,000 gallons per train per regeneration, including rinse water. Average flow rate will be about 15 gpm and maximum instantaneous flow may be 350 gpm. It is anticipated that one demineralizer train will be regenerated every three to four days, depending on demineralized water usage. The demineralizer regeneration wastes, including condensate polisher regeneration, will be directed to a pH adjustment tank for elementary neutralization. From this tank, the combined streams will be directed to a flow equalization basin for equalization with other plant waste streams. The basin will be lined with synthetic material similar to that described in Section 3.5.1.7 and will hold up to two million gallons in each of two cells.

A portion of the water used for dust suppression during coal handling will be retained in the coal. The remainder will drain, producing a wastewater with a suspended solids concentration in excess of 30 mg/l and showing wide variations in pH. This flow, which is directed to the coal pile runoff sedimentation pond, is expected to average about 30 gpm with a maximum of approximately 100 gpm. Treatment will be required to reduce suspended solids and adjust pH to acceptable levels.

The miscellaneous wastes include those resulting from routine equipment cleaning, laboratory drains, sampling streams, floor drains, etc. Collectively, these wastes are expected to average about 81 gpm. Maximum instantaneous flow may be as high as 485 gpm. Waste characteristics are expected to vary considerably, depending on the source, and consequently, treatment will vary also. Some of this wastewater will be reused in other plant systems without prior treatment. The remaining wastes will require treatment for solids removal, pH adjustment, oil and grease removal, or some combination of these treatments. Those wastewaters requiring oil and grease removal, such as water used for floor washing during equipment maintenance, will be treated in oil-water separators before being combined in an oily wastewater collection basin. The oil-water separators will be designed to produce an effluent with oil and

grease concentrations of less than 15 mg/l. The basin will be lined with an impervious synthetic material to prevent groundwater contamination in the event large quantities of oil are discharged into the basin.

The effluent from the oily wastewater collection basin ordinarily will be discharged directly through the final effluent pump station; however, an alternative route to the flow equalization pond has been provided, in the event monitoring indicates noncompliance with EPA effluent limitations. Disposal of the separated oil and grease is discussed in Section 3.5.2.3. Other wastes, e.g., laboratory drains, will require pH adjustment prior to combining with other wastewaters in the flow equalization pond for additional treatment in the central facility.

3.5.1.2 Bottom Ash Transport Water

Present design for the bottom ash handling system precludes generation of a liquid discharge requiring treatment. The recirculating bottom ash handling system recycles an average sluice water flow of 2250 gpm. A makeup flow of 200 gpm is required, to makeup that water lost by binding to bottom ash particles and used in the wetting of fly ash for on-site disposal. Bottom ash system water balance calculations indicate that sufficient dissolved solids will be removed in the water bound to the dewatered ash to eliminate the need for blowdown. However, provisions have been made to incorporate a future blowdown should the solids content in the recirculating sluice water exceed acceptable operating levels. Blowdown from the bottom ash system could be as much as five percent of the daily average recirculating flow and would require treatment for suspended solids removal. If necessary, this blowdown would be directed to the flow equalization pond for subsequent treatment in the central treatment facility.

3.5.1.3 Fly Ash Transport Water

Fly ash will be collected dry and pneumatically transported to storage silos. The fly ash transport system will not generate a liquid waste.

3.5.1.4 Metal Cleaning Wastes

Metal cleaning wastes result from scheduled periodic maintenance cleaning of the air preheaters, boiler firesides, and boiler watersides. Air operated sootblowers will remove accumulated material during boiler fireside cleaning.

Air preheater cleaning is required periodically to remove accumulated soot and fly ash on the air pass surfaces. Preheaters will be cleaned by hosing them down with high-pressure water. Resulting wastes may be acidic and normally should contain sulfates, fly ash and soot, and metallic ions such as iron and copper. Air preheater washing is expected to occur about twice a year per unit, with approximately 100,000 gallons of water required per washing. Maximum flow rate is estimated to be 3000 gpm, averaging 32 gpm on an annual basis.

Boiler waterside cleaning to remove corrosion products and scale will be required every three to five years for each unit to maintain normal operating performance. Corrosion products would be characteristic of the boiler tube material and would contain primarily iron oxide. Boiler scale consists of precipitated salts and may include calcium and/or magnesium phosphates, and silica, depending on boiler feed water and materials of construction.

The chemicals used in boiler cleaning specifically depend on the requirements of the boiler system, based on analysis of boiler scale. The chemicals are generally highly acidic and alkaline and considerable quantities of water are required for flushing. The total volume of wastes per event is estimated to be between 0.5 to 1.5 million gallons, averaging 1 gpm on an annual basis.

Both air preheater and boiler waterside cleaning wastes will require treatment for iron removal, pH adjustment, and suspended solids removal. These wastes will be directed to the metal cleaning waste retention basin

for equalization and storage prior to treatment in a segregated train of the chemical wastewater treatment facility. This retention basin will be designed in two cells with a capacity of between 1.5 and 2 million gallons, enough to contain the maximum expected discharge from a routine maintenance cleaning operation. The basin will be lined with a synthetic material, as described in Section 3.5.1.7, to protect groundwater from potential contamination. Floating mechanical agitators will be installed in each cell to produce a waste with uniform pH.

3.5.1.5 Boiler Blowdown

Boiler blowdown will be fairly continuous to control the buildup of dissolved constituents in the boiler/steam cycle and is expected to average 91 gpm with a maximum flow of about 510 gpm. The blowdown will be very low in dissolved and suspended solids and will be slightly alkaline. The estimated range of boiler blowdown water quality characteristics is as follows:

<u>Parameter</u>	<u>Concentration (mg/l)</u>
pH	9.4 - 9.6
Total suspended solids	1 - 10
Oil and Grease	0 - 5
Iron	0.01 - 2.0
Phosphate, PO ₄	2 - 10

Because the boiler blowdown quality is quite high, this water will be reused as makeup to the FGD system, unless its use adversely affects the quality of gypsum produced. The blowdown will flow first to a flash tank, then will be routed to the FGD system.

3.5.1.6 Cooling Tower Blowdown

Discharge from the recirculating cooling water system will be in the form of cooling tower blowdown. Blowdown quantity will vary depending somewhat on meteorological conditions; that is, when meteorological conditions are such that cooling tower evaporation losses decrease, the rate of blowdown will increase under conditions of constant makeup flow. The expected average blowdown flow is about 23,900 gpm (see Section 3.4), on a constant makeup flow of 34,400 gpm and an annual average evaporation of approximately 10,500 gpm.

The only contaminants expected to be added to the blowdown are thermal energy, chlorine, and perhaps sulfate. The increases in temperature (16.4°F average in winter and 5.3°F average in summer) will be dissipated in a designated mixing zone in the river beyond the NGS's point of discharge (POD). Thermal input effects are discussed in detail in Section 5.1.2. Chlorine will be added to the cooling tower system to control biological fouling.

The concentration of free available chlorine in the blowdown is not expected to exceed the current standard of 0.2 mg/l at the POD for more than two hours per day per unit. Chlorination will be carefully controlled at the minimum levels necessary for efficient operation after the plant goes into commercial operation. Sulfate concentration in the cooling tower blowdown may increase slightly as a result of acid addition for scale control. The addition of 25 to 50 mg/l of sulfuric acid may increase sulfate (SO_4) levels by 24 to 48 mg/l and decrease bicarbonate levels (as CaCO_3) by 25 to 50 mg/l. The pH of the water may decrease slightly but will be maintained above 6.0 pH units. It is not anticipated that additional chemicals, such as corrosion inhibitors, will be required in the cooling tower flow.

Blowdown quality will depend primarily on the makeup water characteristics and will vary directly with river water quality and the operating cycles of concentration in the cooling towers. In most

instances, the concentration of substances in the makeup water will increase in direct proportion to the cycles of concentration (see Chapter 5, Section 5.1.3.2). Estimated blowdown characteristics are presented in Table 3.5-1. These estimates are based on approximately 1.5 cycles of concentration and average and worst case ambient river water quality. The blowdown will be discharged to the existing NGS discharge channel downstream of the proposed intake location, and will discharge ultimately to the St. Johns River via the existing NGS submerged discharge.

3.5.1.7 Area Runoff

Rainfall runoff from certain plant areas will require treatment to maintain compliance with federal regulations and policies. These areas include coal handling and storage, limestone handling and storage, main transformer area, oil storage and unloading, solid waste handling and temporary storage, and the solid waste landfill areas. Runoff quantities have been estimated based on area involved and expected rainfall. The average runoff is based on the highest mean monthly rainfall of 7.89 inches for the period 1941 through 1980 (see Chapter 2, Table 2.6-4). Maximum flows have been calculated using a once in 10 years, 24-hour design storm of 7.6 inches, with maximum intensity of 5.2 inches occurring within a six hour period.

The following table indicates average and maximum expected runoff from various plant areas and the estimated size of each area. A runoff coefficient of one (1) has been assumed for all areas except the active and test cell solid waste landfills. For these areas, a runoff coefficient of 0.6 has been assumed. The table also indicates the parameters for which treatment will be necessary.

<u>Area</u>	<u>Size</u>	<u>Average Runoff(gpm)</u>	<u>Maximum Runoff(gpm)</u>	<u>Treatment Necessary</u>
Coal Handling and Storage	42 acres	206	6047	pH, TSS, Iron
Limestone Handling and Storage	6 acres	29	861	pH, TSS
Landfill (Active)	10 acres	10	140	pH, TSS
Landfill (Test Cell)	5 acres	3	70	pH, TSS
Solid Waste Handling and Temporary Storage	3 acres	16	70	pH, TSS
Light Oil Storage and Truck Unloading	1 acre	5	200	Oil and Grease
Coal and Limestone Service	16,553 ft ²	2	150	Oil and Grease
ID and FD Transformer Area	14,000 Ft ²	2	100	Oil and Grease
Main Transformer Area	5,000 ft ²	2	100	Oil and Grease

The major contributor to runoff quantity is the coal pile storage area. Estimated coal pile runoff quality is presented in Table 3.5-1, assuming the proposed plant will burn coal from regions of east Kentucky and east Tennessee.

Rainfall runoff from the various plant areas will be collected by drainage ditches, piping, and catch basins and routed to appropriate sedimentation ponds prior to further treatment or discharge. Potentially oily runoff from certain areas will be treated for oil removal in oil-water separators prior to discharge into a central oily wastewater collection basin. The oil-water separators will be designed to produce an effluent with oil and grease concentrations of less than 15 mg/l. Effluent from the basin will be pumped to the final effluent pump station for discharge. An alternate route to the flow equalization basin will be provided if further treatment of these wastes is required. Oil skimmers will be provided for in the collection basin, if required. Disposal of the separated oil and grease is discussed in Section 3.5.2.3.

Runoff from the two solid waste landfills north of the plant loop and from the solid waste handling and temporary storage areas will be collected in sedimentation ponds then pumped to the flow equalization pond. Treatment in the central facility will adjust the pH of the runoff, remove additional solids not removed in the pond, and reduce small concentrations of certain metal constituents. An alternate route for the runoff from the solid waste areas has been planned should the runoff quality be in compliance with guidelines for pH, total suspended solids, and other water quality criteria. This route will pump the effluent from the sedimentation pond directly to the final effluent discharge pump sump.

The largest rainfall runoff flow will be from the coal and limestone handling and storage areas due to the larger areas involved. This runoff will be collected in the coal pile runoff sedimentation pond, pumped to the flow splitter box, then treated in the central treatment facility for pH adjustment and solids and iron removal.

Of the rainfall runoff sedimentation ponds at the main plant site, only the coal pile runoff sediment control pond will be lined. The coal pile also will be lined. The liners to be used will be high density polyethelene, which is a flexible, impervious synthetic material, or equal, designed to protect groundwater resources from industrial liquid wastes. Other plant facilities which will be lined with the same material include the metal cleaning waste retention basin, the flow equalization basin, and the oily wastewater collection basin. The proposed lining system will be designed for the life of the project and will have had proven satisfactory service for at least five years under similar service conditions. All seams (joints) between individual liner sheets will overlap with at least two inches of weld seam, which will be tested to insure a strong, water-tight bond between the sheets. Liners will have resistance to wear and abrasion at points of contact with concrete structures and fittings.

The sedimentation ponds will be designed with sufficient capacity to satisfy the regulatory requirements for runoff control, to process the volume associated with the once in ten year, 24-hour rainfall event. Capacity will be provided in each pond, except the coal pile pond, to allow accumulation of settled solids of up to 20 percent of total pond volume. At this level, solids will be removed. The coal pile runoff sediment control pond will be designed to provide for sludge accumulation of up to two feet averaged over the total pond area.

3.5.1.8 Flue Gas Desulfurization Blowdown

The FGD system will require a blowdown of approximately 1,000 gpm to remove dissolved solids from the system. Chloride concentrations must be maintained at about 4,000 mg/l for reliable system operation as described in Section 3.3.3.5. The blowdown will contain the same constituents as those present in the makeup water. Concentrations of these constituents will vary in direct proportion to the makeup flow plus contributions from the flue gas and limestone processed. Table 3.5-1 presents estimated FGD system blowdown characteristics. Depending on which FGD system is selected, makeup water requirements might increase to 3150 gpm and blowdown flow may increase to 2000 gpm. Blowdown quality should remain essentially the same, however.

Blowdown from the FGD system and wastewater generated from system cleaning will be pumped to the flow equalization pond, the flow splitter box, and then to the central treatment facility for pH adjustment and suspended solids removal.

3.5.2 Solid Waste

The largest quantity of solid wastes produced by the operation of the plant will be generated by the flue gas desulfurization (FGD) system. Coal combustion ash, in the form of fly ash and bottom ash, will be the other major solid waste. Collectively, FGD waste and coal ash are referred to as "high volume solid wastes." Other comparatively small quantities of solid

wastes, generated by the operation of the plant include sludges from the sedimentation pond, retention basin, cooling towers, and wastewater treatment facilities.

Ash is the residue produced by the combustion of coal. It consists of the unburned organic matter and the inorganic mineral constituents present in the coal. The quantity and chemical characteristics of ash depend on the coal, boiler operating conditions, and air pollution control devices. Two types of ash are produced during combustion, fly ash and bottom ash. Fly ash consists of the finer particles that are entrained in the flue gas stream. Bottom ash is the coarser, heavier material that accumulates in the furnace bottom in the form of a loose ash or slag.

For the proposed wet limestone FGD scrubber, the sulfur dioxide in the flue gas reacts with the limestone slurry producing a waste. The principal constituent of the waste produced at the proposed plant will be calcium sulfate (gypsum) based on a forced oxidation system.

The following conditions have been used to estimate the quantities of high volume solid wastes:

Plant

Two 600 MW Units

Heat input rate = 5928×10^6 Btu/hour/unit

Plant life = 40 years

Average capacity factor = 60 percent (not levelized)

Coal

Heating value = 11,590 Btu/lb

Ash content = 9.2 percent

Sulfur content = 2.7 percent

Fly Ash

Removal efficiency = 100 percent

Percent of total ash produced = 80 percent

Bulk density at disposal site (dry) = 60 lbs/ft³

Bottom Ash

Percent of total ash produced = 20 percent

Bulk density at disposal site (dry) = 80 lbs/ft³

FGD System

Scrubber type = Wet limestone with forced oxidation

Waste composition = $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ (Gypsum)

Removal Efficiency = 100 percent

Excess sludge = 10 percent

Solid content = 80 percent

Bulk density at disposal site (dry) = 64 lbs/ft³

Values used are estimated averages over the anticipated 40 year life of the plant. Removal efficiencies of 100 percent are assumed for the sake of conservatism.

3.5.2.1 Bottom Ash

Approximately 1.99 million tons of bottom ash are expected to be generated over the life of the plant. The total volume is estimated to be about 1140 acre-feet. Maximum rate of production of bottom ash is expected to be about 20 tons/hour for both units.

Bottom ash will be sluiced to a dewatering system for water removal. The water is recycled back to the bottom ash hopper and the dry ash is removed from the dewatering bins for reuse off-site or disposal on-site.

Potential markets for bottom ash include sectors of the construction industry. Non-marketed bottom ash will be combined with the other combustion by-product solid wastes and disposed of in an on-site landfill.

3.5.2.2 Air Quality Control Systems Waste

The Air Quality Control Systems (AQCS) wastes consist of fly ash collected in the electrostatic precipitators and the FGD waste. Fly ash will be generated at a maximum rate of about 81 tons/hour from Units 1 and 2.

Approximately 7.95 million tons or 6,080 acre-feet of fly ash will be generated over the life of the plant. Fly ash will be pneumatically conveyed to temporary storage silos. The silos will provide a minimum of three days storage.

The maximum rate of production of dry gypsum for the two units is estimated at about 134 tons/hour. Total gypsum produced over the life of the plant will be approximately 17.2 million tons or 12,400 acre-feet. Temporary storage up to seven days at full load generation will be provided for marketable gypsum.

Fly ash is a valuable, recoverable resource. Several alternatives are currently available for the use of fly ash. With the congressional encouragement of resource recovery activities through the passage of the Resource Conservation and Recovery Act of 1976, and with a potential nearby market for fly ash, it is anticipated that fly ash generated by the proposed plant will be sold as a by-product.

The gypsum produced by the FGD system will be of a commercial grade, comparable in quality to natural gypsum deposits. This quality can be achieved through special equipment design and quality control procedures. Wallboard manufacturing facilities exist in the vicinity of the proposed plant and it is anticipated that the gypsum produced at the proposed plant will be utilized in the manufacture of wallboard.

In the event markets for fly ash, bottom ash, and gypsum do not materialize, or during temporary market interruptions, on-site storage will be necessary. Due to the conservative assumptions used in the solid waste area impacts assessment which have been necessary because of the absence of a specific plant coal and leachate characteristics, a storage program having two elements will be implemented. These elements include an on-site solid waste disposal test program and an on-site landfilling operation for material not directly associated with the test program.

The test program will be designed to characterize the handleability, structural stability, and other physical and chemical properties of fly ash, bottom ash, and gypsum mixtures, and to develop criteria for establishing an environmentally acceptable and cost effective long term disposal plan.

During the testing period (approximately five years), the material not directly associated with the test program will be placed into a secure, on-site, monitored landfill. The landfill will be developed in cells of approximately 10 acres each. The base of the landfill will be above the seasonal high water table. The base material will be compacted to achieve a permeability of approximately 9×10^{-4} cm/sec and designed to minimize leachate caused by rainfall infiltration within the limitations of water quality standards in the area. The waste material will be placed and compacted in lifts (layers) up to a total height of about 60 feet above grade. Compaction of this material further reduces infiltration of rainwater through the waste.

Before initial waste placement within each cell, diversion berms for diverting water runoff from surrounding areas will be constructed. In addition, a perimeter ditch inside the berm will collect precipitation runoff from the landfill. Collected runoff will be treated as discussed in Section 3.5.1.7. During placement, drainage will be maintained toward perimeter ditches.

For closure of the landfill, the tops of the completed cells will be sloped to enhance surface runoff while reducing infiltration. A cover consisting of a granular base (such as bottom ash) and topsoil will be placed on the sides of completed outside cells and on the landfill top surface. Interfacing side slopes of the cells will not be covered since they serve as initial sides for the next cell. The final step in closure will be to seed the covered landfill.

A system of groundwater monitoring wells will be installed prior to the disposal of the waste material and a monitoring program will be initiated. The system will include wells upgradient and downgradient of the disposal area. Water levels will be periodically monitored and water samples will be periodically collected for analysis of selected indicator parameters.

The solid waste mixture (fly ash, bottom ash, and gypsum) has a moisture content of approximately 20 percent; thus, fugitive dust emissions from the waste are anticipated to be minimal. The continual placement and compaction of new (moist) material over the old during construction of each landfill lift will also prevent the formation of dust should the surface be disturbed due to working. Covering the waste with soil and seeding will eliminate possible future dust emissions after closure of each cell.

3.5.2.3 Other Wastes

Compared to the high volume solid wastes, quantities of miscellaneous solid wastes generated by operation of the plant will be insignificant. These wastes include settled solids from various sedimentation ponds, the metal cleaning retention basin, and the cooling tower basin; separated oil and grease from oil-water separators; and, sludges from the sanitary waste treatment facility and the central wastewater treatment facility. The quantities of the miscellaneous solid wastes generated will depend on a number of factors.

Solids which have accumulated in the various sedimentation basins will be removed periodically to maintain sufficient liquid holding capacity in the ponds. Solids build up will depend primarily on rainfall frequency and duration and the concentration of suspended solids in the influent to the ponds. Solids in these ponds will consist mainly of coal dust and ash. Material from the coal pile runoff sedimentation control pond at the plant and will be removed and returned to the coal pile. Solids from the other runoff sedimentation ponds will be placed in the on-site landfill after removal. Frequency of solids removed from these ponds is estimated to be about once per year.

Removal of wastes from the metal cleaning waste retention basin will be required once every three to five years, corresponding with the frequency of one or two boiler cleaning operations. Because of the potentially corrosive nature of the liquid waste held in the basin, the settled solids remaining may be considered hazardous under the rules of RCRA. If the wastes are considered hazardous, a RCRA permitted contractor will remove the wastes from the basin in accordance with the applicable regulations and dispose of them off-site. Should these wastes not be determined to be hazardous, the RCRA permitted contractor requirement will be dropped and on-site disposal considered.

Solids accumulated in the flow equalization basin (primarily from the FGD system blowdown) will be removed for disposal in the on-site landfill for fly ash, gypsum, and bottom ash.

Suspended solids and particulates from the atmosphere will build up over time in the cooling tower basins. These basins will be cleaned once or twice a year and the accumulated solids will be removed and disposed of in an on-site landfill.

Sludge will be produced from operation of the chemical wastewater treatment facility, generated during the solids clarification and precipitation processes. The quantity of sluges produced will depend on

the influent wastewater characteristics and length of operation of the facility. The sludge will be removed when required, dewatered and disposed of in the landfill.

Although, the extended aeration sanitary waste treatment facility is not expected to produce significant quantities of sludge, this material will be removed as necessary and disposed of off-site.

Oily waste removed from the oil-water separators will be collected for off-site disposal or reuse by licensed vendors. These wastes also may be incinerated in the boilers with the coal at selected times.

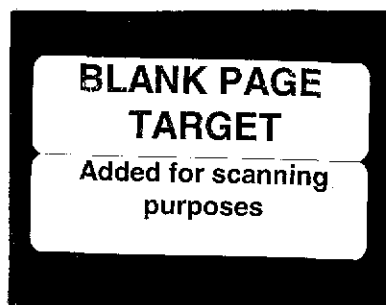
Table 3.5-1 (Revision 1)

PLANT EFFLUENT CHARACTERISTICS

Parameter	Cooling Tower Blowdown		FGDS Blowdown	Demin. Regen.	Landfill Area Runoff	Coal Pile Runoff
	Avg.	Max.				
Chlorides, mg/l	18,740	30,390	6,905	149	59	10
Sulfates, mg/l	2,500	3,873	10,000	8,000	766	5,000
Calcium, mg/l	391	588	3,000	394	130	300
Iron, mg/l	1.1	4.0	8.1	.178	1.2	200
Magnesium, mg/l	1,215	1,788	2,750	162	4.3	250
Potassium, mg/l	385	544	32	8.17	---	---
Sodium, mg/l	10,300	13,630	2,400	2,200	---	---
Cyanide, mg/l	.01	.13	---	---	< 0.01	0
Aluminum, mg/l	.703	5.4	0.3	.131	.9	260
Antimony, ug/l	.27	1.4	2,300	---	---	600
Arsenic, ug/l	.99	1.5	300	7.1	15	150
Beryllium, ug/l	.13	.28	140	---	< 7	40
Boron, mg/l	4.5	7.0	46	2.91	---	---
Cadmium, ug/l	.42	3.3	110	5.68	1.8	0.9
Chromium, ug/l	2.3	7.4	500	---	< 10	6.0
Copper, ug/l	100	410	200	28.4	23	900
Lead, ug/l	0.5	15	400	149	12	9
Manganese, ug/l	39.3	134.1	2,500	14.2	---	28
Mercury, ug/l	.35	.89	70	.71	.46	0.4
Nickel, ug/l	4.8	25	1,500	24.9	64	2,500
Selenium, ug/l	.72	1.1	2,200	35.5	10	5
Silver, ug/l	.23	.52	60	2.84	< 10	---
Zinc, ug/l	66.6	222	350	49.7	50	6,500

a See Appendix C, Section C.6 and Table C-36

OMIT



3.6 SANITARY WASTES

3.6.1 Volumes and Quantity

Sanitary wastes from plant locker rooms, showers, and toilets, estimated at an average daily flow of 15,000 gpd, 11 gpm, for the estimated operational staff of 375 people. Wastewater characteristics are expected to be similar to municipal wastewater. The five-day biological oxygen demand (BOD_5) is expected to be about 26 pounds per day, using a loading of 0.07 pound BOD_5 per capita per day. General composition of the plant sanitary wastes is as follows:

Composition of Sanitary Wastes (Construction Phase and Operational Phase)

<u>Constituent</u>	<u>Range of Concentrations, mg/l</u>
Solids, Total	700 - 1,500
Dissolved	500 - 1,000
Suspended	200 - 500
Biological Oxygen Demand, (BOD_5 -20°C)	150 - 250
Chemical Oxygen Demand (COD)	500 - 1,200
Nitrogen (Total as N)	40 - 100
Phosphorous (Total as P)	10 - 25
Oil and Grease	100 - 200

During plant construction, the peak work force is expected to be approximately 2,000. Of these, approximately 650 people will use portable, self-contained facilities. Wastes from the portable facilities will be disposed off-site either by the facilities's supplier or by some contractor who would collect the wastes and transport them to the nearest municipal sanitary waste treatment facility with available capacity. Approximately 1,350 of the construction personnel will use permanent and temporary

toilets, located in several site areas. The average wastewater generated is expected to be approximately 30,000 gpd at a rate of 22 gallons per capita per day. The biological oxygen demand is expected to be about 54 pounds per day, using a loading of 0.04 pounds per capita per day.

3.6.2 Treatment and Disposal

The plant sanitary waste treatment facility will be designed to provide secondary treatment to some domestic wastes generated during construction and all domestic wastes generated once the proposed plant is operational. Two 15,000 gallons per day (gpd) extended aeration package plants will be provided. The two plants will operate together or separately and will have some common components. Both plants will be required during construction; however, after this phase is completed, one plant will provide treatment for the anticipated average flow of 15,000 gpd for the estimated operational staff of 375 people. The other plant will be maintained as a spare unit.

The extended aeration process to be used is a modification of the conventional activated sludge process which has been designed to minimize the amount of biological sludge produced. Treatment will consist of pre-screening, followed by aeration, sedimentation, aerobic sludge digestion, and finally chlorination. A 90 to 95 percent removal efficiency for BOD and suspended solids is anticipated. Characteristics of the treated effluent is discussed in Chapter 5, Section 5.1.3.4.

During construction, the treated effluent from the sanitary waste treatment facility will be directed to the construction runoff sediment control pond discussed in Section 3.7. Upon completion of construction, the effluent from the treatment facility will be pumped to the final effluent pump station for discharge into the NGS discharge channel, in accordance with the overall station water management plan discussed in Section 3.5.1. Sludge disposal is discussed in Section 3.5.2.3.

from the treatment facility will be directed to the sedimentation pond in accordance to the overall station water management plan discussed in Section 3.5.1. Sludge disposal is discussed in Section 3.5.2.3.

3.7 ON-SITE DRAINAGE SYSTEM

3.7.1 Construction Phase

Approximately 300 acres of land within the railroad loop will be cleared and grubbed (see Figure 3.1-1). Of this, approximately 10 acres will be paved (construction building, roads, etc.) having an assumed 100 percent runoff. The runoff coefficient for the remaining 290 acres (a sandy type soil) is expected to be approximately 0.30. The average runoff coefficient for the cleared area is expected to be approximately 0.32. The total runoff from the 300 acre site is expected to be about 61 acre-feet, based on the 10 year, 24-hour design storm of 7.6 inches. During construction, temporary sedimentation ponds will be located southeast of the railroad loop and within the area enclosed by the loop. All runoff waters generated within the general boundaries of the rail loop during construction will be directed to these ponds, where the majority of sedimentation will take place. The runoff collection system will consist of grassed drainage ditches, storm sewers, and a circumferential grassed main drainage ditch directing flow from the construction sedimentation ponds to the runoff sediment control pond. The runoff sediment control pond will provide 24-hour retention of the design storm and will be sized to retain accumulated solids. Effluent from this pond will overflow via a control pipe and follow existing drainage paths to the St. Johns River via Brown's Creek. Figure 3.7-2 shows the on-site drainage plan during construction. A schematic diagram of the construction phase drainage is presented as Figure 3.7-1.

The runoff is expected to contain little, if any, chemical contamination. However, until all construction is completed, there will be a potential for soil loss from uncovered areas. It is expected that some of the settleable material will be taken out of the runoff by filtering in the grass-covered drainage ditches. Additional settling will take place in the runoff sediment control pond prior to discharge to Brown's Creek. Total suspended solids are expected to be 50 mg/l on a daily average with a

maximum of 100 mg/l. The runoff sediment control pond will be designed with sloping embankments, thus allowing growth of vegetation along the edges of the pond and facilitating biological uptake of nutrients and metals which may be contained in runoff entering the pond.

3.7.1.1 Concrete Truck Washing

Concrete trucks leaving the construction site after delivery will be hosed down at a paved truck washing area. Washout from trucks will be directed to a 2.2 million gallon sedimentation pond. Overflow from this pond will be directed to the construction phase runoff sediment control pond (see Chapter 4, Section 4.1.1.1). Peak drainage from the washing activity is expected to be approximately 20,000 gallons per day.

3.7.1.2 Heavy Equipment Refueling Area

One or more areas will be lined with gravel to serve as refueling areas for heavy construction equipment. These areas will include temporary fuel storage tanks. Rainfall runoff from these areas will be directed to gravity type oil-water separators designed to handle the once in 10 year, 24-hour storm. The effluent from the oil-water separators will be directed to the construction phase runoff sediment control pond.

3.7.1.3 Erosion Control

Development of the construction phase runoff sediment control pond will be during the first stages of construction. Erosion during construction as a result of runoff from precipitation events will be minimized through sediment and erosion control practices (see Chapter 4, Section 4.1.8.1). Measures to minimize the sediment load of the runoff will include various diversion and interceptor dikes, critical area stabilization with semi-permanent and permanent seedings, temporary mulch or rock cover, and a routine inspection program. The control practices will include limiting the amount of land disturbed, reducing time of

disturbed area exposure, installation of sedimentation basins, and scheduling construction activities to reduce construction time. As construction activities are completed in the specific areas, ground cover proposed for final plant landscaping will be applied.

3.7.2 Operational Phase

Rainfall runoff from certain plant areas will be collected for treatment as specified in the water management plan discussed in Section 3.5.1.7.

Runoff from all other areas will be collected in a stormwater collection and drainage system and discharged into the surrounding areas to approximate the discharge of natural runoff which occurred with pre-construction drainage patterns. The collection and drainage system will be designed to handle the 10 year, 24-hour design storm.

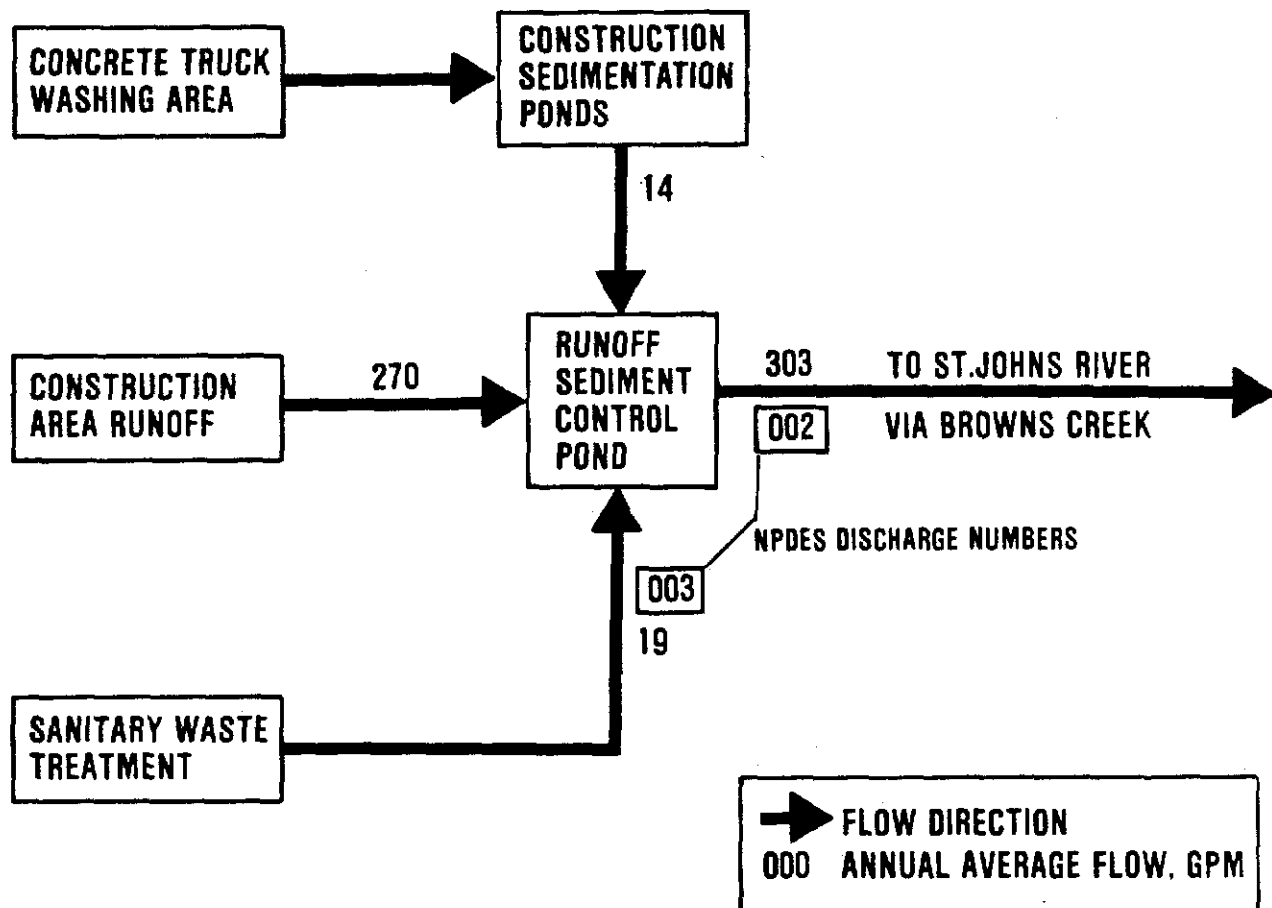


Figure 3.7-1 Construction Phase Drainage-Schematic

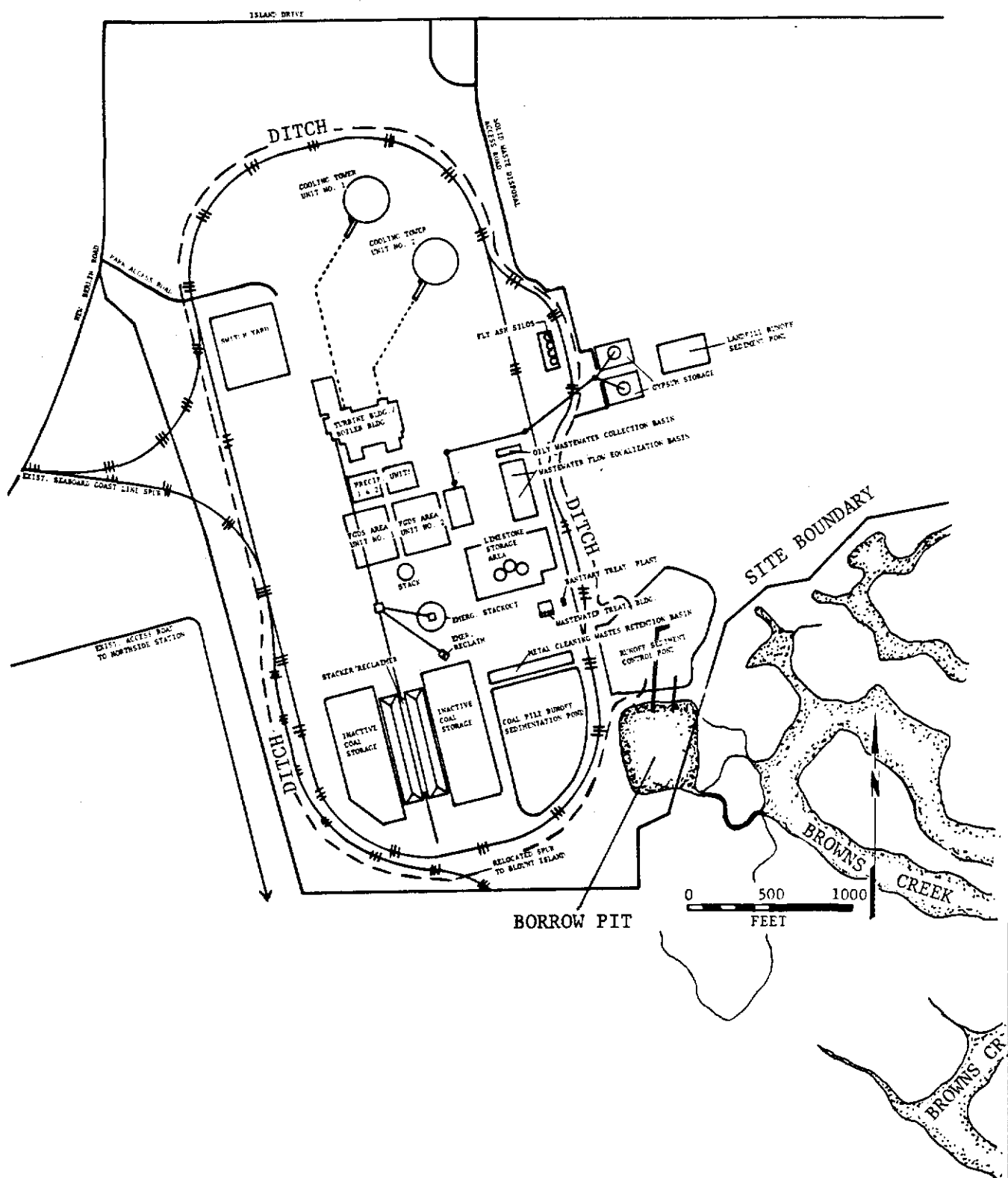


Figure 3.7-2

Construction Phase Drainage-Plot Plan

3.8 AIR EMISSIONS

3.8.1 Combustion and Flue Gas Systems

Using pulverized coal, each steam generating unit (boiler) will be capable of delivering 4,897,000 pounds of steam per hour continuously at 2,400 psig and 1000°F. Assuming "worst case" coal characteristics (maximum pollutant content and minimum heating value), the expected uncontrolled emissions from each boiler for the criteria pollutants are as follows:

<u>Pollutant</u>	<u>Lbs/MMBtu</u>	<u>Lbs/Hr</u>
Sulfur Dioxide	7.6	46,694
Oxides of Nitrogen	.60	3,686
Particulates (fly ash)	13.71	84,232
Carbon Monoxide	.05	307
Hydrocarbons (non-methane)	.0005	3
Lead	Negligible	Negligible

3.8.2 Air Pollution Control System

3.8.2.1 Regulatory Requirements

This section describes the systems that have been selected to control the emissions from the steam generator described above. The emission control systems required are governed principally by two federal regulations: New Source Performance Standards (NSPS) and the Best Available Control Technology (BACT) requirements associated with the Prevention of Significant Deterioration (PSD) regulations. These federal regulations both have similar counterparts in the rules of the Florida Department of Environmental Regulation (Florida Administrative Code, 1979).

Fossil fuel-fired steam generating units of more than 250 MMBtu/hr of heat input produce three types of emissions for which the U.S. Environmental Protection Agency (USEPA) has established NSPS [44 FR (113) 33579-33624, June 11, 1979]. The applicable NSPS for these pollutants from coal-fired units and the related Florida emission standards are as follows:

Particulate Matter - 0.03 lb/MMBtu heat input and 20 percent opacity based upon a six minute average. The Florida standard is 0.1 lb/MMBtu, two hour average and 20 percent opacity.

Sulfur Dioxide - 1.2 lb/MMBtu heat input and a 90 percent reduction in potential sulfur dioxide emissions is required at all times except when atmospheric emissions are less than 0.60 lb/MMBtu heat input. When sulfur dioxide emissions are less than 0.60 lb/MMBtu heat input, a 70 percent reduction in potential emissions is required. Compliance with the emission limit and percent reduction requirements is determined by continuous monitoring to obtain a 30-day rolling average. The Florida standard is 1.2 lb/MMBtu, with no percent reduction requirement, maximum two hour average.

Nitrogen Oxides - 0.6 lb/MMBtu heat input for bituminous coal and a 65 percent reduction in potential nitrogen oxide emissions based upon a 30-day rolling average and expressed as nitrogen dioxide. The percent reduction is not controlling as USEPA has determined that compliance with the emission

limitation will assure compliance with the percent reduction requirement. The Florida standard is 0.7 lb/MMBtu, maximum two hour average.

In addition to these requirements, the Clean Air Act as amended in 1977 and the implementing PSD regulations as well as the Florida Administrative Code rules on air pollution require a case-by-case evaluation of BACT for projects the size of this facility. BACT is defined as follows in the federal regulations (the Florida definition is similar):

"Best available control technology means an emission limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under the Act which would be emitted from any proposed major stationary source or major modification, which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques, for control of such pollutant. In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR Part 60 and Part 61..."

An evaluation of alternative air quality control systems has been conducted in the PSD application for this project (Envirosphere, 1980) and a BACT system has been selected for control of particulate matter, sulfur dioxide, nitrogen oxides, carbon monoxide, hydrocarbons, and fugitive dust. Systems for control of these pollutants were evaluated because the proposed facility will be a "major" source of these pollutants (except hydrocarbons), as defined in the PSD regulations which were applicable at

the time the PSD application was submitted [43 FR (118) 26379-26410, June 19, 1978]. The proposed facility was considered a "major" source since it will have the potential to emit these pollutants in excess of 100 tons per year and because it will not be exempt as provided in Paragraph (k) of those regulations.

As indicated, the BACT portions of the revised PSD regulations [45 FR (154) 52675-52748, August 7, 1980] are not applicable to this project because a complete PSD application was submitted to USEPA before the new rules were promulgated. These new regulations would require BACT demonstrations not only for the pollutants for which the source is "major", but also for all other pollutants regulated under the Clean Air Act that would be emitted in greater than "de minimis" amounts, except pollutants for which the area is nonattainment. Although there is some uncertainty at this point because the specific project coal(s) has not been selected, it is believed on the basis of generic eastern coal analyses that no additional pollutants fall into this category. A discussion on hydrocarbons is presented since the Jacksonville area is nonattainment for ozone, even though projected hydrocarbon emissions will be too small to trigger any nonattainment area requirements existing in the regulations applicable to this project.

An evaluation of alternative air quality control methods is presented in Chapter 9, Section 9.4. This evaluation includes an assessment of technology, removal efficiencies, auxiliary power requirements, environmental considerations and economics for applicable control methods for the proposed facility in accordance with the USEPA guidance document (USEPA, 1978a). Based upon this evaluation and the level of control required to meet applicable NSPS, PSD increments, and ambient air quality standards, the BACTs are selected. The BACTs thus selected will provide emission levels offering the maximum level of environmental protection consistent with the efficient use of energy and capital. These BACTs are described in the remainder of this section, along with a discussion of the stack.

3.8.2.2 Stack Height

The stack is designed such that it is tall enough to ensure that emissions do not result in excessive pollutant concentrations in the immediate vicinity of the stack as a result of plume downwash due to wake effects that may be created by the stack itself, nearby structures, or nearby terrain obstacles. The Clean Air Act Amendments of 1977 require that dispersion modelling estimates of ground level pollutant concentrations not take credit for stack heights in excess of the value known as the "Good Engineering Practice (GEP)" stack height. The GEP value for any particular facility is governed by regulations proposed by the USEPA (44 FR 2608, January 12, 1979) and a draft Technical Support Document (USEPA, 1978).

In accordance with this guidance, the GEP value for the proposed project was determined using the formula $GEP = H + 1.5W$, where H is the obstruction height and W is a factor which is equal to the obstruction width if the width is less than the height, otherwise W is set equal to the height. The obstruction in this case is the combination of connected buildings which comprise the power block.

This combination results in a building width which is greater than the height; thus "W" is set equal to the building height (Nagler, 1979). Therefore, since the boiler building height is expected to be 256 feet above grade, $GEP = 256 + 1.5 (256) = 640$ feet.

3.8.2.3 Sulfur Dioxide

The system selected as BACT for the control of sulfur dioxide emissions is a limestone flue gas scrubbing system with the following characteristics (based on the worst case coal):

Design Removal Efficiency	90 percent
Maximum Emission Rate	0.76 lb/MMBtu
Number of Operating Modules Per Unit at Full Load	Three
Number of Spare Modules Per Unit	One
Type of Absorber	Spray Tower
Type of Absorber Reagent	Limestone

The FGDS will be designed for near 100 percent availability (including use of the spare module). It will be furnished with a flue gas reheating system in order to increase the temperature of the flue gas exiting the absorber modules. The increased flue gas temperature will serve to increase the plume rise characteristics of the flue gas, as well as to help prevent condensation of flue gas moisture within the stack. Depending upon the sulfur content of the fuel, a small fraction of the untreated flue gas will be bypassed around the absorbers to reheat the gases exiting the absorber.

3.8.2.4 Particulate Matter (Stack Emissions)

The analysis of alternatives described in Chapter 9, Section 9.4 indicates that an electrostatic precipitator with the following characteristics is the BACT for control of particulate matter from the main units (again, assuming worst case coal):

Design Removal Efficiency	99.78 Percent
Maximum Emission Rate	0.03 lb/MMBtu
Maximum Opacity	20 Percent
Number of Precipitators Per Unit	Two
Number of Electrical Fields in Direction of Gas Flow	Seven
Number of Electrical Bus Sections per Unit	82

3.8.2.5 Nitrogen Oxides

The control technology for nitrogen oxides (NO_x) consists of design parameters and operating practices for the steam generator rather than a distinct process or system. Nitrogen oxides emissions from large coal-fired units are a function of furnace size, burner spacing, burner design, fuel nitrogen and moisture content, excess air, off stoichiometric firing with overfire air and flame temperature. The fuel burning characteristics of the boilers for this project will be designed to limit the NO_x emission rate to a maximum of 0.6 lb/MMBtu as required by NSPS.

3.8.2.6 Carbon Monoxide

Carbon monoxide is a by-product of the combustion of coal in large utility steam generators. The generation of carbon monoxide is a function of excess air, off stoichiometric firing with overfire air, and low flame temperatures, and varies inversely as a function of the nitrogen oxides production rates. In practice, the steam generator manufacturers optimize their designs in order to minimize and balance the emissions of both air pollutants. Therefore, there are no specific control technologies available at this point in time. Based upon the BACT NO_x emission rates in Section 3.8.2.5, the boiler vendor anticipates that the carbon monoxide emission rate would be on the order of 0.05 lb/MMBtu, although they cannot guarantee this level. Thus, the carbon monoxide BACT for the project is the variety of combustion controls and practices rather than a specific emission limitation.

3.8.2.7 Hydrocarbons

It is not expected that non-methane hydrocarbons will be a "major" pollutant from the proposed plant (i.e., emitted in quantities greater than 100 tons/year). However, since the Jacksonville area is nonattainment for ozone, a discussion of hydrocarbon emissions has been included.

Non-methane hydrocarbon emissions from steam electric generators have not been well defined to date. However, the limited information available (Neligan, 1978), indicates that uncontrolled non-methane hydrocarbon emissions would be on the order of 0.0005 lbs/MMBtu. Since there is no known specific control technology for these emissions, and based upon the extremely low emission levels, no specific measures will be taken to control or limit non-methane hydrocarbon emissions for the proposed project and no specific emission rate can be guaranteed.

3.8.2.8 Fugitive Dust

Fugitive dust is produced by a number of sources associated with the project. These include the Coal Handling System, Limestone Handling System, Fly Ash Handling System, and FGD Waste Handling and Disposal Systems. Also, since brackish water cooling towers will be used, EPA has indicated (Nagler, 1980) that dissolved and suspended solids in the small droplets fraction (less than 50 microns diameter) of cooling tower drift would be considered fugitive dust in the impact assessment. The following paragraphs describe the control systems and/or methods proposed as BACT for these fugitive dust sources.

Coal Handling Fugitive Dust Collection

Control and collection of fugitive particulates in the coal handling system will be accomplished by several different methods, including totally enclosed conveying systems, water spray dust suppression systems, and dry dust collection systems utilizing fabric filters. Collection efficiencies are expected to be 99.9 percent for the dry dust collection systems (used on the unloader receiver hopper of the ocean coal unloading facility and surge bins of the coal handling building), 97 percent for the water spray dust suppression systems (used in the stacker-reclaimer conveyors and plant site unloading building), and 90-99 percent for the wetting agent system (such as those used in various coal pile areas).

Limestone Fugitive Dust Collection

Control and collection of fugitive dust particulates from the limestone addition system for the FGD equipment will be accomplished by fabric filter dust collectors and wet dust suppression systems.

Limestone will be hard rock type and unloaded from rail cars in the coal unloading building where a wet dust suppression system will be utilized. It will be transported at the site by totally enclosed belt conveyors. All hoppers utilized by the limestone system will be vented to fabric filter dust collectors. Similar collectors will be located at all conveyor discharge points. The limestone will be stored on-site in a five acre pile; it has been assumed that fugitive emissions from this pile will be negligible because of the type of limestone to be used.

Control and Collection of Fugitive Fly Ash Particulates

The fly ash handling system consists essentially of ash hoppers located beneath the flue gas particulate collection equipment. Pneumatic conveyors are utilized to transfer fly ash to ash storage silos. Pneumatic conveyors are enclosed conduits, and fugitive fly ash particulate will be controlled at all transfer and discharge locations by fabric filters. The disposal method for fly ash is discussed in detail in Section 3.5.2.2.

FGD Waste Fugitive Dust

The disposal of gypsum is discussed in detail in Section 3.5.2.2.

Cooling Tower Drift

The dissolved and suspended solids in the small droplet size fraction of cooling tower drift are considered by EPA to contribute to total suspended particulate concentrations. Drift is minimized by using high efficiency drift eliminators in two natural draft towers (which limit drift to approximately 0.002 percent of circulating water flow) and by maintaining the cycles of concentration of the circulating water to a low level (in this case a value of 1.5 will be used).

3.8.2.9 Auxiliary Boilers

As indicated in the project description, the auxiliary boilers planned will burn No. 2 fuel oil and have emissions which are much smaller than those from the main units. Also, it is expected that the auxiliary boilers will have an annual capacity factor of only 5 percent compared to 74 percent for the main units during the first few years of operation. Thus, there would be no cost benefit for installing a pollution control system on the auxiliary boilers, since the emissions are so small. The auxiliary boiler heat rate is approximately 127 MMBtu/hr for each of the two units. At an annual capacity factor of 5 percent, the SO₂ emissions will only total 44 tons/yr. This is below the amount which triggers the requirement for a control system according to new source performance standards.

3.8.3 Expected Emissions

The expected air pollutant emissions from each of the main units, without the use of the air pollution control systems described above, are presented in Section 3.8.1. Table 3.8-1 presents the expected air pollution emissions after the use of the pollution control systems and contrasts these values with the uncontrolled emission rates.

The two unit controlled emission rates in English and metric units as well as the other emission parameters important in air pollution dispersion modelling are presented in Table 3.8-2 for various plant loads. Auxiliary boiler emissions are also presented in that table.

Table 3.8-3 presents the fugitive emission rates that are anticipated from the various fugitive dust sources associated with the plant. The fugitive dust control techniques which are identified in the table were described in Section 3.8.2.8.

3.8.4 References

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U.S. Environmental Protection Agency, Region VIII, December 10, 1979. Compilation of Past Practices and Interpretations by EPA Region VIII on Air Quality Mining. Denver, Colorado.

Table 3.8-1 (Revision 1)
 MAIN UNITS AIR POLLUTION EMISSION RATES^a
 (CONTROLLED AND UNCONTROLLED)

	Uncontrolled Emissions (lbs/hr)	Controlled Emissions (lbs/hr)	Removal Efficiency (%)
Sulfur Dioxide	46,694	4,669	90
Particulates	84,232	184	99.78
Nitrogen Oxides	3,686	3,686 ^b	-
Carbon Monoxide	307	307 ^b	-
Hydrocarbons	3	3 ^b	-

-
- a Emissions are per unit at 100 percent load and assuming worst case fuel characteristics (maximum sulfur and ash and minimum heating value).
- b Controlled and uncontrolled emission rates are the same since controls for these pollutants are by boiler design and firing practices rather than with a pollutant removal system.

Table 3.8-2 (Revision 1)

MAIN UNITS AND AUXILIARY BOILER
EMISSION CHARACTERISTICS

	2-Unit Emission Rate lbs/hr (g/s)		Stack Height (m)	Stack Temp. (°K)	Exit Vel. (m/s)	Stack Dia. (m)
	SO ₂	NO ₂ TSP				
Main Units (100% Load)	9338 (1176.6)	7372 (928.9)	368 (46.4)	195	327.6	18.29
(75% Load)	7937 (1000.1)	6266 (789.5)	313 (39.4)	195	327.6	15.55
(50% Load)	5182 (652.9)	4092 (515.6)	204 (25.7)	195	327.6	10.16
Auxiliary Boilers	203 (25.6)	76 (9.6)	2.5 (0.3)	85.4	441.0	12.2
						2.08

Table 3.8-3 (Revision 1)
FUGITIVE EMISSION AND CONTROL SUMMARY

Process	Type	Amount	Factor	Control	Technique	Emissions (Grams/Sec)
Ship Unloading	Grab Bucket	10,000 Tons/Day	0.4 lb/Ton ^a	(99.9%) ^b	Dry Collection on Hoppers	0.04
Ship Unloading Transfer Points	6 Points	10,000 Tons/Day	0.2 lb/Ton ^c	(99.9%) ^b	Dry Collection	0.06
Ship Unloading Transfer Points	3 Points	10,000 Tons/Day	0.2 lb/Ton ^c	(97%) ^b	Wet Suppression	0.95
Ship Unloading Facility Train	Loading Shed	10,000 Tons/Day	0.4 lb/Ton ^a	(99.9%) ^b	Dry Collection	0.02
Ship Unloading Facility Coal Surge Pile	Active	30 Acres	13 lb/Acre/Day ^a	(90%) ^a	Wetting Agent	0.20
Rail Car Unloading	Rotary Dumper	10,000 Tons/Day	0.4 lb/Ton ^a	(97%) ^b	Wet Suppression	0.63
Coal Handling Transfer Points	2 Points	10,000 Tons/Day	0.2 lb/Ton ^c	(99.9%) ^b	Dry Collection	0.02
Coal Handling Transfer Points	2 Points	3,300 Tons/Day	0.2 lb/Ton ^c	(99.9%) ^b	Dry Collection	0.01
Coal Handling Transfer Points	6 Points	3,300 Tons/Day	0.2 lb/Ton ^c	(97%) ^b	Wet Suppression	0.62
Coal Handling Transfer Points	7 Points	5,000 Tons/Day	0.2 lb/Ton ^c	(99.9%) ^b	Dry Collection	0.04
Coal Storage at Plant	Active	8 Acres	13 lb/Acre/Day ^a	(90%) ^a	Wetting Agent	0.05
Coal Storage at Plant	2 Inactive Piles	15 Acres	3.5 lb/Acre/Day ^a	(99%) ^a	Wetting Agent	0.01
Limestone Unloading	Rail Dumper	750 Tons/Day	0.4 lb/Ton ^a	(97%) ^b	Wet Suppression	0.05
Limestone Transfer	1 Point	750 Tons/Day	0.2 lb/Ton ^a	(99.9%) ^b	Dry Collection	0.001
Cooling Towers	Drift	2 x 243,500 gal/min (maximum) (40% <50 microns diameter)	51,450 ppm solids	99.998%	Drift Eliminators	12.66
Solid Waste Disposal Area	Active	10 Acres	13 lb/Acre/Day ^a	(90%) ^a	Wetting Agent	0.07

^a Fedco, 1977

^b Stoughton, 1980

^c USEPA, 1979

3.9 DIRECTLY ASSOCIATED TRANSMISSION LINES

Transmission lines associated with the proposed plant will terminate at the Normandy Substation on the west side of Jacksonville and at the Fort Caroline and Robinwood Substations to the east of Jacksonville (Figure 3.9-1). Transmission lines will be routed within the proposed preferred corridor.

3.9.1 Route and Size

Corridors are identified in Chapter 9, Section 9.6. The preferred corridor includes an existing transmission right-of-way (ROW). Where it is feasible from an engineering, environmental, and system reliability standpoint, the final new ROW will be located parallel and adjacent to the existing system. A preliminary estimate is that this should occur in over 90 percent of its length. The new ROW will normally be 150 feet to 200 feet in width. As the ROW approaches sensitive areas, it may be constricted to minimize impact. New maintenance roads will generally be required only where the new ROW will not be adjacent to the existing ROW. Existing ROW maintenance roads should also provide adequate access to the new maintenance roads for the new ROW where it does not occur parallel to the existing ROW. All transmission line ROW will be cleared and maintained in accordance with the National Electrical Safety Code.

3.9.2 Structures

The transmission lines must be both reliable and aesthetically acceptable. The new lines, tower, and substation appearance will differ little from the existing system. Substation size will not increase as a result of new line addition. Alternative tower designs will not substantially alter the environmental effects of tower construction and maintenance. All the towers are self-supporting, double circuit and have enough longitudinal capability to withstand the tension required to string a conductor or shield wire by the controlled tension stringing method. The tower designs include:

1. Single Steel Pole - The single steel pole requires the narrowest ROW and is the least susceptible to differential settlement. Its structural flexibility is preferred in an area that might be affected by hurricane winds. Corrosion resistant steel is utilized. Curved upswing cross-arms are to be used for aesthetic reasons (Figure 3.9-2). Most of the new towers not used to span waterways will employ this design.
2. Steel H-Frame Pole - In this alternative a horizontal configuration is used. In the transverse direction, this structure is susceptible to differential settlement and requires two independent foundations. The erection cost is increased compared to the single pole configuration, due to the 22 foot wide column spread (Figure 3.9-3).
3. Concrete H-Frame Pole - These are similar to the steel H-frame except that the columns are made of prestressed concrete poles (Figure 3.9-3). Their cross-arms may be fabricated of steel or pre-cast concrete whichever is to be more economical at the time when the order is placed.
4. Lattice-Type Towers - These are conventional, self-supporting, vertical configuration, lattice type towers with a square base, which have been used extensively on transmission lines (Figure 3.9-4). This structure, like the steel pole H-frame configuration is also susceptible to differential settlement. It is proposed that this configuration be used at the river crossings due to the increased tower height required here.

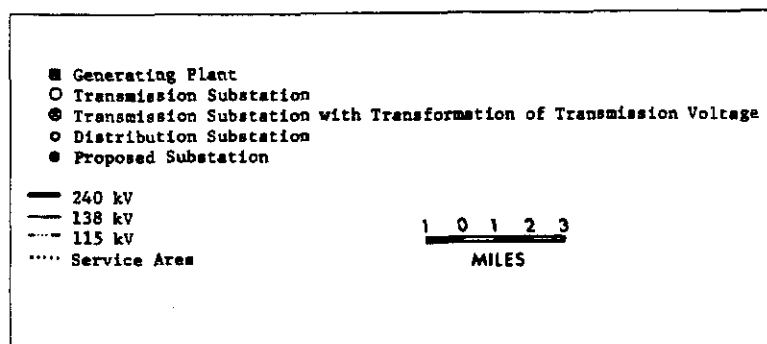
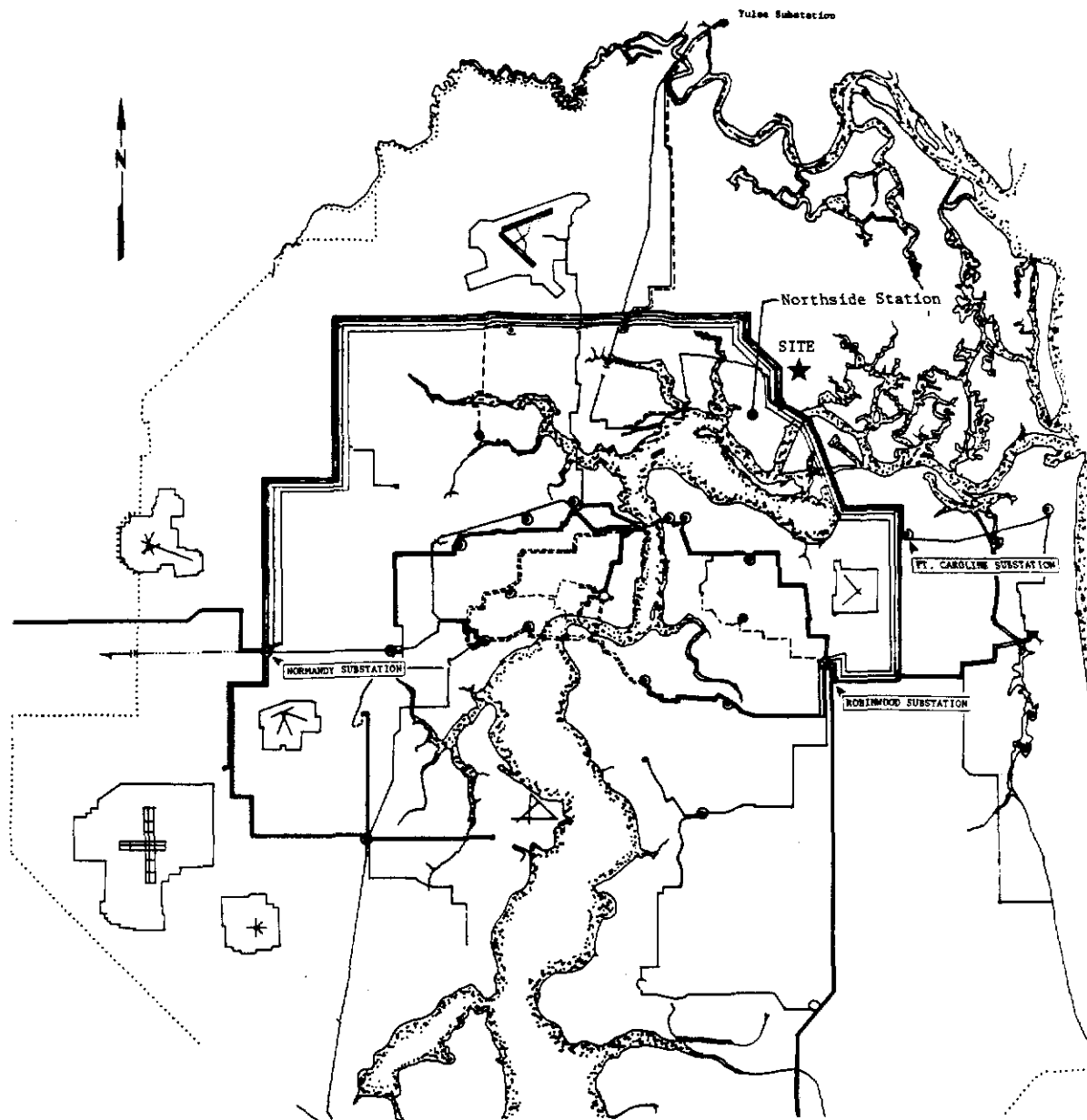


Figure 3.9-1 Existing Transmission System

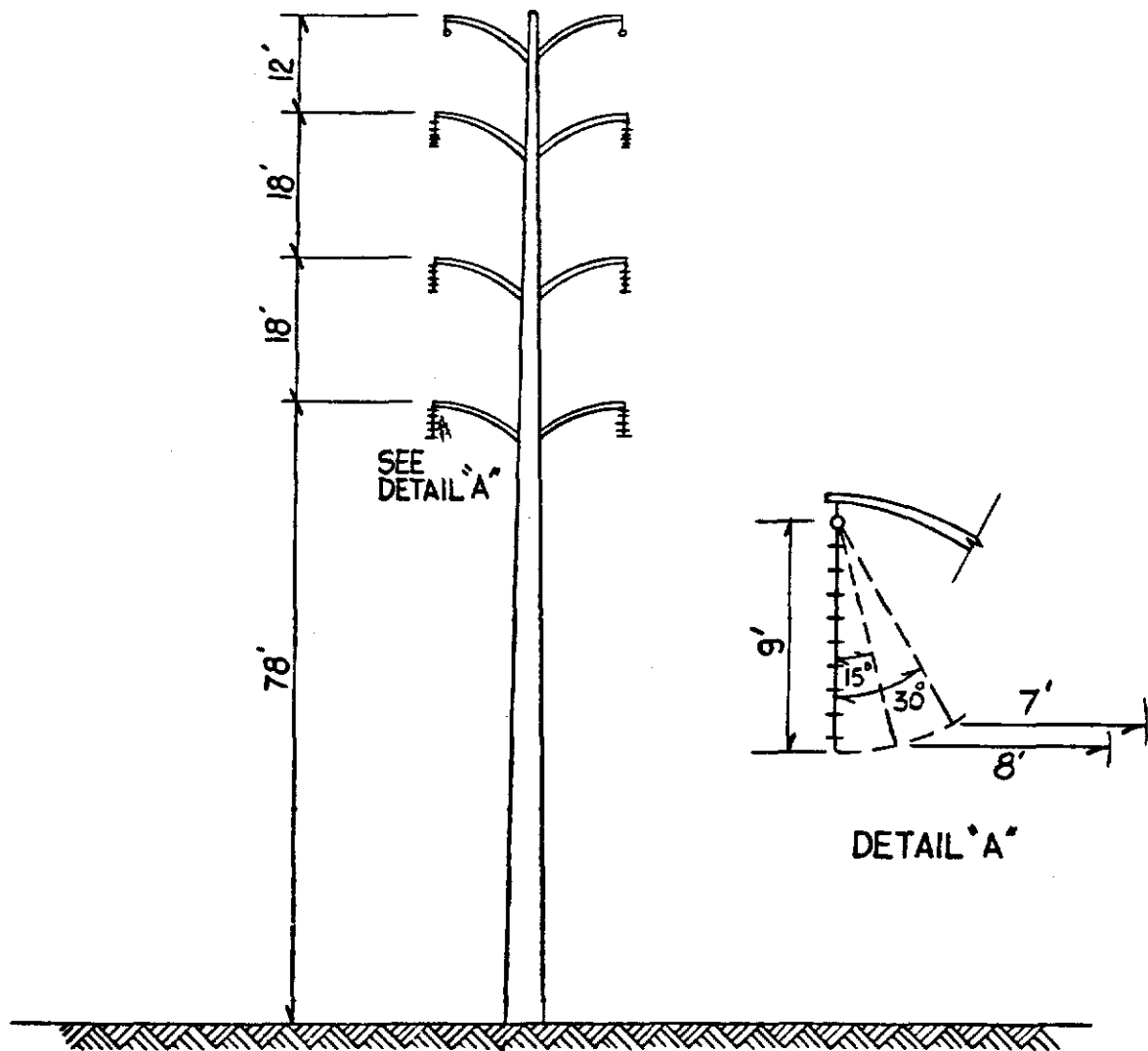


Figure 3.9-2 Single Steel Pole Tower

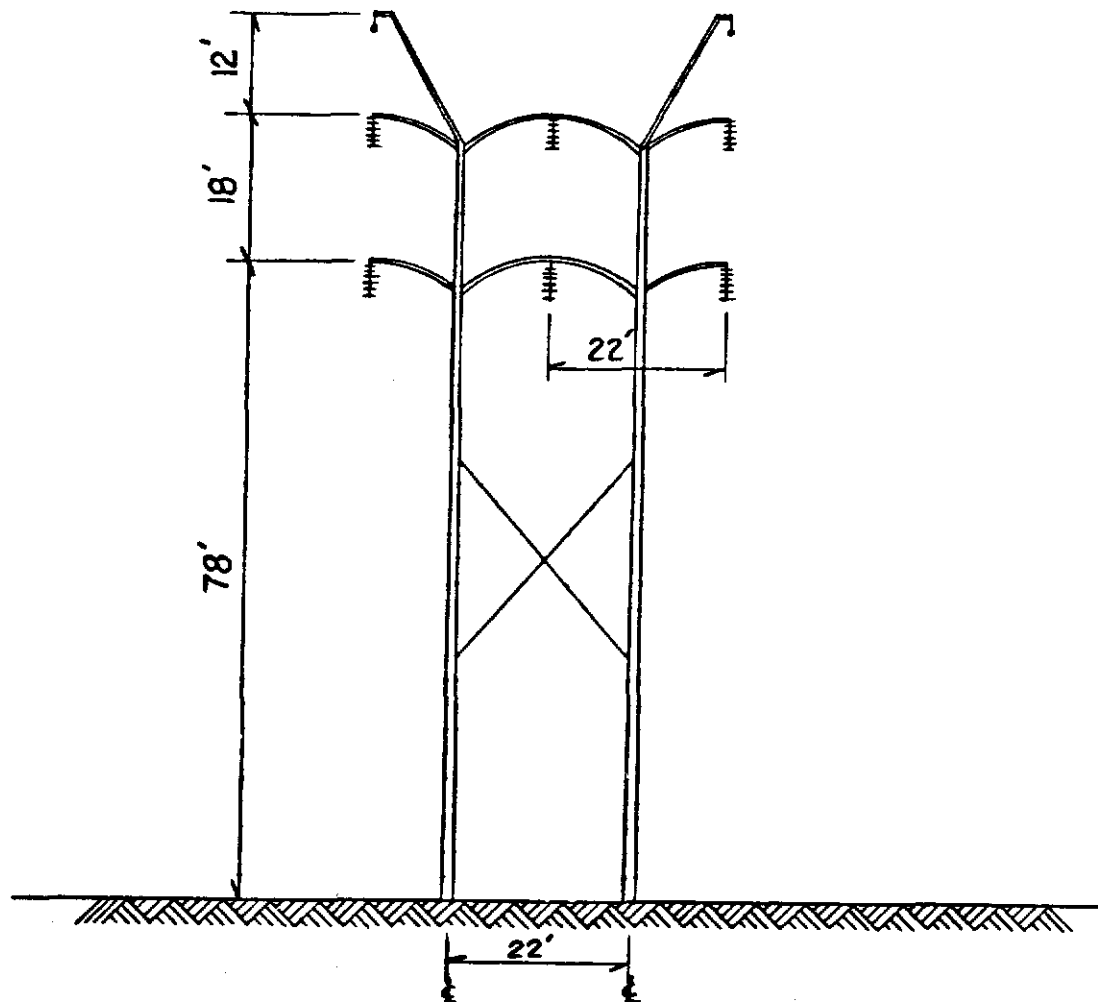


Figure 3.9-3 Steel/Concrete H-Frame Pole

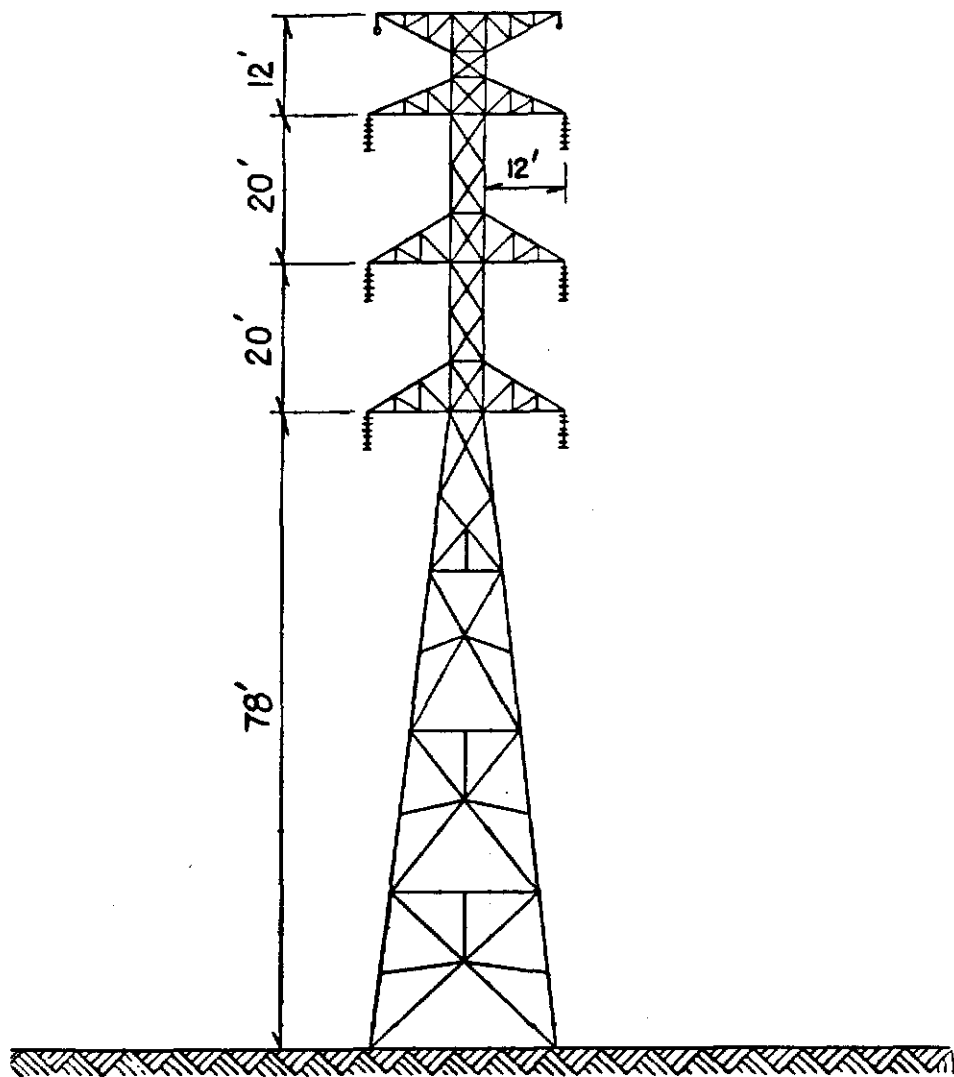


Figure 3.9-4 Lattice-Type Steel Tower

The ocean vessel coal unloading facility is directly associated with the proposed plant. It will be designed with the capability to unload colliers and barges and store and load coal into shuttle or unit trains for transport to the plant site. The terminal will be located on the north bank of the Fulton-Dames Point Cutoff on the St. Johns River, adjacent to the Jacksonville Port Authority (JPA) Facility area on the south side of Blount Island as shown in Figure 3.10-1.

3.10.1 General Description

The facility will be designed to unload coal at an average rate of 3000 tons/hour using two bucket-type unloaders. It will take about 22 hours to unload a typical ocean vessel carrying 65,000 tons of coal if both unloaders are used on a single vessel. The coal will be conveyed from the unloaders to a stacker-reclaimer in an area capable of storing up to 70,000 tons. It will then be transferrable to rail cars also at a rate of 3000 tons/hour via the rail car loading building. An emergency stackout and reclaim system is also provided for use when the stacker-reclaimer or rail car loading systems are not available or operational. Distribution to the stacker-reclaimer and emergency stackout from the unloaders will be routed by the coal handling building which will also include sampling and iron separation equipment. The emergency reclaim system is provided to feed the rail car loading building when the stacker-reclaimer is not operational. These facilities are shown in Figure 3.10-2.

3.10.1.1 Unloading System

A wharf with a 40-year design life will be provided. The wharf will be capable of docking large colliers, sea-going barges, and river barges. It will be fitted with bumpers, bitts, and cleats for docking. The wharf deck will carry two rails, each designed for 60 ton wheel loads. The rails will be parallel to the river, with a span of 115 feet, and with one rail

10 feet from the river side of the wharf. The proposed wharf will be approximately 1,200 feet long, and will be able to accommodate two vessels at a time for coal unloading.

Two 1,500 ton per hour grab-bucket type unloaders will be provided. The unloaders can be used either one or both to a vessel, depending upon the unloading requirements. These will be rope-trolley machines with onboard receiving bins, bin discharge feeders and transverse conveyors discharging to a gathering conveyor parallel to the river.

The unloading rate was established as a function of ship usage (optimum turn around time). This unloading rate of 3,000 tons per hour enables about six times as much coal to be unloaded in an hour as the plant will consume during that time (500 tons per hour), assuming two unit operation burning performance coal at 90 percent load.

3.10.1.2 Conveying System

The conveying system will consist of the following components:

Gathering Conveyor at Wharf

Elevating Conveyor from Coal Handling Building to Emergency Stackout

Elevating Conveyor from Coal Handling Building to Rail Car Loading Building

Stacker-Reclaimer Yard Belt to Coal Handling Building

Emergency Reclaim Conveyor to Coal Handling Building

Stacker-Reclaimer Yard Belt

Stacker-Reclaimer Transfer Belt

Both the normal conveying system and the emergency conveying components will have a capability to operate at 3,000 tons per hour.

All conveyor galleries will be enclosed, except for the gathering conveyor and yard belt. Conveyor galleries will be provided with service water for wash down and fire protection, and with vacuum cleaning systems.

3.10.1.3 Rail Car Loading Building

The rail car loading building will discharge coal to rail cars after receiving coal via the coal handling building from the:

stacker-reclaimer,
emergency reclaim, or
unloaders

The Rail Car Loading System will be designed to accurately load each car with its design capacity of coal.

3.10.1.4 Stacker-Reclaimer System

The stacker-reclaimer system consists of the stacker-reclaimer machine, the reversing yard conveyor, reversing boom conveyor, tripper conveyor, two crane rails mounted on two concrete grade beams, and suitable manual and automatic controls, including a small programmable logic controller. It will be capable of 70,000 tons of active storage.

The machine will stack out coal as received from the unloading system at a maximum rate of 3000 tons per hour. At this rate, the active storage area can be filled in about the same time as a typical ocean vessel is unloaded. The machine will reclaim coal for loading into rail cars at a rate of 3000 tons/hour. Flow rate will be modulated to maintain a level in the surge bins over the granular feeders in the coal handling building.

3.10.1.5 Emergency Reclaim System

The emergency reclaim system will include an elevating conveyor and two reclaim pits, each consisting of a grizzly, stainless steel hopper, stainless steel slide gate, and belt feeder. Each grizzly, hopper, gate and feeder will be enclosed in a reinforced concrete pit, which will be drained by sump pumps which will discharge to a sedimentation pond located

on-site on Blount Island. Where below grade, the elevating conveyor will be enclosed in a reinforced concrete tunnel. The emergency reclaim system will operate at a reclaim rate of 2,000 tons per hour.

This system will be used to reclaim coal from storage when the conventional systems are not operational. Coal will be reclaimed from the storage piles using dozers, front-end loaders, etc.; then dumped into the emergency reclaim hoppers. From there, it will be transported via the feeder and elevating conveyor to the rail car loading building.

3.10.1.6 Emergency Stackout System

The emergency stackout system will include a motorized stainless steel flop gate at the end of the elevating conveyor from the unloading system, a concrete lowering well, and an elevating conveyor from the coal handling building. It will be capable of stacking out 3000 tons per hour of coal. The total active storage capacity will be 10,000 tons, or sufficient capacity to allow for mobilization of mobile equipment. At the maximum rate of operation, the storage area will be filled in slightly more than 3 hours.

Normal operation will bypass the emergency stackout system. If the coal handling system downstream is out of service during unloading, the emergency stackout system will then be utilized. Coal will be transported back into the system using the bulldozers or front-end loaders.

3.10.1.7 Coal Handling Building

This building will include chutes and gates to distribute coal to the stacker-reclaimer or emergency stackout systems, a primary sample cutter for each incoming conveyor, a single sampling system capable of accepting coal from each primary sample cutter and magnetic separators to remove tramp iron from each incoming conveyor.

Normal operations of the coal handling building will be to accept coal from the unloading system, while simultaneously transporting coal to loadout or active storage systems. Alternatively, coal could be directed to the emergency stackout system.

3.10.2 Water and Wastewater Management

3.10.2.1 Water Requirements

Water requirements at the ocean vessel coal unloading facility will be potable water and service water. Water supply will be from the existing Jacksonville Port Authority (JPA) facilities located on Blount Island.

Approximately 400 gpd of potable water and an average of 20 gpm (200 gpm maximum) service water will be required. Service water uses include coal dust suppression and occasional equipment washing. Water from the treatment facility to be constructed on the island will be reused whenever available for coal dust suppression.

3.10.2.2 Wastewater Management

Wastewater generated at the facility will consist of sanitary wastes, rainfall runoff, and area drainage resulting from coal dust suppression and equipment washing operations.

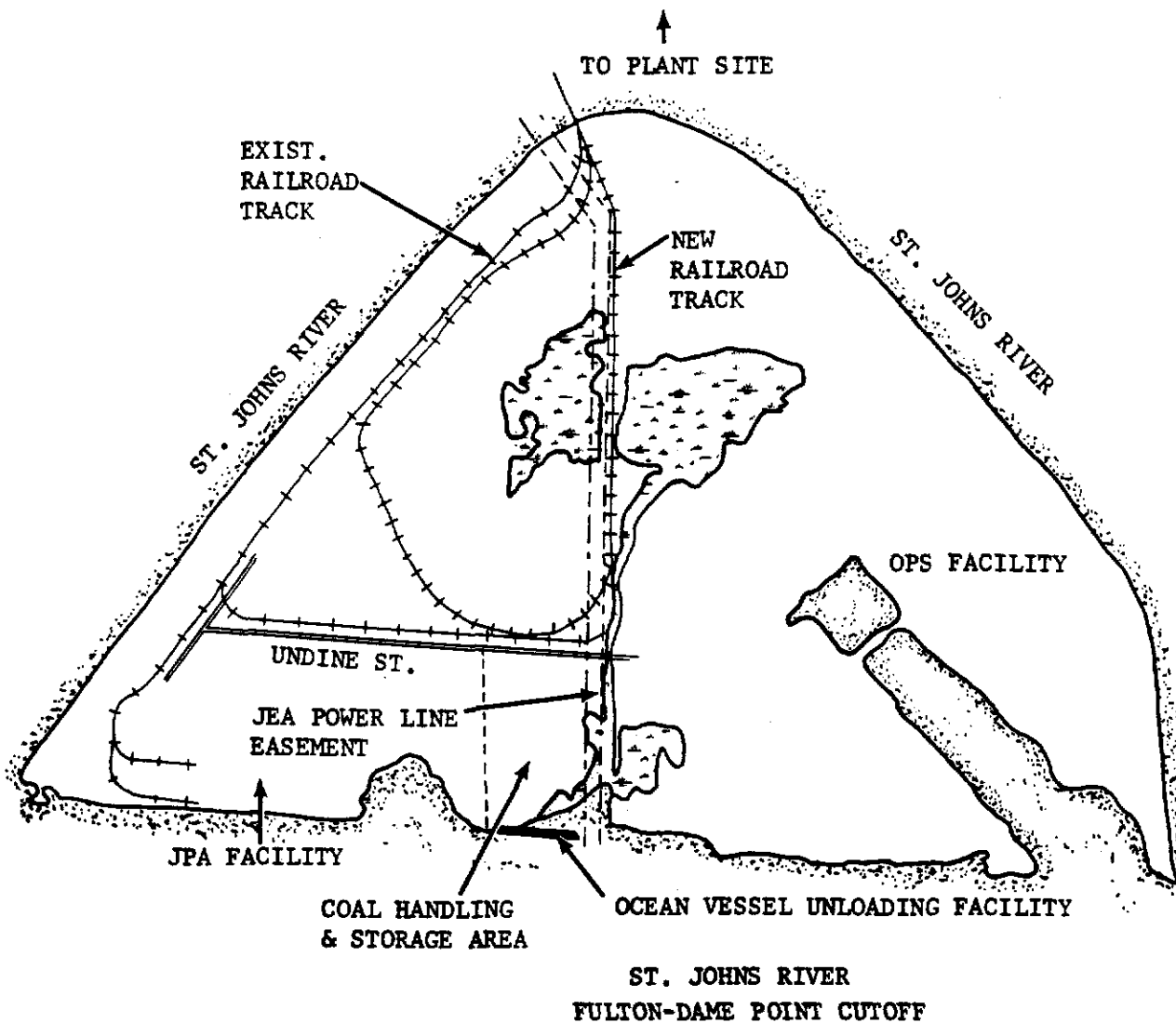
Area drainage is expected to average 5 gpm with a maximum flow of 50 gpm. This wastewater will be similar to that generated at the main plant's coal handling area and will require treatment for solids removal and pH adjustment. Oil and grease concentrations may be above acceptable levels due to contributions from equipment washing, in which case oil-water separation would be required.

Sanitary wastes generated at the unloading facility will average approximately 400 gallons per day (gpd). Characteristics of these wastes are the same as those for sanitary wastes generated at the main plant location, as described in Section 3.6. These wastes will be pumped to the existing JPA sanitary waste treatment facility on the island.

Rainfall runoff requiring treatment will be primarily from the lined coal pile. Average runoff is expected to be about 100 gpm, based on a total area of 35 acres, an annual rainfall average of 54.5 inches, and a runoff coefficient of 1.0. Total runoff quantity produced will be approximately 22.2 acre feet, determined from a 10-year, 24-hour design storm of 7.6 inches. The wastewater produced from draining off the coal pile will be similar in character to that generated at the main plant coal storage area (see Section 3.5.1.7).

Facility area drainage and rainfall runoff from the lined coal pile will be directed to a lined sedimentation pond located at the unloading facility site. The pond will be designed to process the rainfall runoff from the 24-hour, ten year design storm. The effluent from the sedimentation pond will be treated in an on-site physical/chemical treatment facility, which will be designed to process pond effluent at a maximum rate of 900 gpm, the anticipated flow during periods of excessive rainfall. Treatment provided will include pH adjustment and iron and suspended solids removal. The treatment facility will consist of a combination of neutralization, coagulation, precipitation, gravity separation, and media filtration. The effluent from the treatment plant then will be discharged into a two cell percolation pond, also designed to accommodate the maximum expected flow.

Solids which have accumulated in the sedimentation pond will be removed periodically and returned to the coal pile.



JPA-Jacksonville Port Authority
OPS-Offshore Power Systems



Figure 3.10-1

Coal Unloading Facility Location on
Blount Island

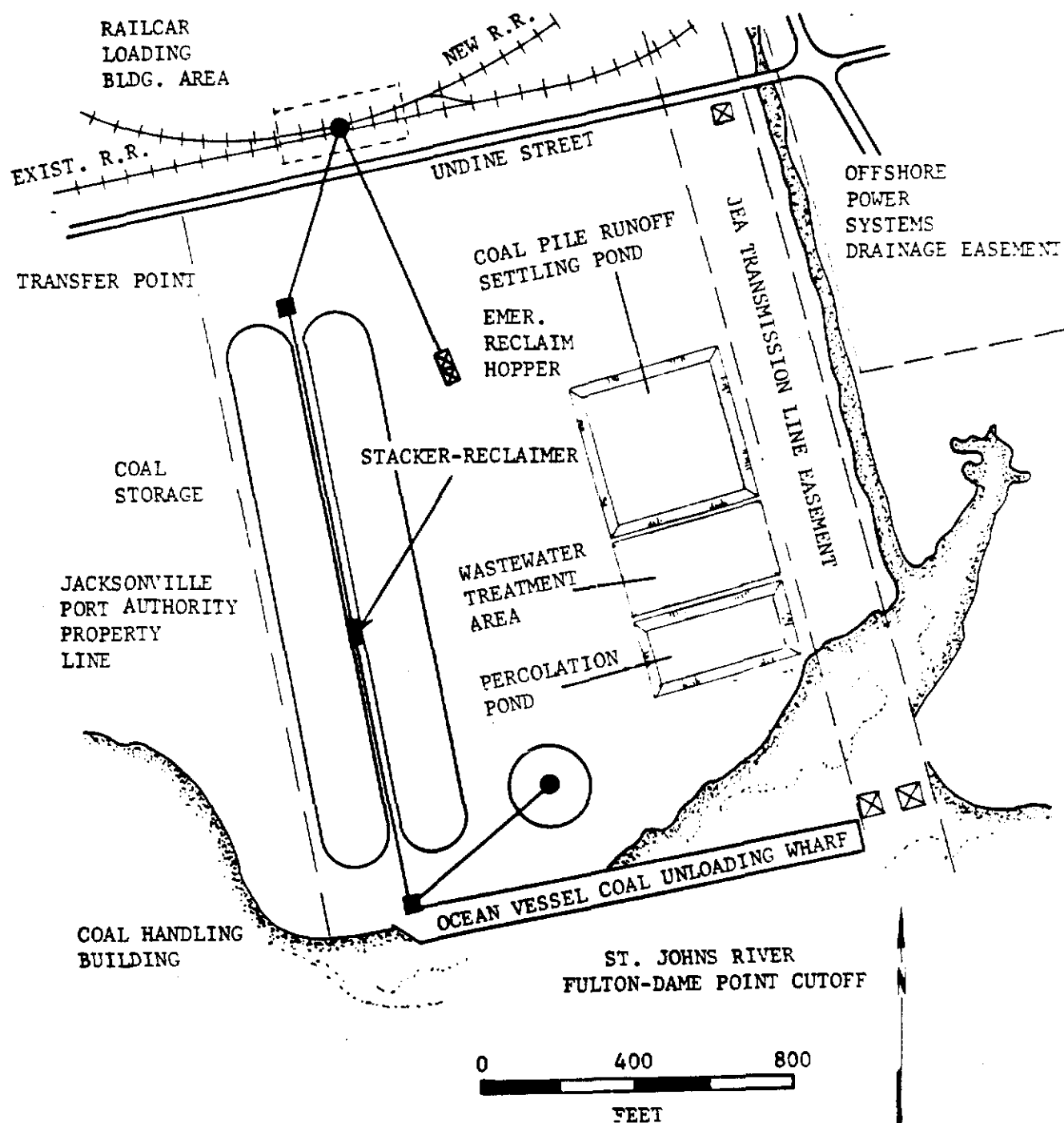


Figure 3.10-2 Coal Unloading Facility

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4. ENVIRONMENTAL EFFECTS OF SITE PREPARATION, PLANT AND ASSOCIATED TRANSMISSION FACILITIES CONSTRUCTION

4.1 SITE PREPARATION AND PLANT CONSTRUCTION

4.1.1 Construction Areas

Figure 4.1-1 shows the layout of the proposed plant and its associated facilities. These major plant construction components will occupy the following approximate acreages within the 1,656 acre total site area:

Plant island construction laydown areas and rail loop - 302 acres
Bottom ash disposal area - 125 acres
Solid waste disposal area A - 88 acres
Solid waste disposal area B - 343 acres
Access road - 7 acres

The construction laydown areas located within the rail loop can be seen in Figure 4.1-2.

4.1.1.1 Site Layout During Construction

Construction activities such as clearing the site, building temporary or permanent roads, waste disposal and laydown areas for building materials, are all phases of construction that will affect, to varying degrees, the site area. The disruptive effects of these construction operations are discussed below.

Clearing the site of natural vegetation will be kept to a minimum to minimize erosion and to reduce the negative impacts to terrestrial communities. A buffer approximately 200 feet wide will be placed around each of the wetlands contiguous with the St. Johns River or its tributaries. The boundary of the buffer zone will be delineated with a fence line (Figure 4.1-3). The fence will be constructed early in the

construction phase of the project and will serve to limit access to the wetlands. The natural buffer which results will serve to filter any noise from plant operations and will serve as a visual barrier to the plant itself.

A pulp wood operation has already timbered much of the site for marketable pine pulp wood under the site owner's direction. After additional timber harvesting, construction areas will be cleared and grubbed. Clearing and grubbing wastes will be disposed of either by burning or burial. If burning is chosen as the best approach, burning operations will be conducted in accordance with local and state requirements.

After clearing and grubbing, the construction areas will be graded. As discussed in Section 4.1.8.1, appropriate measures will be employed to control erosion. After grading, the lightly traveled laydown areas will be seeded and grass established to hold down dust and erosion. Heavily traveled construction laydown areas and roads will be stabilized with shell or rock. Dust from high traffic areas will be controlled with water sprinkling. The laydown areas in most cases will be adjacent to the particular facility in which that material will be used. Construction buildings and shops will be located on the eastern side of the power block. Most temporary construction buildings for offices, warehouses, and shops will be located inside the rail loop.

The proposed plant will have three access roads during construction and two access roads after construction is completed. Access during construction will be off New Berlin Road, Island Drive, and the existing north access road to the Northside Generating Station (NGS) (Figure 4.1-2). After construction, the access roads will be off New Berlin Road and the existing NGS access road (Figure 4.1-1).

The entrance from Island Drive during construction will be a paved or coated surface road used by construction personnel. It will provide a route to the employee parking area which is to be located to the east of the boiler building. The road will be approximately 2700 feet long and 20 to 24 feet wide.

The access road from New Berlin Road will be paved both during and after construction. The final route of this access road will be slightly different from that used during construction. During construction, this entrance will be for non-manual and material receiving. The road will be 20 to 24 feet wide. Once the plant is complete, this access road will be rerouted as can be seen in Figure 4.1-2 and will serve as the main entrance for the proposed plant.

The existing north access road to the NGS will serve as a tie-in for the southern entrance to the proposed plant. This access road will have a paved surface to be used as an entrance for plant operators.

The railroad spur will come off the existing Seaboard Coast Line just west of New Berlin Road. The spur will enclose the plant in a loop as shown in Figure 4.1-2. The existing spurline to Blount Island will also tie into the rail loop as shown in the figure. Additional trackage will be provided to allow the movement of train traffic to and from Blount Island without affecting normal plant operations.

Waste materials will be disposed of in accordance with applicable rules and regulations. A number of waste materials such as scrap wood and iron will be taken to a specified open area of the site where they will be separated and stock piled for possible salvage. General waste materials will be disposed of in dumpsters for collection and possible disposal at the city landfill adjacent to the site or other suitable and approved local landfill areas.

By proper site grading methods, construction runoff will be routed to a construction sedimentation pond located at the south end of the rail loop. Chemical waste, such as fuel and lubricants, will be collected in holding tanks for periodic removal. These wastes will either be taken to salvage locations or disposed of at appropriate off-site locations. Sanitary waste will be handled by portable toilet units, temporary units and permanent units. The portable units will serve the coal unloading and ash disposal sites. Temporary units will be located near and throughout the power block area. Permanent units will be located in the boiler area.

The activities associated with the construction and use of the roads and rail lines is not expected to produce significant changes in surface water flow. No adverse effects of disposal of trash and chemical waste are expected, as proper management practices will be developed and followed.

4.1.1.2 Construction Schedule

Construction of the proposed plant is scheduled to begin in 1982. Improvements to the site are scheduled to begin in June, 1982 and subsurface foundation preparation in August, 1982. The installation of the steam drum for Unit 1 is scheduled for August, 1983. Installation of the steam drum for Unit 2 is scheduled for January, 1985. Unit 1 is expected to begin test operation in September, 1985. During the following months, Unit 2 will remain under construction while Unit 1 is operational. Unit 2 is expected to begin test operation in May, 1987. Certain construction related work, including site clean up and landscaping, will continue through December, 1987, at which time all construction activity is scheduled for completion.

Construction of the Blount Island coal handling facilities and all transmission lines will be scheduled concurrent with construction of Unit 1. This will require construction of the coal handling facility on Blount Island to begin by late 1982 with completion of most work by mid-1985 to allow stockpiling of coal. Transmission line construction is expected to occur during 1983 and the first half of 1984.

4.1.2 Effects on Vegetation, Wildlife and Aquatic Life

4.1.2.1 Vegetation

Direct Losses

Of the 1,656 acres of the proposed plant site, construction of the proposed plant will disturb approximately 896 acres (Table 4.1-1). Three vegetation types, grassy scrub, salt marsh, and bottomland hardwood, will not be affected by construction or construction related activities. The plant island (rail loop) (Figure 4.1-3) will require about 300 acres, which includes all the land inside the rail loop as well as a 100 foot wide zone outside the rail loop. Any disturbance associated with construction of this rail loop is assumed to be concentrated within the rail loop and the 100 foot zone. Solid waste disposal area B will require about 348 acres. The bottom ash disposal area will require the third largest amount of land followed by solid waste disposal area A, with approximately 100 and 88 acres, respectively. The waste handling area, sediment control pond, and construction parking area will require approximately 27, 16, and 11 acres, respectively.

Clearing and grubbing of the site will not extend beyond the fence line (Figure 4.1-3). An approximate 200 foot buffer zone of existing trees will be left between the proposed fence line and on-site wetlands which are contiguous with the St. Johns River or its tributary creeks. The affected vegetation community types are discussed below in order of their presentation in Table 4.1-1.

Approximately 33 acres of cypress swamp will be disturbed. The largest disturbances will come from construction of solid waste disposal area B, which will affect 22 acres, or 55 percent, of the total areal extent of this community type within the boundaries of the proposed site. Considering the limited occurrence of this vegetation type at the site, the loss of this association may be considered to be a significant impact from

a site specific perspective. However, this vegetation type is common throughout Duval County with the amount lost due to construction estimated to be less than 0.7 percent of the county total. From this perspective, the loss of this association is not considered to be significant.

Construction of the plant island (that area within the plant rail loop), bottom ash disposal area, construction parking, and waste handling area will eliminate about 286 acres of the grassy scrub/pine flatwood vegetation type. This 286 acres represents 79 percent of the total area of this vegetation type within the proposed site boundaries and is the second largest community type disturbed. This vegetation type has a large number of species including a number of orchids considered to be occasional in occurrence. The loss of this vegetation type, from a site specific perspective, is considered to be a minimal impact. The impact is considered to be minimal since this vegetation type has been disturbed by fire, and the species common to this vegetation type are only present due to the fire induced disturbance. The high species diversity observed is also due to the disturbance by fire. In effect, disturbance is responsible for the uniqueness of this vegetation type and without fire, normal successional patterns would ensue. The loss of this vegetation type in its unnatural state is considered insignificant.

Approximately 23 acres of the bayhead community will be disturbed by the construction of the plant rail loop and waste disposal area. This represents 80 percent of the total areal extent of this vegetation type within the proposed site boundaries. This loss, although it may be considered significant from a site specific perspective, will not result in a major impact on this vegetation type due to its abundance in north and north-central Florida.

Approximately 156 acres of the hardwood hammock vegetation type will be disturbed by the construction of the plant island (inside the rail loop), solid waste disposal area A, and sediment control pond. The 156 acres disturbed by construction is 37 percent of the total area of this

type within the site boundaries. This hardwood hammock type is fairly common in the proposed plant site area, and loss of a portion of this vegetation type is not considered to be significant.

Construction of the plant island and associated rail loop would require the filling of approximately 33 acres of the hardwood swamp vegetation type. The amount disturbed is 32 percent of the total areal extent of this association within the boundaries of the plant site. None of the other proposed facilities will require any additional acreage from this vegetation type. An additional 65 acres of the hardwood swamp occur within the boundaries of the proposed site. However, these 65 acres will be maintained in their natural state throughout the life of the proposed plant. A fence line will be placed 200 feet from the border of the 65 acre tract of the hardwood swamp, forming a buffer between the swamp and the solid waste disposal area (Figure 4.1-3). Loss of a portion of this vegetation type and its supporting soils is not considered to be significant in light of the small amount of this type affected and the preservation of the remaining community type within the site boundary.

The pine flatwoods vegetation community has the largest areal extent of those community types to be disturbed by construction. A total of 350 acres will be disturbed with the largest portion coming from construction of solid waste disposal area B. The 354 acres represent 70 percent of the total areal extent of the pine flatwoods vegetation type within the proposed site boundaries. The pine flatwoods type is the most common vegetation type in Duval County covering about 80 percent of the county. The resultant loss of this vegetation type is therefore not considered to be a significant impact. Approximately 75 percent of this vegetation type found to the north of Island Drive has been logged. In its current state, its value from an ecological perspective is low.

Dusting

Some of the predominant soils, including the Ortega and Pottsburg, within the boundaries of the proposed plant site have been classified in a wind erodibility group two. Soils in this group are highly erodible and as such are considered to have a potential for dust formation.

Dust emitted during construction activities may accumulate on the leaves of vegetation within the immediate vicinity of the construction activity. Although dust accumulations have been reported (Parish, 1910; Czaja, 1961; Spinka, 1971) to cause leaves to overheat during sunny periods and thereby cause premature leaf death, such impacts are not expected to be significant based on: (1) the utilization of dust suppression measures such as paving of major access roads and spraying with water, (2) the small area affected, (3) the tendency for localization within the area of the activity, and (4) the frequency of rain showers which would tend to wash off dust accumulations.

4.1.2.2 Wildlife

Impacts Due to Habitat Loss

Construction of the proposed plant and associated waste disposal areas will disturb approximately 896 acres of wildlife habitat. The pine flatwoods area will be most affected. A logging operation which has cleared approximately 75 percent of this habitat type north of Island Drive has already greatly reduced the value of this community type as wildlife habitat. Varying amounts of hardwood hammock and hardwood swamp will also be lost during the construction phase. The more mobile wildlife species may move into neighboring habitats depending on the carrying capacity and number of animals already present in these areas. Site preparation will destroy the less mobile small mammal, reptile and amphibian populations present in the areas designated for development. These groups generally exhibited low population levels and species diversity. This loss is not

considered significant since the species to be lost are well established in other portions of their range. One possible exception is the gopher tortoise which is discussed in detail later in this section.

Noise Impacts

Site preparation and plant construction will result in increased noise levels which may cause certain noise sensitive species to attempt relocation. Measures have been recommended in the mitigation section (4.1.8) which will help to minimize noise impacts. Significant impacts from noise on wildlife populations are not anticipated.

Dust Related Impacts

Dust levels will increase during site preparation and plant construction, which will indirectly affect wildlife through impacts on vegetation. However, impacts on plants are expected to be minimal (as explained in Section 4.1.2.1) and, therefore, no significant impacts are predicted for wildlife populations.

Impacts on Biologically Sensitive Areas

Rookery

The rookery described in Chapter 2, Section 2.9.2.2 is not included in the site boundary and will not be directly affected by either site preparation or plant construction. However, because of the rookery's proximity to the proposed site, the potential will exist for certain indirect impacts.

Herons traditionally establish rookeries in the same area year after year. Custer et al. (1980) discuss several factors which appear to influence the yearly location and composition of colonies; 1) destruction of nesting habitat by the herons themselves, 2) changes in feeding habitat,

and 3) human disturbance and habitat alteration. Human disturbance at critical times during the nesting season can cause abandonment of previously used areas. The measures described in Section 4.1.8, will help minimize disturbance during these critical times. However, other suitable nesting habitat exists in the area should construction activities force some birds to relocate. Therefore, no significant impact is expected from the construction of the proposed power plant.

Salt Marsh

The construction of a sedimentation pond to intercept runoffs from site preparation and plant construction will prevent significant impacts to the wildlife populations dependent on the salt marsh for food or cover. The pond will be designed to provide a 24 hour retention of runoff produced by a 10 year, 24 hour design storm (Chapter 3, Section 3.7.1) and retain accumulated solids. Freshwater effluent from the sedimentation pond will overflow a wier and follow existing drainage patterns into the marsh.

Impacts on Commercially or Recreationally Valuable Species

The whitetail deer, eastern gray squirrel, and Bobwhite Quail were not present in sufficient numbers to be recreationally important. A huntable population of marsh rabbits is present, but little if any local interest was exhibited as evidenced by the lack of hunting activity. Several of the less economically important furbearers (opossum, raccoon) are present but do not represent a commercially important resource. No significant impacts are predicted for any commercially or recreationally important species.

Impact on Endangered or Threatened Species

American Alligator

Several small cypress areas and a portion of the hardwood swamp are scheduled to be filled as part of site preparation and plant construction. The field study indicates that these areas support only a small number of

alligators. The Florida alligator population has recovered dramatically in recent years and the few animals which may be adversely affected will not significantly impact the local or regional population. The habitats involved are also not unique from a regional or local perspective and their loss will not have a significant impact on the alligator population.

Wood Stork

On several occasions, Wood Storks were observed flying in the vicinity of the proposed plant site and were assumed to be feeding in the area. No evidence of nesting activity was found. Neither site preparation nor construction activities are expected to have a significant impact on stork feeding areas. The Wood Stork is a highly mobile species which can utilize the other suitable feeding habitats in the area if necessary.

Bald Eagle

No Bald Eagles were observed during the course of the study. Potential eagle nesting habitat on the eastern border of the site is scheduled to be maintained in its natural state. The proposed monitoring program, described in Chapter 6, Section 6.3.9, will help assure that there is no significant impact to the local Bald Eagle population.

Gopher Tortoise, Eastern Indigo Snake

The loss of a significant portion of the pine flatwoods habitat may result in the loss of the resident gopher tortoise population. However, tortoise numbers may have already been reduced due to the logging operation currently underway in this area. Therefore, the significance of impacts associated with any additional disturbance cannot be firmly predicted.

Gopher tortoise burrows are occasionally inhabited by the eastern indigo snake. Although numerous burrows were evidenced on the proposed site, the eastern indigo snake was not observed and generally prefers

wetter habitats. Moler (1980) does not believe indigo snakes are present in large numbers either on the site or in Duval County. Therefore, the probability is considered low that the proposed plant will adversely affect this species.

During the approximately 50 man-days spent visiting the proposed site, the two aerial reconnaissances, and numerous consultations with appropriate personnel from both the U.S. Fish and Wildlife Service and the Florida Game and Fresh Water Fish Commission, no information was found to indicate the presence of any "important" species other than those already indicated.

4.1.2.3 Aquatic Life

Site preparation and plant construction will impact aquatic life in on-site freshwater habitats, i.e., streams, inundated swampy areas or bogs, cypress ponds, etc. Approximately 40 acres (Figure 4.1-4) of cypress swamp will be filled during the 30 year life of the plant. Due to their ephemeral nature, these areas are of only limited value to aquatic life. No commercially important or rare and endangered species were observed in these areas during the Preoperational Monitoring Program. Aquatic life in on-site freshwater streams could potentially be affected by increased turbidity from surface water runoff. Since adequate storm water runoff control will be provided, as described in Section 4.1.7, the potential for adverse effects due to increased turbidity is expected to be minimal since many of the organisms found in the creeks are tolerant to turbid conditions, and any potential increase would be expected to be temporary.

No adverse impacts to the aquatic life in the Browns Creek saltmarsh complex are expected due to site preparation or plant construction. No intrusion into or construction in the salt marsh will occur. Additionally, surface water draining from the site will be controlled as described in Section 4.1.7 and drainage water will meet all applicable standards.

Site preparation and plant construction will not impact aquatic life in the Blount Island Channel. This area is removed from the construction site, and will not receive discharges of storm water, sanitary wastes, or other effluents from site preparation or construction.

4.1.3 Land

4.1.3.1 Land Use Activities

Land use activities on-site currently include timber and limited hunting. Construction of the proposed facility would preclude these activities for at least the life of the plant.

Surrounding land uses are primarily industrial and residential. These land uses are not expected to be altered as a result of plant construction.

4.1.3.2 Transportation

This section evaluates the impacts of construction related traffic in the site area, by comparing existing traffic volumes, projected construction related traffic volumes, and road capacities. Little or no barge traffic is expected and, therefore, will not be discussed as a significant impact. The four roadways to be impacted are Heckscher Drive, Main Street, Eastport Road and New Berlin Road. Existing traffic flow, including average daily travel and peak hour traffic, is discussed in Chapter 2, Section 2.3.2. Figure 4.1-5 illustrates the location of primary site access routes.

The year of 1985 will be the peak employment period (2,575) with 90 percent of the work force expected to arrive between the hours of 7:00 and 8:00 a.m. and leave between 3:30 and 4:30 p.m. Assuming an average of 1.2 persons riding in each car (Jacksonville Area Planning Board reported local passenger averages), approximately 1,850 trips will be made to and from the site daily during the peak periods. These 3,700 daily trips were assigned

to the four roadways based on the projected location of the work force and the area from which it would be coming. In addition to the work force, 37,200 trucks are expected to enter and leave the site during 1985, the peak construction year.

The existing and 1985 projected average daily traffic volumes are shown in Table 4.1-2. The volumes projected for 1985 are based on traffic volumes measured in 1980 for each of the four roadways, increased by approximately 4 percent per year to the year 1985 (JAPB reported current local traffic growth rates), and includes the assignment of the additional construction generated truck and work force trips. Table 4.1-2 also shows the projected peak hour volume on, and capacity of, each of the roadways. Projected peak hour volumes were determined by taking the existing peak hour traffic on each of the roadways, increasing it by 20 percent (approximately 4 percent per year from 1980-1985), and then adding the part of the 1,850 trips assigned to the various roadways. The capacities of the roadways were determined by using the Highway Capacity Manual (1965) and capacity charts derived from this publication.

Based on the comparison between the peak hour volume and the capacity, shown as column 4 in Table 4.1-2, two of the roadways, Heckscher Drive and New Berlin Road, will be exceeding level of service C capacity in 1985. Level of service C is defined as stable traffic flow where most drivers are restricted in selecting their speed, but where all stopped traffic will clear a signalized intersection. This is the desired level of service for urban design conditions. This would indicate that the intersections along Heckscher Drive, and particularly the intersection of Heckscher Drive and New Berlin Road, will probably be exceeding the existing intersection capacity. This is based on the fact that the capacities shown in Table 4.1-2 are for free flow conditions. With the introduction of a signalized location, capacity would be greatly reduced. It should be noted that the 4 percent growth per year is an estimate and therefore could be either high or low. However, the area off Heckscher Drive and the Blount Island facilities are just starting to develop. Indications are that the area

will continue to grow and that traffic will increase on roadways leading into the area. Increased automobile occupancy rates could help alleviate traffic problems.

New Berlin Road is expected to receive additional impacts related to truck damage to the road surface. Some repairs to the road surface are anticipated during construction.

In summary, under existing operations and traffic conditions, all signalized locations and roadways in the area of the proposed site are operating at level of service C with additional capacity available. However, the influx of the power plant work force and the continued growth in this particular area will temporarily (through the construction period) affect traffic conditions along these roadways. As indicated, the existing intersections of the I-95 spur to Heckscher Road and its intersection with Heckscher Drive going toward Main Street are presently creating some congestion during peak periods. With additional traffic, this problem will become more severe as will the left turn lane from the north at the intersections of Heckscher and Main Street; New Berlin Road and Main Street; and Eastport and Main Street. Additionally, turning traffic at the intersection of Eastport Road and Heckscher Drive will increase. Perhaps the most severe problem will occur at the intersection of New Berlin Road and Heckscher Drive, presently an intersection of 2 two-lane facilities. The turning traffic from Heckscher onto New Berlin is expected to significantly increase and will likely require the addition of a left turn lane on the west approach at this location. Other locations likely to require improvements include:

Heckscher Drive, Main Street - geometric design, signal controller

Heckscher Drive, Spur - signalization

Main Street, Eastport Road - geometric design, signal controller

Eastport Road, Heckscher Drive - geometric design widening, signalization

Main Street, New Berlin Road - geometric design, signal controller

The estimated costs of these improvements are discussed in Chapter 7, Section 7.2.2.

Construction of the section of the proposed Dame Point Expressway from Main Street to Heckscher Drive would provide improved access to the site area and would greatly alleviate traffic congestion on all roads in the site area. The state proposed expressway is illustrated in Figure 4.1-5. The ability of this highway to alleviate plant construction related traffic is dependent upon the currently uncertain schedule for the Dame Point Expressway project.

One alternative solution to traffic problems on Heckscher Drive and New Berlin Road would be to construct a new bridge across Dunn's Creek and utilize the Eastport - Faye Road connection to the site. This would provide both direct access to the site and relief to both Heckscher Drive and New Berlin Road. However, an Eastport Road - Faye Road connection to the site would introduce increased traffic volumes to residential areas currently experiencing low volumes of traffic. Although Faye Road could handle increased traffic loads, it would be desirable to restrict the use of tractor trailers on this road. For these reasons, use of such a route is not intended.

The use of Heckscher Drive or the proposed Dame Point Expressway for plant access would be compatible with surrounding land uses. Heckscher Drive is currently developing as an industrial area, resulting in heavy truck traffic. In 1985 (peak total employment year), plant construction is expected to increase the tractor trailer traffic share of the total average daily traffic by only 2 percent on this road. Eastport Road also currently serves a high volume of truck traffic with a peak construction year increase of tractor trailer traffic of only 2.5 percent of total average daily traffic. New Berlin Road currently accommodates a high volume of trucks as the access road to the municipal landfill. The alternate use of the proposed Dame Point Expressway would be compatible with surrounding

land use. Engineering practices demand that expressways be designed with adequate buffers from land uses bordering the highway, thereby insulating surrounding users from highway noise.

4.1.4 Effects on Human Populations

4.1.4.1 Noise

Noise impact projections were made for Unit 1 construction activities from 1982 to 1985. The highest noise levels will result from earthmoving activities, which will be conducted concurrently for Units 1 and 2 (e.g., site preparation, solid waste disposal areas). Thus, noise levels during 1986 and 1987 associated with Unit 2 construction are not expected to be greater than those projected for 1982 through 1985.

Projections of noise levels from construction activities are divided into six-month time intervals beginning in July of 1982 when site clearing operations are expected to begin, and continuing through December of 1985 when completion of Unit 1 is expected. Table 4.1-3 lists the anticipated numbers and types of construction equipment with corresponding usage factors for each time interval. Based on this information and typical noise levels for each piece of equipment specified in an EPA document (USEPA, 1971), the total site noise level during each period was estimated (Table 4.1-3). Because of the sporadic nature of noise generated by pile driving and steam blowout operations, these are discussed separately below. Noise levels from these two operations are not included in the site totals presented in Table 4.1-3.

Estimated construction noise levels (excluding pile driving and steam blowout) at the nearest residence, located approximately one mile from the center of construction activity, are presented in Figure 4.1-6. This figure depicts how the noise level will vary throughout the course of the 38 month construction period. These attenuated levels take into consideration geometric spreading and atmospheric attenuation of the sound

waves. No credit was taken for shielding by vegetation or other structures in the calculations, although there will be some attenuation due to any trees between the source and the receptor.

The maximum noise level predicted is 54.4 dB(A) at one mile. This level will be attained only during normal working hours for approximately 1-1/2 years between January, 1984 and July, 1985, and coincidentally is the same as the existing $L_{eq}(24)$ at the nearest residence (55 dB(A) winter, 54 dB(A) summer) (Chapter 2, Section 2.10.1). Therefore, the construction noise impact at this location will be minimal, with a resultant L_{eq} of approximately 57 dB(A) during the working day and unchanged at night. However, this 57 dB(A) level is slightly above EPA's guideline of 55 dB(A) for protecting against outdoor activity interference (see Chapter 2, Table 2.10-2). This means that occasionally there may be some interference of outdoor activity at this location. There should be less of an effect on indoor activity since about a 15 dB(A) reduction in noise levels can be achieved by closing windows and doors.

Two other construction activities which will have noise impacts are pile driving and blowout of the steam lines just prior to start-up of the plant. One pile driver operating intermittently during the first year will produce peak impact levels of 101 dB at 50 feet as the hammer strikes the pile. This level will be reduced to between 55 and 60 dB at the nearest residence and will sound like a distant thumping at a frequency of several blows per minute. Long time residences of this riverside industrial area should be familiar with, and in many cases, accustomed to, the sounds of piles being driven.

In lieu of extensive pile driving for foundations, a technique known as dynamic consolidation may be employed. This consists of lifting a 40 ton weight to a height of 100 feet and dropping it numerous times in a grid pattern over the area to be compacted. Vibration in the ground, rather than noise is the major concern. Vibration measurements conducted in the vicinity of a dynamic consolidator (Law Engineering, 1980) indicate that

damage to walls of typical buildings can be expected to extend only about 250 feet. At 600 feet, the vibration is just noticeable to persons. Therefore, at a distance of one mile the vibration would probably not be noticeable and would certainly cause no damage. Even with this technique, some pile driving would still be required but it would not be nearly as extensive.

Steam blowout is the procedure whereby the steam lines in the plant will be cleared of welding and any other debris by blowing them out with high pressure steam prior to plant start-up. This activity will generate the greatest noise levels, 129 dB(A) at 50 feet, associated with plant construction. However, the duration is short, at less than 3 minutes per blow, and the total number of blows is only about 20. For Unit 1, this will occur during a two week period in late 1985 and will be preceded by adequate notice to the public.

The outdoor noise level at the nearest residence during steam blowout is expected to be between 80 and 90 dB(A). Short exposure to these levels is not damaging to hearing, and the greatest effect the noise will produce is a startle response from persons nearby. However, the public notification plan is designed to minimize this effect.

There are presently no plans to use explosives during any phase of construction.

On the average, one switch engine per day will deliver several railcars carrying construction materials to the site. Because of the frequency, low speeds and short lengths of these trains, noise impacts are not expected to be significant.

Unit 1 will go into operation approximately 18 months before Unit 2 is completed. Since Unit 1 operational noise levels (see Section 5.6.2.2) will be about 10 dB(A) less than the Unit 2 construction noise levels, noise impacts during this overlap period are expected to be no greater than those projected for the period 1982 through 1985.

Some increase in noise levels along Heckscher Drive and New Berlin Road is expected due to the increase in traffic caused by the work force and the movement of materials to and from the site. However, because of the already heavy truck traffic on these roads and the lack of sensitive land uses along the routes, the impact is expected to be minimal.

4.1.4.2 Air Quality

Sources of Air Pollutants During Construction

Various construction activities, including land clearing, open burning, heavy machinery operation, vehicle (light and heavy-duty) traffic, and road construction will discharge certain amounts of pollutants into the atmosphere. The pollutant generated in greatest quantities by site construction is suspended particulates, also termed fugitive dust. The quantities of dust emitted by the site construction vehicular traffic will be dependent on a number of factors, including the frequency of operations, specific operations being conducted, weather and soil conditions. A large portion of the construction operations, such as land clearing and foundation excavation, will be intermittent and usually of short duration.

Open burning will emit quantities of particulate matter, carbon monoxide, hydrocarbons, sulfur oxides and nitrogen oxide. The burning of cleared land debris will be conducted for short periods. These pollutant emissions will depend on the amount and moisture content of the debris.

Exhausts of heavy machine and truck traffic will be a minor source of air pollutants, consisting of mainly carbon monoxide, hydrocarbons, nitrogen oxides, sulfur oxides, and particulate matter. Table 4.1-3 summarizes the construction vehicles and their projected usage.

Air Quality Impacts

The impact of heavy construction activities and site preparation on air quality will be short term and will be confined to the immediate vicinity of the construction activity. This is primarily because most of the fugitive dust created by construction traffic and earthmoving operations consists of relatively large particulates. These large particles tend to settle quickly rather than remaining suspended for long distances. To minimize dust: (1) construction personnel will enter the plant site over prepared surfaces and will park in a surfaced lot; (2) there are presently no plans for on-site concrete production; (3) wetting will be employed on dust prone areas, as needed; and (4) laydown areas will be appropriately stabilized.

Only minor short-term air quality impacts are expected to result from burning since these operations will be conducted only during periods of good atmospheric dispersion. Burning will be conducted in compliance with local and state regulations.

Because of the mitigative measures which will be employed, it is not expected that vehicular emissions, fugitive dust or smoke from burning operations will present any significant air quality problems.

4.1.5 Work Force and Settlement Patterns

This section presents the magnitude and pattern of settlement of the immigrant construction workers, along with the population effects that will be induced by these workers. Immigrant workers are defined as those skilled or semi-skilled workers who will migrate to the Jacksonville area to work on the proposed project, and will remain in the area as long as project work is available. Due to the overlap of Unit 2 construction and Unit 1 operation during 1984-1987, the evaluation includes the immigrant operational population effects for those same years. It is assumed the secondary employment generated by the proposed plant will be filled by

local employables. This assumption is based on a 1979 unemployment rate in Duval County of 5.6 percent. This equates to approximately 13,500 unemployed people in the county, which is more than sufficient to fill the secondary jobs generated by plant construction and operation. Therefore, the only population increase attributable to the proposed plant was assumed to be immigrant construction and operational workers and their families.

The EnviroSphere Construction Worker Model, described in Appendix H, was used to determine the magnitude of the construction worker influx. As shown in Table 4.1-4, most immigrant construction workers would settle in the seven county region, with Duval County having by far the greatest concentration. During the peak construction employment year (1984) when the immigrant level would reach 493 workers, about 59 percent (292) of the total immigrant work force would locate in Duval County. Clay and Nassau Counties would have the second and third largest concentrations of immigrant construction workers with 18 percent (88) locating in Clay County and 14 percent (69) locating in Nassau County. The remaining counties of the region are projected to experience little or no influx of immigrant construction workers during the construction phase.

The projected total population effects within the region attributable to the construction phase are displayed in Table 4.1-5. During the peak construction year of 1984, the immigrant population would total approximately 1,150 persons. The greatest concentration of immigrant population in the region during the construction phase would occur in Duval County. During the peak construction year of 1984, approximately 690 immigrants are expected to locate in Duval County. Clay and Nassau Counties would have the second and third most significant total population effects in raw numbers, respectively. The remaining counties in the region are projected to experience minimal population impacts as a result of the construction phase.

The socioeconomic effects of immigrant settlement in the seven county region are discussed in Chapter 7.

4.1.6 Landmarks and Culturally Sensitive Areas

As noted in Chapter 2, Section 2.2.1.3, archeological sites have been located on the proposed plant site. Modifications have been made in the location of some site facilities to avoid most archeological sites. A few sites are in possible conflict with the construction of site facilities. Should these sites be determined eligible for the National Register of Historic Places by the State Historic Preservation Officer, appropriate programs will be undertaken to preserve the archeological information.

Installation of fencing around the site will restrict land access to any archeological sites on the property which may be designated for protection on the site plan. This should reduce the potential for vandalism of these areas. At the present time, all or part of eight sites have been designated for protection (Figure 4.1-7). Since the archeological sites present are not suitable for public interpretation, the restriction of access is seen as a positive impact.

4.1.7 Water Bodies and Uses

Runoff

The activities associated with site preparation and construction are not expected to produce significant changes in surface water flows. During construction of the plant, runoff from the construction and storage areas will be collected by grading methods such as swales and ditches. The runoff will be directed to construction sedimentation ponds located southeast of the railroad loop and within the area enclosed by the loop (see Chapter 3, Figure 3.7-2). A circumferential grassed main drainage ditch will direct flow from these ponds to the runoff sediment control pond. This pond will provide 24 hour detention of storm water runoff for the once in 10 year, 24 hour rainfall event and will be sized to retain accumulated solids to ensure compliance with effluent standards. The overflow will be reintroduced through natural drainage patterns to the St. Johns River via Browns Creek.

Water quality of the effluent from the sedimentation pond is estimated to be similar to that discussed in Chapter 2, Section 2.4.1.7 and presented in Appendix C, Tables C-33 and C-34, for on-site streams. As noted, the waterbodies sampled on-site meet freshwater classification and Florida Class III water quality standards, except for ambient fecal and total coliform. Because of observed on-site ambient concentrations, high levels of coliform may be present in the construction area runoff. Contributions related to proposed construction activities are not expected to elevate existing coliform concentrations since sanitary wastes will be collected and treated (see Section 4.8.1.2 and Chapter 3, Section 3.6).

For both total suspended solids and turbidity, the construction pond will be designed to control excessive concentrations in the effluent. Total suspended solids will be controlled to approximately 50 mg/l on a monthly average with daily maximums of 100 mg/l or less (see Chapter 3, Section 3.7.1). Turbidity will be about 50 Jackson units, or less, above the ambient receiving water (see Chapter 2, Table 2.5-1, Florida Water Quality Criteria for Class III Predominantly Marine Waters). With the controls on total suspended solids and turbidity, and with the high quality of on-site streams, no significant impact on Browns Creek should occur from construction runoff discharge.

Dewatering

Some dewatering activity will be required during plant construction to permit excavation for structural foundations. The largest dewatering requirement anticipated will be associated with an excavation (coal/limestone unloader pit, see Figure 4.1-1) having surface dimensions of about 400 feet by 400 feet (maximum), and basal dimensions of approximately 80 feet by 80 feet at a depth of approximately 70 feet. The excavation will penetrate the full thickness of the water table aquifer and intermediate sands, and the uppermost portions of the shallow rock aquifer (Chapter 2, Section 2.5.2). Dewatering associated with this excavation, involving only peripheral dewatering wells or pumpage directly from the

excavation, could require production of relatively large quantities of water (on the order of 1000 gallons per minute) over a period of up to one year, possibly lowering water levels in the aquifer throughout an extensive area surrounding the dewatering site unless groundwater control measures such as those described below are employed.

Any potential impacts will be mitigated by employing groundwater control measures in the vicinity of the dewatering site, designed to: (1) limit the lateral extent of dewatering effects and (2) minimize the quantities of groundwater which must be produced in order to achieve the desired level of dewatering. The groundwater control measures could include such techniques as the use of sheet pilings, slurry walls, grout curtains, dewatering wells constructed on benches within the excavation, or other methods as will be required to limit dewatering impacts to the immediate vicinity of the site. Impacts will be monitored using an appropriate observation well or array of observation wells selected, if possible, from the pre-application groundwater monitoring points (Chapter 6, Figure 6.2-10). Accordingly, no significant impacts to water supply wells in the vicinity of the site are expected to result from the dewatering operation.

Other excavations on the site will be limited to depths of 20 to 30 feet and will require dewatering of the shallow, "water table" aquifer for periods generally less than one year in duration. Since the hydraulic conductivity of the shallow sediments is low (Section 2.5.2), the dewatering effects should be confined to a relatively small area surrounding the dewatering site. Moreover, since the water table aquifer is not utilized for water supply in the site vicinity, dewatering will not affect local water use.

Effluent from the dewatering operation will be discharged directly to existing drainage patterns. The discharge should not result in degradation of surface or subsurface water quality since water quality in the shallow rock and water table aquifers is good (Chapter 2, Section 2.5.2). Where

excessive levels of turbidity are encountered, for example in water pumped from open excavations, effluents will be routed to a sedimentation pond prior to discharge to surface drainage.

4.1.8 Mitigating Measures

Measures will be taken to mitigate certain potential adverse impacts associated with site preparation and plant construction. These measures include erosion and sediment control, wastewater treatment and control, dust stabilization, control of vehicle traffic, noise control, and protection of sensitive areas and wildlife.

4.1.8.1 Erosion and Sediment Control

Accelerated erosion will be controlled by compaction of embankments, early soil stabilization, limitation of exposed areas, maintenance of relatively flat grades, stabilized storm water flat grades, stabilized storm water outlets, and flat bottom ditches, as well as other appropriate erosion control techniques.

Sedimentation will be controlled during construction by use of sediment control basins and traps, filter berms, straw bales, perforated riser pipes at drainage structures, or other applicable devices as appropriate. Site drainage will be toward the south to a sedimentation pond located near the plant loop.

Earthmoving activities will be staged so as to limit the surface area of disturbed land at any one time, consistent with the amount and types of construction equipment available to work these areas. With the exception of that area occupied by plant components, exposed areas will be revegetated with pines and other vegetation native to the site and beneficial to wildlife. Slash pine (Pinus elliottii) will be planted with an appropriate grass encouraged as the ground cover.

4.1.8.2 Wastewater Treatment and Control

Two methods for sanitary waste disposal will be used. Portable toilet units will be used at the coal unloading and ash disposal sites. Wastes from the portable facilities will be disposed off-site either by the facility's supplier or by a contractor who will collect the wastes and transport them to the nearest municipal sanitary waste treatment facility with available capacity. Permanent toilet units will be used in the boiler area. There will be temporary trailer units in the power block area to supplement the permanent units. Sanitary waste will be treated by extended aeration as indicated in Chapter 3, Section 3.6. Effluent will be discharged to a sedimentation pond during the construction phase.

Metal cleaning wastes resulting from pre-operational cleaning of various plant components will be handled in one of two ways. One method would involve the cleaning contractor collecting and disposing of the wastes in an approved off-site location. A second method would be to treat the wastes in the plant wastewater treatment facility prior to discharge to the NGS intake flume. Metal cleaning waste treatment is described in Chapter 3, Section 3.5.1.4.

4.1.8.3 Dust Stabilization

When deemed necessary, water and/or other dust suppression chemicals will be applied to exposed areas to control fugitive dust. All main construction roads and parking area surfaces will have prepared surfaces to further control dust.

4.1.8.4 Vehicle Traffic Control

Traffic will be controlled by limiting site access to required delivery vehicles. Employee parking will be restricted to a designated area located near the construction office. New Berlin Road will experience

extensive truck traffic during site preparation and plant construction. Any damage to the road surface resulting directly from this plant related traffic will be repaired.

4.1.8.5 Noise Control

Noise levels due to the operation of construction equipment will be minimized by requesting contractors to make use of modern low noise level equipment when possible. Most construction activities will take place during daylight hours, which will further reduce noise impacts. Steam blowout at start-up of each unit is expected to present the greatest noise impact. Such operations will occur only intermittently over a two week period per unit. Steam blowout will be restricted to daylight hours with prior notice made to the public.

4.1.8.6 Protection of Sensitive Areas

Wetlands and archeological sites, indicated for preservation on the plant site plan (Figure 4.1-7), will be protected from construction activities by placing a fence around the area designated for development. The loss of 27.5 acres of hardwood swamp within the area of the plant island will be offset by the preservation of approximately 65 acres of hardwood swamp in the northwestern portion of the property. A buffer zone approximately 200 feet in width will be delineated around each of the on-site wetlands which are contiguous with the St. Johns River or its tributaries. The boundary of the buffer zone will be defined by a fence (Figure 4.1-3) which will serve to restrict access to the wetlands and in turn, aid in the preservation of the areas. The fence line in the portion of the hardwood swamp to be filled for construction of the plant rail loop will be placed 100 feet from the rail line. Fencing around the remaining portion of this wetland will maintain the 200 foot buffer, used in the other on-site wetlands.

4.1.8.7 Wildlife Protection

When possible, construction of solid waste disposal areas in close proximity to the rookery will be timed to avoid disrupting nesting birds in spring and early summer (Figure 4.1-8). Herons and Egrets just starting nesting activities can withstand some disturbance if other birds have already established nests in the rookery. However, it is essential that the first groups of birds be undisturbed while establishing nests. Based on information obtained from other studies and from the preoperational monitoring program, the critical period of initial nesting in north Florida rookeries is from late March to early May. Least Terns nest from April to August and any construction activity close to Least Tern nesting areas should be timed accordingly.

The gopher tortoise, listed as a species of special concern by the Florida Game and Fresh Water Fish Commission, is abundant in the sandhill communities on the site. An effort will be made to capture and transport these animals to another area prior to construction depending on the tortoise's status after the intensive logging operation being conducted on the proposed site is completed. The feasibility of relocation will be evaluated through consultation with appropriate state and federal agencies.

4.1.8.8 Public Revenues

Although construction activities associated with the proposed plant will induce various additional public costs for Duval County, these will be completely offset by 1985 (see Chapter 7, Section 7.2.2.3). The most significant of these costs will be road repair and improvements. Due to increased traffic during construction, the roads and major intersections in the vicinity of the proposed plant will need upgrading. There will also be public costs incurred because of the additional demand on various public services by the immigrant work force and their families. These additional public costs, which are discussed in detail in Chapter 7, Section 7.1, will result in an overall negative fiscal impact during the first three years of construction (Chapter 7, Section 7.2.2.3).

However, the additional public costs induced by plant construction will be more than offset by revenues generated by both JEA and FPL through the sale of electricity and property taxes. A detailed discussion of public revenues is contained in Chapter 7.

4.1.9 Benefits of Construction

Site preparation and plant construction will afford benefits to the region including the protection of sensitive lands, increased employment opportunities, and additional regional income.

Certain areas of the site have been designated as sensitive and will be protected by construction of a fence separating these areas from the usable portion of the plant site. Included in this category are 200 acres of wetland and eight designated archaeological sites as shown in Figure 4.1-7. These land areas will be purchased by the JEA and protected from disturbance during construction and from future use, thereby ensuring their preservation as a natural resource for the region.

The new levels of direct basic employment that would occur during the construction phase (1982-1987) are presented in Table 4.1-6. During the peak construction year of 1984, the proposed plant is expected to generate a total of 2,384 new basic jobs. Because Unit 1 operational staffing will begin in 1984, 68 of the 2,384 basic jobs are direct operational jobs. The overall employment impact of the proposed plant during 1984 will be the generation of approximately 5,905 new jobs in the area (2,384 new basic jobs and 3,521 new non-basic/secondary jobs). During 1985, the Jacksonville area will realize the peak overall employment impact of the plant. The plant is expected to generate 2,294 basic construction jobs, 281 direct operational jobs and 4,261 non-basic/secondary jobs during this year, resulting in a total of 6,836 new jobs in the area.

The impacts the proposed facility would have on income in the region during the construction phase are illustrated in Table 4.1-7. During the first year of construction (1982), the proposed plant is expected to

generate approximately \$7.4 million in additional income in the region. The annual income impacts of the proposed facility are expected to peak in 1985 with the generation of approximately \$82.5 million in additional income in the region. During the construction and operation overlap years of 1984-1987, the region would realize additional income of over \$240 million. The cumulative income effect of the proposed facility during the entire construction period (1982-1987) is projected to be in excess of \$288 million.

4.1.10 References

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 - Sequoyah Nuclear Plant, July, 1972
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Table 4.1-1 (Revision 1)

AREAL SUMMARY OF VEGETATION COMMUNITY TYPES AFFECTED
BY DEVELOPMENT OF THE PROPOSED PLANT SITE

Vegetation Community Type	Plant Island and Rail Loop	Sedi-ment Control Pond	Facility Component (Acres)							Total Area Within Site (Ac)	Total Area Not Affected (Ac)	Percent of Total Area On-Site Affected
			Solid Waste Disposal Area	Solid Waste Disposal Access Road	Solid Waste Disposal Area A	Con-struction Parking	Waste Handling Area	Solid Waste Disposal Area B	Total Area Affected			
Bottomland Hardwood	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	79.9	79.9	0.0
Cypress Swamp	7.3	0.0	0.0	0.0	3.3	0.0	0.0	22.0	32.6	40.1	7.5	81.2
Grassy Scrub/Pine Flatwood	158.4	0.0	89.5	1.6	0.0	11.2	25.9	0.0	286.6	363.2	76.6	78.9
Bayhead	21.1	0.0	0.0	0.0	0.0	0.0	1.6	0.0	22.7	28.3	5.6	80.2
Hardwood Hammock	61.3	16.0	0.0	0.0	79.4	0.0	0.0	0.0	156.7	415.2	258.5	37.7
Hardwood Swamp	33.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.0	100.8	67.8	32.7
Pine Flatwoods	10.6	0.0	8.9	0.2	5.1	0.0	0.0	325.5	350.3	504.1	153.8	69.5
Salt Marsh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	41.1	41.1	0.0
Grassy Scrub	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.5	24.5	0.0
Open	14.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.1	58.7	44.6	24.0
Total	305.8	16.0	98.4	1.8	87.8	11.2	27.5	347.5	896.0	1655.9	759.9	54.1

a Total area of each vegetation type within site boundaries

Table 4.1-2

EXISTING AND PROJECTED (1985) AVERAGE DAILY AND PEAK HOUR
TRAFFIC VOLUMES IN THE PROPOSED SITE VICINITY

	<u>1980 Average Daily Traffic</u>	<u>1980 Peak Hour Volume</u>	<u>Projected 1985 Average Daily Traffic</u>	<u>Projected 1985 Peak Hour Volume/ Capacity (level of services C)</u>
Heckscher Drive	10,265	835	16,136	2753/2600
Main Street	16,446	1,386	21,962	2605/5200
Eastport Road	7,591	615	10,459	1276/2000
New Berlin Road	1,636	159	5,781	1972/1800

ASSUMPTIONS:

20% Growth (1980-1985)

1.2 Person per car

GIVEN:

Construction Employment - 2,575 (1985 peak)

Construction Truck Traffic - 37,200 in 1985
(peak)

90% work 8:00 a.m. - 4:30 p.m.

Source: Harland Bartholomew and Associates Inc., 1980

Table 4.1-3

PLANT CONSTRUCTION EQUIPMENT SCHEDULE AND ASSOCIATED NOISE LEVELS
UNIT NO. 1

<u>Equipment Usage by Period</u>	<u>Equipment Numbers</u>	<u>Noise Level^a Per Unit @ 50'</u>	<u>Usage Factor^b</u>	<u>Contribution to L_{eq} of Site_c @ 50'</u>
<u>July, 1982 through December, 1982</u>				
vibratory rollers	4	74 dB(A)	.4	76 dB(A)
24 cu. yd. dirt scraper	10	88	.6	96
Caterpillar D-8 dozers	4	80	.6	84
65 T crawler crane	1	88	.4	84
65 T truck crane	2	83	.4	82
14 T cherry pickers	2	83	.4	82
250 cfm air compressors	2	81	.25	78
pile driving rig, consisting of 3900 Manitowoc crane and a 19,500 ft. lb. double acting pile hammer	1	101 (peak)	.6	101 ^d
front end loaders - Cat #977	2	79	.4	78
3/4 yd. Koehring backhoe	2	85	.4	84
gas driven welding machines	4	78	.1	74
2-1/2 T trucks	2	75	.2	71
3/4 T pickups	6	58 ^e	.2	59
8 cu. yd. concrete mixers	4	85	.1	81
concrete pump	1	82	.05	69
motor graders	2	85	.6	86
gas driven water pumps	2	76	1.0	79
L _{eq} @ 50 feet =				97.7 dB(A)

Table 4.1-3 (Continued)

PLANT CONSTRUCTION EQUIPMENT SCHEDULE AND ASSOCIATED NOISE LEVELS
UNIT NO. 1

<u>Equipment Usage by Period</u>	<u>Equipment Numbers</u>	<u>Noise Level^a Per Unit @ 50'</u>	<u>Usage Factor^b</u>	<u>Contribution to L_{eq} of Site^c @ 50'</u>
<u>January, 1983 through June, 1983</u>				
Manitowoc 4100 crawler cranes	2	88	.4	87
Manitowoc 4000 crawler crane	1	88	.4	84
65 T crawler crane	1	88	.4	84
65 T truck crane	2	83 dB(A)	.4	82 dB(A)
14 T Grove cherry pickers	8	83	.4	88
250 cfm air compressors	2	81	.25	78
750 cfm air compressors	2	81	.9	84
2-1/2 T trucks	8	75	.4	80
truck tractors	2	75	.4	74
3/4 yd. front end loaders - Cat #977	4	79	.3	80
3/4 yd. backhoe	2	85	.3	83
pile driving rig, consisting of				
3900 Manitowoc crane and a 19,500				
ft. lb. double acting pile hammer				
3/4 T pickups	10	101	.6	101 ^d
vibrator rollers	2	58 ^e	.2	61
gas driven 6" water pumps	2	74	.4	73
24 cu. yd. dirt scraper	2	76	.9	79
24 cu. yd. dirt scraper	2	88	.6	89
D-8 Caterpillar dozer	1	80	.6	78
1/3 cu. yd. rubber tired backhoe/				
loader				
8 cu. yd. concrete mixers trucks	4	79	.3	80
concrete pump	6	85	.1	83
motor grader	1	82	.2	75
gas driven welding machines	1	85	.4	81
	2	78	.1	71
L _{eq} @ 50 feet =				96.0 dB(A)

Table 4.1-3 (Continued)

PLANT CONSTRUCTION EQUIPMENT SCHEDULE AND ASSOCIATED NOISE LEVELS
UNIT NO. 1

<u>Equipment Usage by Period</u>	<u>Equipment Numbers</u>	<u>Noise Level^a Per Unit @ 50'</u>	<u>Usage Factor^b</u>	<u>Contribution to L_{eq} of Site^c @ 50'</u>
<u>June, 1983 through December, 1983</u>				
Manitowoc 4100 crawler cranes	2	88 dB(A)	.4	87 dB(A)
Manitowoc 4000 crawler crane	6	88	.4	92
65 T crawler crane	1	88	.4	84
65 T truck crane	2	83	.4	82
14 T Grove cherry pickers	15	83	.4	91
250 cfm air compressors	2	81	.25	78
750 cfm air compressors	3	81	.9	85
2-1/2 T trucks	4	75	.4	77
diesel 2-drum hoist	1	83	.6	81
truck tractors	4	75	.4	77
3/4 yd. front end loaders - Cat #977	2	79	.3	77
4 yd. backhoe	2	85	.3	83
3/4 T pickups	15	58 ^e	.2	63
vibratory rollers	4	74	.4	76
gas driven water pumps	6	76	.9	83
motor graders	2	85	.4	84
3/4 yd. backhoe	2	85	.3	83
1/3 cu. yd. rubber tired backhoe/ loader	4	79	.3	80
8 cu. yd. concrete mixers	6	85	.1	83
concrete pump	1	82	.2	75
gas driven welding machines	3	78	.1	73
L _{eq} @ 50 feet =				97.5 dB(A)

Table 4.1-3 (Continued)

PLANT CONSTRUCTION EQUIPMENT SCHEDULE AND ASSOCIATED NOISE LEVELS
UNIT NO. 1

<u>Equipment Usage by Period</u>	<u>Equipment Numbers</u>	<u>Noise Level^a Per Unit @ 50'</u>	<u>Usage Factor^b</u>	<u>Contribution to L_{eq} of Site^c @ 50'</u>
<u>January, 1984 through June, 1985</u>				
Manitowoc 4100 crawler cranes	4	88 dB(A)	.4	90 dB(A)
Manitowoc 4000 crawler crane	6	88	.4	92
65 T crawler crane	1	88	.4	84
65 T truck crane	2	83	.4	82
14 T Grove cherry pickers	17	83	.4	91
250 cfm air compressors	2	81	.25	78
750 cfm air compressors	3	81	.9	85
2-1/2 T trucks	8	75	.4	80
diesel 2-drum hoist	1	83	.6	81
truck tractors	4	75	.4	77
3/4 yd. front end loaders - Cat #977	2	79	.3	77
3/4 yd. backhoe	2	85	.3	83
3/4 T pickups	16	58 ^e	.2	67
vibratory rollers	1	74	.4	70
gas driven 6" water pumps	2	76	.9	79
motor grader	1	85	.4	81
1/3 cu. yd. rubber tired backhoe/ loader	3	79	.3	79
8 cu. yd. concrete mixers	4	85	.1	81
gas driven welding machines	4	78	.1	74
24 cu. yd. dirt scrapers	10	88	.6	96
D-8 Caterpillar dozers	2	80	.6	81
L _{eq} @ 50 feet =				99.9 dB(A)

Table 4.1-3 (Continued)

PLANT CONSTRUCTION EQUIPMENT SCHEDULE AND ASSOCIATED NOISE LEVELS
UNIT NO. 1

<u>Equipment Usage by Period</u>	<u>Equipment Numbers</u>	<u>Noise Level^a Per Unit @ 50'</u>	<u>Usage Factor^b</u>	<u>Contribution to L_{eq} of Site^c @ 50'</u>
<u>June, 1985 through December, 1985</u>				
65 T crawler crane	1	88 dB(A)	.4	84 dB(A)
65 T truck cranes	2	83	.4	82
14 T Grove cherry pickers	8	83	.4	88
750 cfm air compressors	2	81	.9	84
truck tractors	1	75	.4	71
2 1/2 T trucks	2	75	.4	74
3/4 T pickups	10	58 ^e	.2	61
24 cu. yd. scraper (self-loading)	1	88	.4	84
motor grader	1	85	.4	81
1/2 cu. yd. rubber tired backhoe/ loader	2	79	.3	77
8 cu. yd. concrete mixer trucks	2	85	.2	81
vibratory roller	1	74	.4	70
gas driven welding machine	1	78	.1	68
			L _{eq} @ 50 feet =	92.8 dB(A)
Steam blow (2 week period)			L _{eq} @ 50 feet =	129 dB(A) ^f

Note: Unit No. 2 would be similar except for 24 cu. yd. dirt scrapers and dozers would not be used for site excavation.

a USEPA, 1971

b Ebasco

c Contribution to L_{eq} = 10 log (10^x/10 x number of units x usage factor)

d Not included in total - discussed separately

e Estimated

f USEPA, 1977

Table 4.1-4
IMMIGRANT CONSTRUCTION WORKER LEVELS FOR SEVEN-COUNTY REGION
(1982-1987)

<u>Year</u>	<u>Baker</u>	<u>Clay</u>	<u>Duval</u>	<u>County</u>				<u>Putnam</u>	<u>St. Johns</u>	<u>Total</u>
				<u>Flagler</u>	<u>Nassau</u>					
1982	-	7	43	-	4			-	-	54
1983	-	51	204	-	35			-	1	291
1984	20	88	292	-	69			-	24	493
1985	20	88	290	-	68			-	23	489
1986	-	39	167	-	26			-	-	232
1987	-	20	99	-	12			-	-	131

Note: Dash (-) signifies no projected immigrant construction workers locating in that county.

Source: Ebasco/Envirosphere Company

Table 4.1-5

TOTAL REGIONAL POPULATION LEVELS INDUCED BY CONSTRUCTION PHASE

(1982-1987)

<u>Year</u>	<u>County</u>						<u>Total</u>
	<u>Baker</u>	<u>Clay</u>	<u>Duval</u>	<u>Flagler</u>	<u>Nassau</u>	<u>Putnam</u>	
1982	-	16	98	-	9	-	123
1983	-	116	463	-	79	-	660
1984	45	200	692	-	157	-	1,148
1985	45	200	700	-	154	-	1,151
1986	-	89	500	-	59	-	648
1987	-	45	386	-	27	-	458

- Notes: 1. Dash (-) signifies no projected population changes within that county.
 2. The years 1984, 1985, 1986 and 1987 include immigrant operational phase worker effects in Duval County because of construction and operation overlap during these years. Additional workers were added to the Duval County immigrant construction worker level as follows: 1984-10; 1985-42; 1986-42; 1987-56.

Source: Ebasco/Envirosphere Company

Table 4.1-6

PROJECTED BASIC CONSTRUCTION AND OPERATIONAL EMPLOYMENT
(1982-1987)

<u>Year</u>	<u>Construction Phase</u>	<u>Operational Phase</u>	<u>Total Basic Employment</u>
1982	254	-	254
1983	1,366	-	1,366
1984	2,316	68	2,384
1985	2,294	281	2,575
1986	1,089	281	1,370
1987	614	375	989

Source: Ebasco/Envirosphere Company

Table 4.1-7

DIRECT AND INDIRECT INCOME EFFECTS^a
(1982-1987)

<u>Year</u>	<u>Basic Income</u>		<u>Non-Basic/Secondary Income</u>	<u>Total Income</u>
	<u>Construction</u>	<u>Operational</u>		
1982	\$ 4,708,027	-	\$ 2,729,827	\$ 7,437,854
1983	25,319,545		15,426,496	40,746,041
1984	42,928,306	\$ 916,200	29,943,051	73,787,557
1985	42,520,524	3,786,061	36,236,109	82,542,694
1986	20,185,201	3,786,061	25,019,158	48,990,420
1987	11,380,820	5,052,573	17,918,207	34,351,600

a 1980 dollars

Source: Ebasco/Envirosphere Company

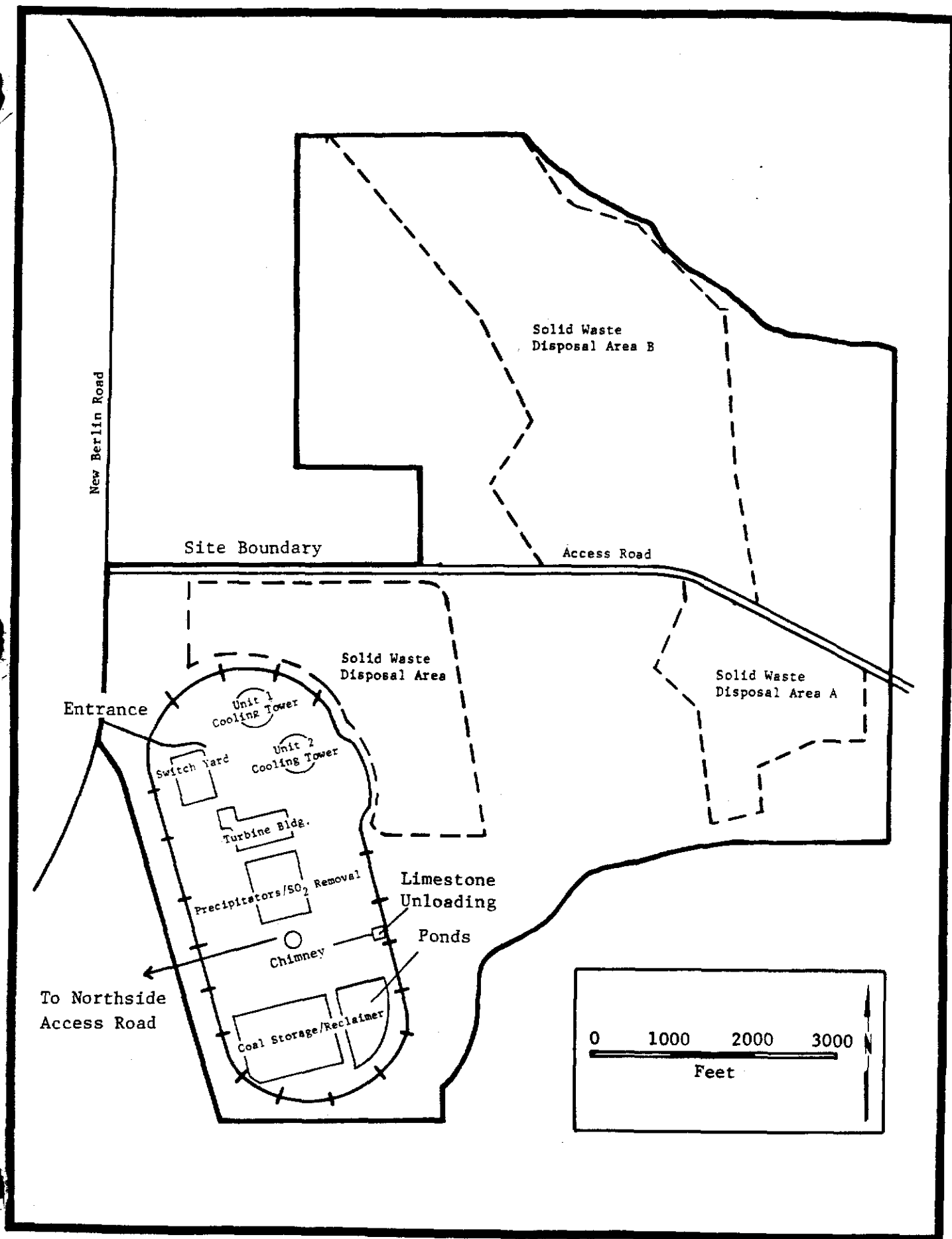


Figure 4.1-1 Layout of Plant and Other Facilities

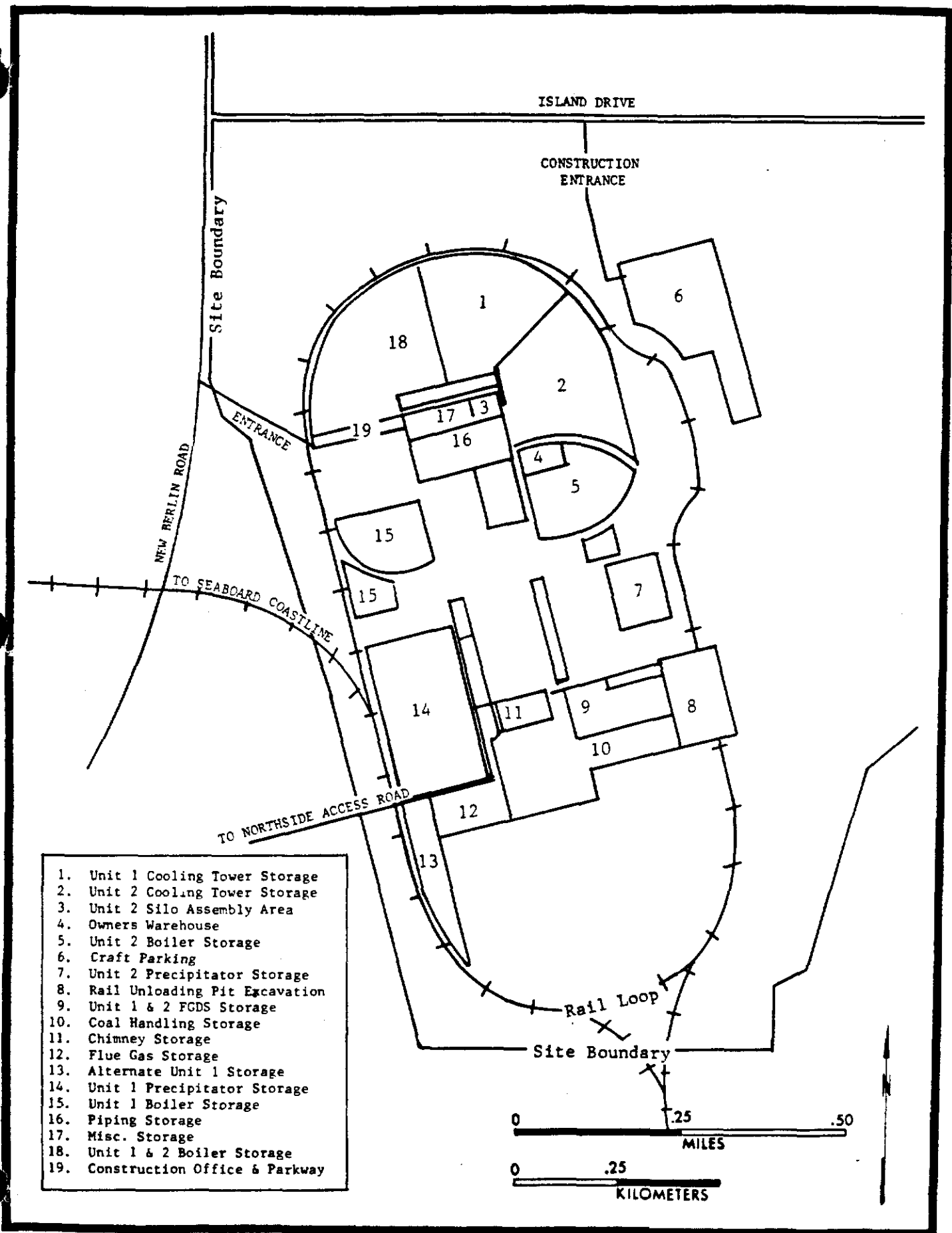


Figure 4.1-2 Plant Construction Laydown Areas

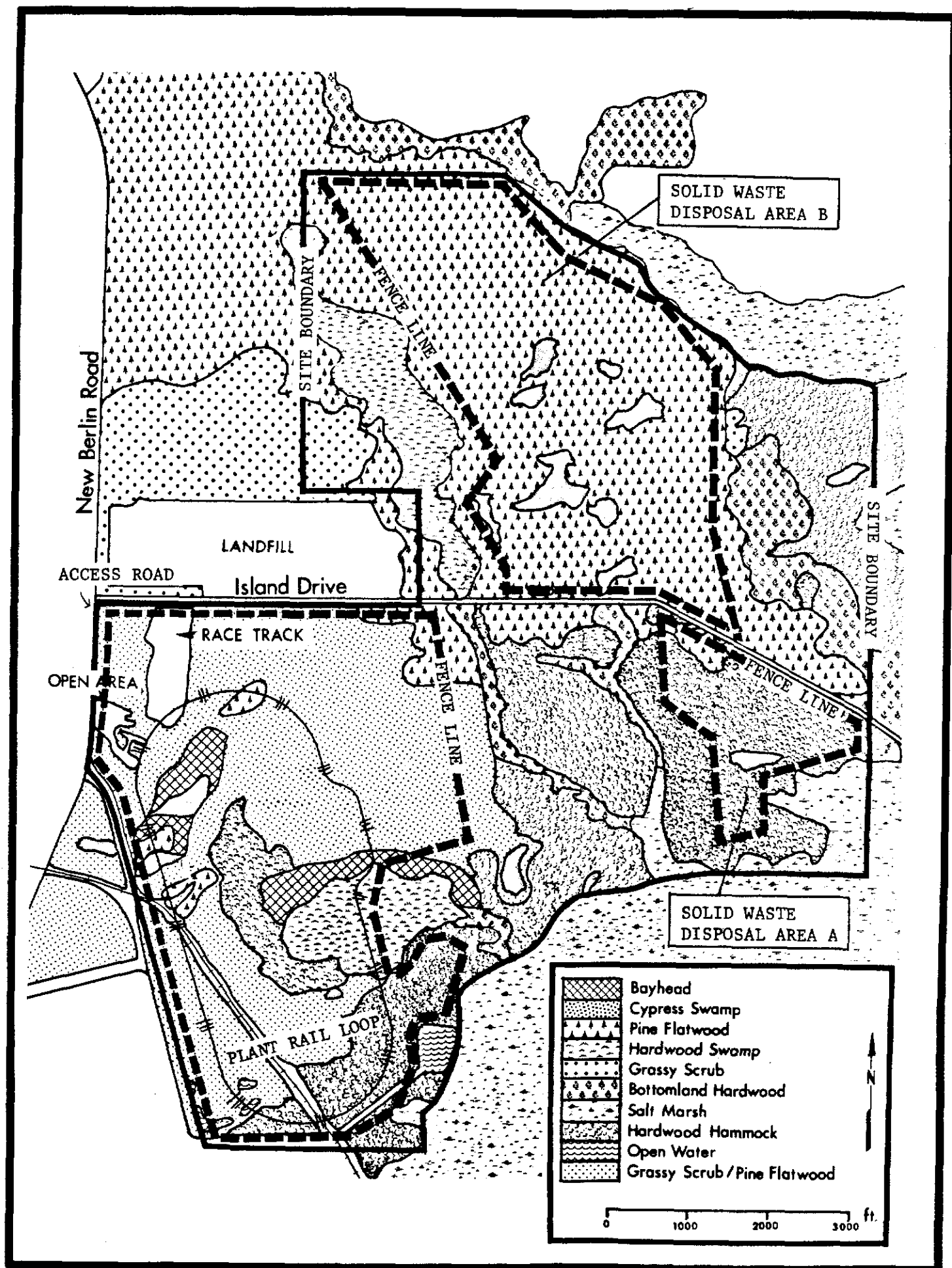


Figure 4.1-3

Location of Facility Components in Relation to Vegetation Community Types

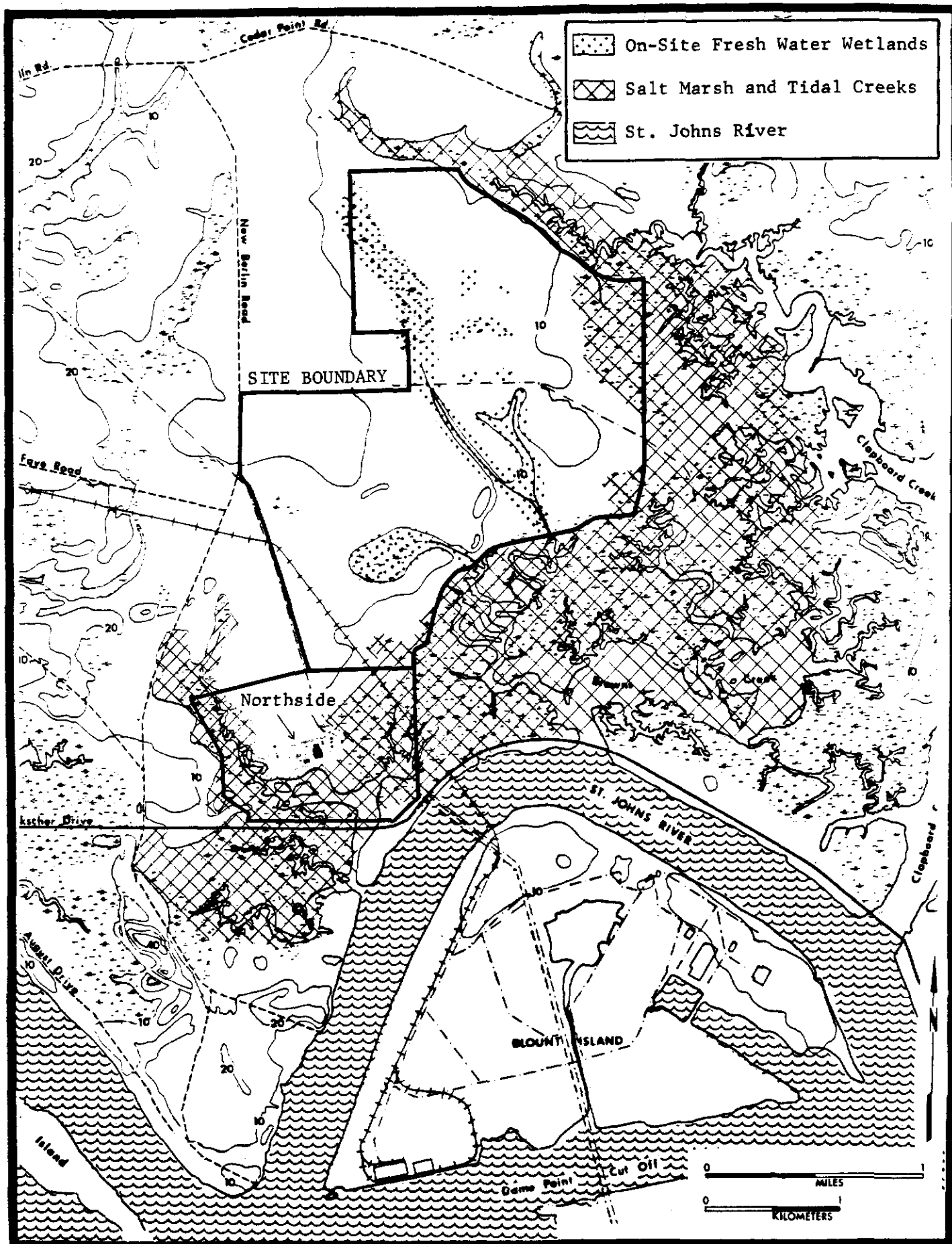


Figure 4.1-4

Aquatic Habitats in Vicinity of Proposed Site

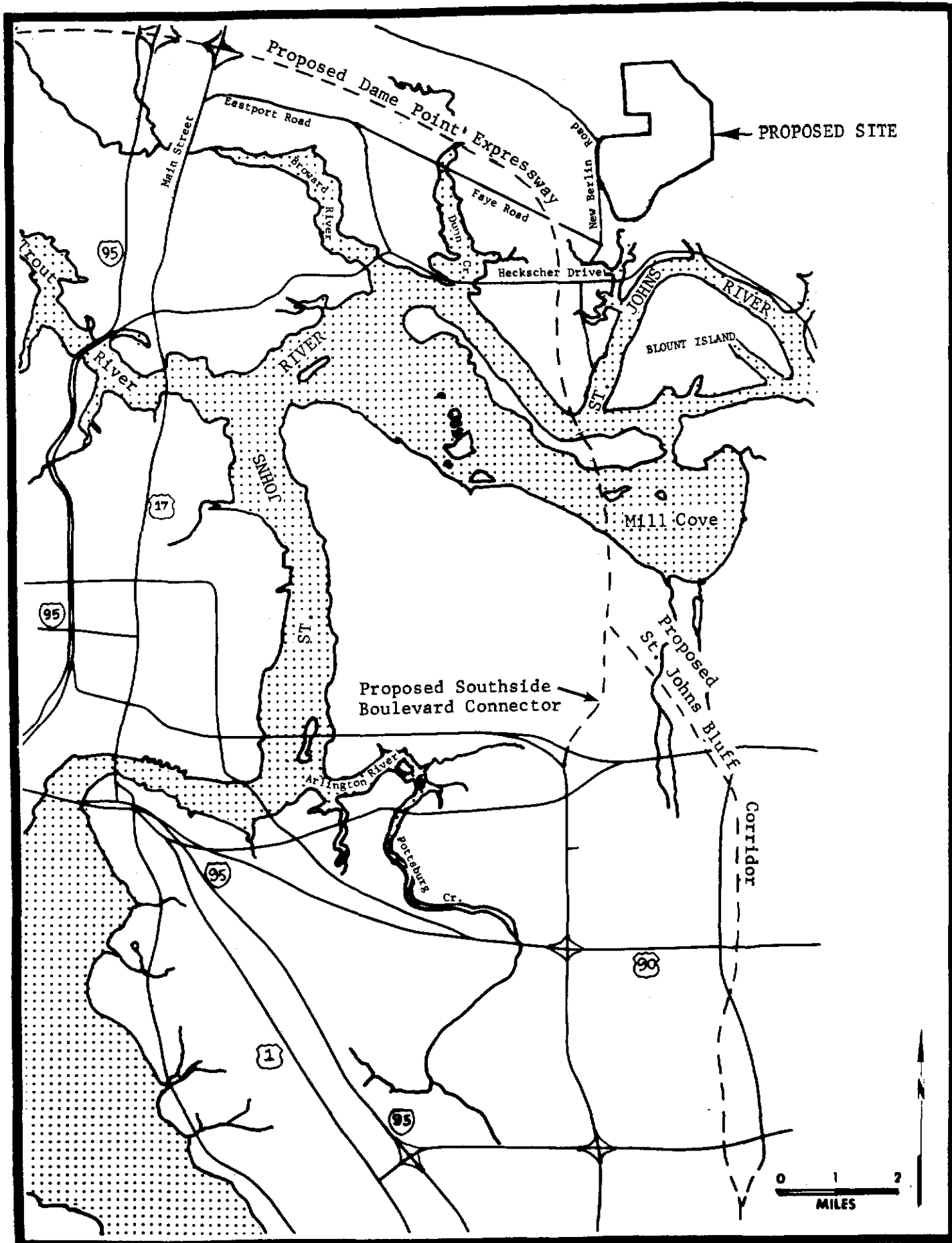


Figure 4.1-5 Major Roads in Vicinity of Proposed Site

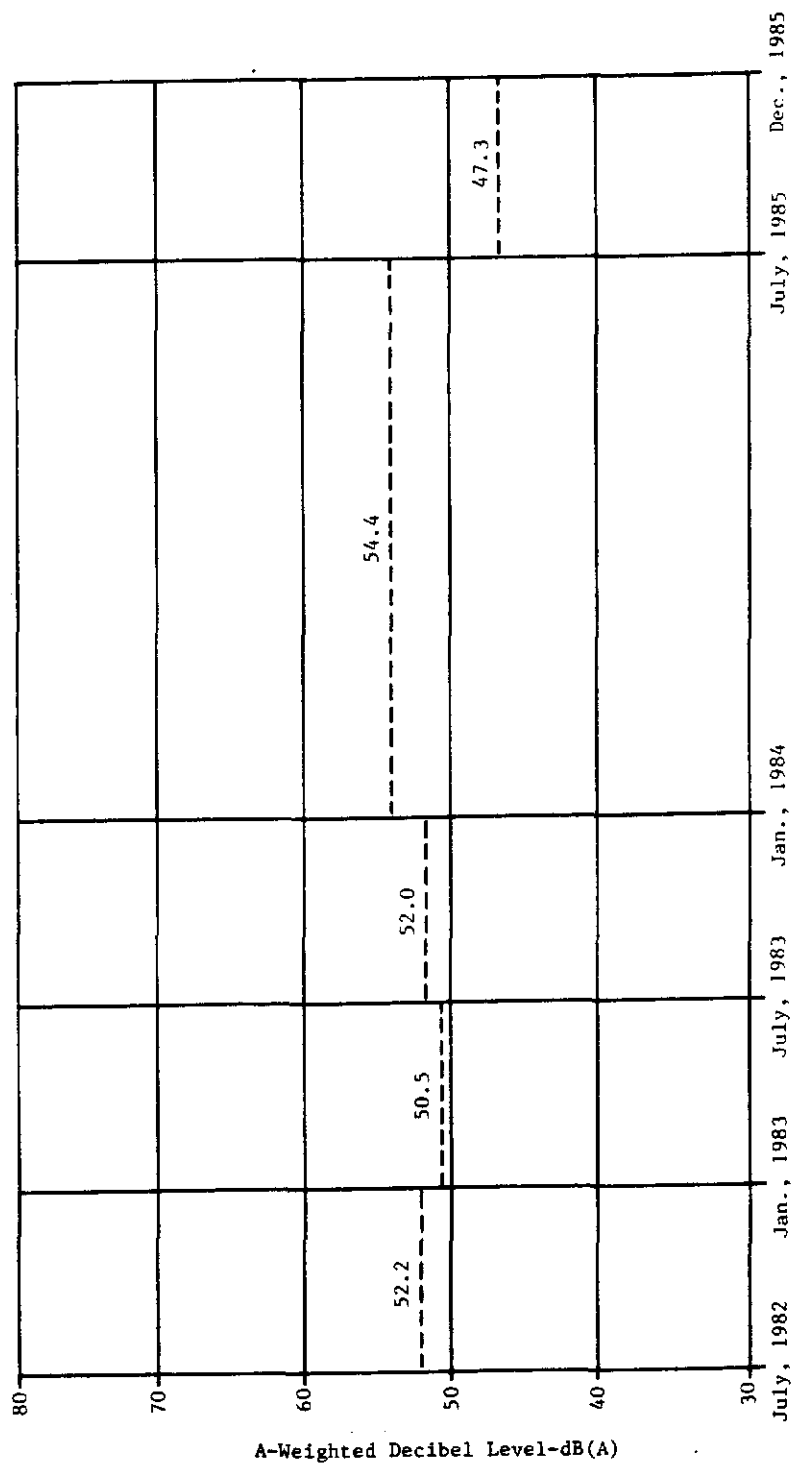


Figure 4.1-6 Projected Construction Noise Levels at 1-Mile from the Proposed Plant

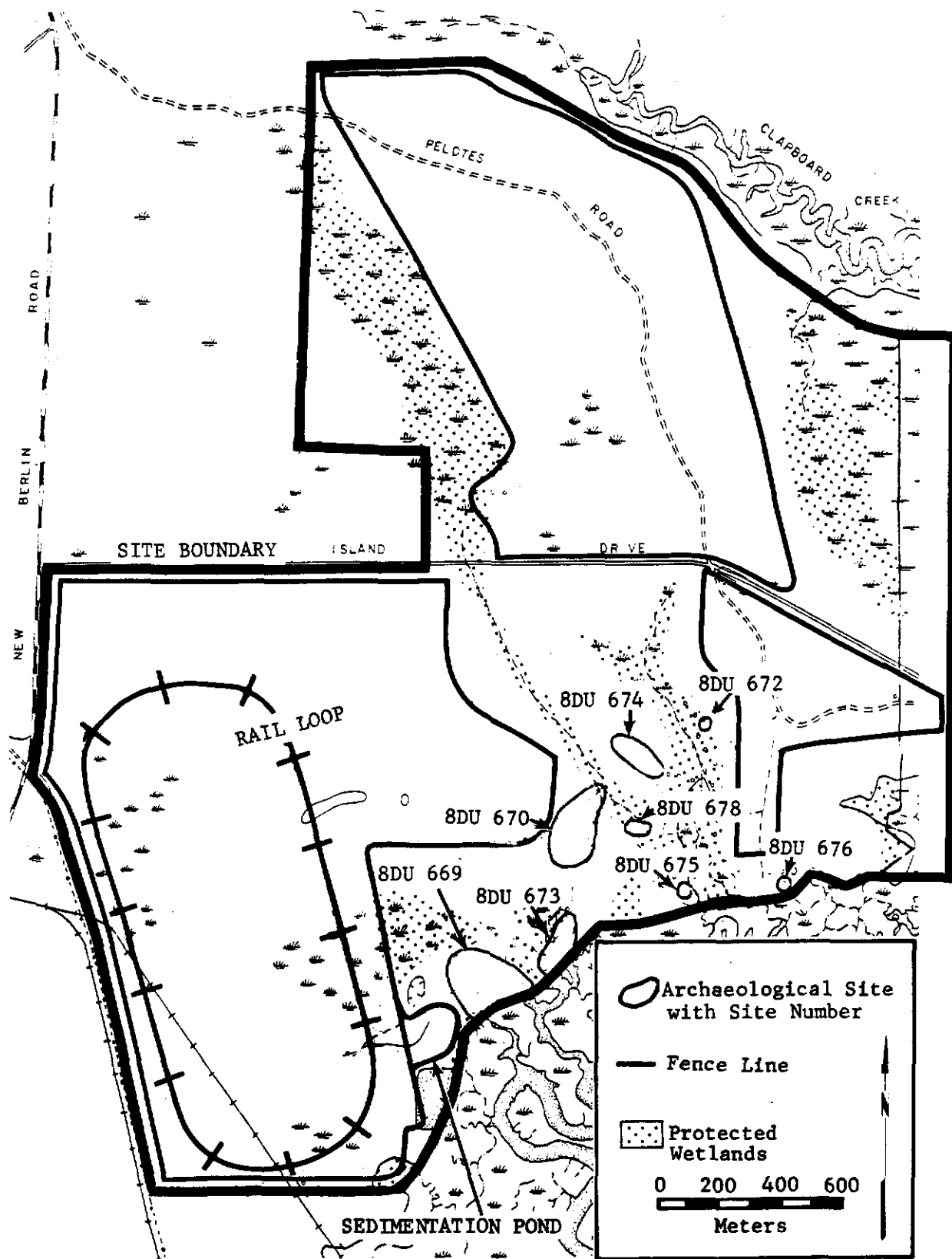


Figure 4.1-7 Plot Plan Showing Protected Areas

4.2 SPECIAL FEATURES - TRASH AND WASTE DISPOSAL

Liquid effluents that will be generated during construction are discussed in Section 3.7.1. These effluents include rainfall runoff from the site and from the heavy equipment refueling area, and wastewater generated during concrete truck washing. Other waste materials produced during construction will be waste oils, solid wastes from the clearing and grubbing operations, construction wastes, and garbage.

Waste oils, fuels, and lubricants from construction equipment will be collected and held in suitable containers for periodic disposal. Oily sludge from the oil-storm water separator at the maintenance area will be removed off-site by approved contractors.

Solid wastes from the clearing and grubbing operations will consist of brush and trees. Contractors will be encouraged to sell all marketable timber. Other clearing and grubbing wastes will be buried on-site or burned, using appropriate techniques for control of smoke. The burning operations will be conducted according to local and state requirements.

Construction waste will be segregated and disposed of in accordance with applicable rules and regulations. Scrap wood and metal will be taken to a specified area of the site to be separated and stock piled for possible salvage or disposal. Portions of the construction debris may also be used as a fill material on-site.

General garbage and waste materials, such as discarded food products, will be placed in suitably marked containers. These containers will be emptied on a scheduled basis by an approved contractor for off-site disposal in local landfills.

4.3 CONSTRUCTION OF DIRECTLY ASSOCIATED TRANSMISSION FACILITIES

The construction of two 230 kV transmission lines from the proposed site to the Normandy Substation and to the Fort Caroline and Robinwood Substations will be directly associated with power plant development. As discussed in Chapter 9, a preferred transmission line corridor, which is 0.5-1 mile in width, has been identified (Figure 4.3-1). Following site certification approval, a right-of-way (ROW) alignment will be established. The preferred corridor includes an existing transmission line ROW from the Northside Station to the respective substations. For over 90 percent of the new ROW, it is anticipated that the existing ROW will simply be expanded by up to 150 feet to accommodate the new facilities. Where the existing ROW is not followed, a new ROW up to 200 feet in width will be constructed. This section, however, addresses potential construction impacts associated with development of a right-of-way within any portion of the preferred corridor.

4.3.1 Effects on Vegetation, Wildlife and Aquatic Life

4.3.1.1 Wetlands

The preferred corridor to the JEA's Robinwood and Normandy Substations includes wooded wetlands with very little salt marsh found in the proposed plant to Robinwood section (Table 2.11-1). The wooded wetland areas in the preferred corridor have been largely drained, particularly through segments C', D and E (Figure 4.3-1, Appendix K). Thus, ROW alignment will have little effect on corridor wetlands as a whole. No major wooded wetland stands will be cleared or bisected by new ROW construction. The largest undisturbed wooded wetland area to be affected is a cypress wetland near the Normandy Substation. Assuming that the new ROW will be adjacent to the existing ROW, relatively little additional clearing will be required through this habitat (less than 150 feet).

With proper construction care, salt marshes will not be greatly impacted by transmission line construction. Corridor halophytic vegetation consists of salt marsh cordgrass (Spartina alterniflora) and needlerush (Juncus roemerianus), herbaceous species that do not impair the establishment and maintenance of a transmission line. By using mats to support heavy equipment in the marsh, lasting damage to the marsh will be avoided. If towers must be located in a marsh, the marsh habitat will be disturbed only in the immediate tower foundation areas. This will result in temporarily increased turbidity levels. When construction in a particular area is complete, the mats will be removed and habitat will recover. Construction noise will locally disturb water birds feeding in salt marshes. Tower construction in Mill Cove mud flat areas east of the existing line will require draglining or dredging to accommodate equipment use in the area. The increased turbidity will be temporary and backfilling of channels will take place. Turbidity screens will be used to minimize impacts where a violation of state water quality is possible. The maximum total volume of dredge material temporarily displaced but retained in Mill Cove and later backfilled, will be approximately 45,000 cubic yards (based on a linear distance of 3,600 feet, a channel width of 45 feet, a 4 to 1 slope and a barge draft of 5 feet). A typical Mill Cove tower cross-section is diagrammed in Figure 4.3-2, showing a tower foundation, dredged channel, and water levels. Figure 4.3-3 shows approximate tower placement near the NGS. Figure 4.3-4 shows approximate tower placement in the Mill Cove area.

4.3.1.2 Upland Habitats

Impacts on upland communities will be greater in forested areas than in open habitats. ROW clearing will result in removal of all trees and brush in the ROW that could interfere with the safe operation of the transmission line. Wood and brush material removed will be disposed of in landfill, sold or burned. Movement of timber harvesting and construction equipment is expected to churn, rut, and compact the soil in wet areas. Increased erosion (see Section 4.3.4) may result. Forested areas will be replaced by early secondary ecological successional stages. The "edge

effect", or tendency for increased variety and density of floral and faunal species at community junctions that is often cited as a benefit of ROWs will be offset by the fact that much diversity of habitats already exists due to the existing ROW. No major forest stands will be involved in ROW preparation (Table 2.11-1), and no chemical herbicides and pesticides are planned during ROW preparation.

4.3.1.3 Aquatic Habitats

The only areas of open water to contain transmission towers will be in Mill Cove. The entire width of the St. Johns River will be spanned without placing a tower in the open channel. New transmission tower locations will be east of existing towers in habitats exposed at low tide. The height of the lines at the towers adjacent to the channel will be 240 feet. The minimum line elevation between towers and over the channel will be 160 feet. Fewer towers may be required because of the shorter over water distance required. Dredging (dragline) equipment will be brought into the area by barge via the existing channel. Efforts will be made to minimize sediment disturbances, including barging in of equipment during high tide periods. Streams and channels will be spanned, and, where necessary, culverts will be placed to avoid altering stream flow characteristics.

roads? sewer pipe
cove
COC
culverts.

4.3.1.4 Important Wildlife

The most important wildlife to be potentially affected by construction of the transmission lines and towers are colonial and raptorial birds. Potential impacts to other wildlife species are not anticipated to be serious due to their relatively larger abundances or local absence.

The special areas of wildlife importance include Blount Island and the Northside Station area. On Blount Island, spoil areas on and near the existing ROW have the potential to become nesting habitat for several species of shorebirds, and terns such as the Least Tern (Sterna albifrons). However, if construction takes place during breeding season (April-August), these birds may be driven away from potential nesting

areas. Similarly, the Osprey (Pandion haliaetus) frequently nests in transmission towers and has nested in towers on Blount Island and in the salt marsh near the Northside Station. Construction in the areas of nesting terns and osprey will be avoided. It should be noted that fresh spoil mounds left behind or introduced to the area will expand potential habitat for the terns.

4.3.2 Sensitive Areas

For this analysis, areas are classified by low, medium or high sensitivity to the construction of transmission lines. High sensitivity areas include, for example critical habitats of threatened or endangered species, wooded wetland communities, and medium and high density residential areas. Medium sensitivity areas include, for example salt marshes, open water, and recreational areas such as golf courses. Low sensitive areas include land cover such as agricultural lands, pine flatwoods habitats, and grasslands. Several areas of high sensitivity are crossed by the existing transmission line ROW. However, when compared to other possible ROW alignments through the preferred corridor, expansion of the existing ROW will result in less severe impacts. Sensitive areas and linear existing transmission line distances through these areas are listed in Table 4.3-1.

4.3.3 New Roads

A service road is maintained along most of the existing ROW. Approximately 90 percent of the new transmission ROW will follow existing ROW. Therefore, it will be necessary to construct very few, if any, new roads.

4.3.4 Erosion

Impacts of transmission line construction on soils will be limited to the effects of required clearing and stripping activities. Clearing will be required along the ROW and associated access roads. The removal of

natural vegetation and the stripping and grading operations will result in disturbance to the soil, making the land susceptible to wind- and precipitation-induced erosion. The use of construction equipment compacts topsoil which reduces infiltration of rainfall and increases surface runoff. This will result in locally increased erosion evidenced by the formation of rills and gullies. The loss of topsoil removes nutrients resulting in decreased soil productivity. The impacts associated with this loss will be most prominent in on-site wet areas. Because construction equipment will occupy a relatively small portion of the ROW and because the terrain is flat, erosion impact is expected to be minor.

The Federal Power Commission (1971) states that impacts to soils can be minimized by adhering to the following guidelines:

- . The time and method of clearing the ROW will take into account soil stability and protection of vegetation.
- . Trees, shrubs, grass and topsoil not cleared will be protected from damage during construction.
- . Clearing of the ROW to the mineral soil will be avoided. Where this does occur, topsoil will be replaced and stabilized without undue delay by planting appropriate vegetation.
- . Scars on the ground surfaces in erosion prone areas will be repaired and replanted.
- . Terraces and other erosion control devices will be constructed where necessary.
- . Where the ROW crosses streams, the banks will be stabilized and if necessary, culverts will be constructed to minimize alterations in water flow.

- . Construction access roads will be stabilized by erosion control measures and by planting appropriate grass and other vegetation. Roads will be designed for proper drainage.
- . Service and access roads will be used jointly when possible.
- . Exposed ground will be sprayed with water to reduce dust as needed.
- . Periodic inspection of the transmission line will include observations for areas of erosion. These areas will be noted and stabilized promptly.

Where practical, these guidelines will be implemented during construction.

4.3.5 Land Use and Socioeconomics

By avoiding most areas of existing or planned medium and high density residential development, the preferred corridor remains largely compatible with surrounding land uses (Jacksonville Area Planning Board). The preferred corridor is characterized mostly by natural upland vegetation. It is probable that the selected ROW will cross limited areas of medium residential development. Such crossings may result in the displacement of a small number of residences. These crossings will be avoided when possible.

The preferred corridor section to the Robinwood Substation includes a limited area of private recreation uses consisting of a golf course and tennis courts. It may, however, be possible to avoid crossing these recreation areas by using tower designs which decrease the ROW width necessary along with changing the tower location.

Areas diverted to transmission line ROW can still be utilized for certain compatible land uses. Possible uses include general agriculture; cultivation of nursery stock pine trees; parks; golf courses; equestrian or

bicycle paths; picnic areas; game refuges; and hiking trail routes (Federal Power Commission, 1971). It is possible that all or part of the existing transmission line ROW that lies within the preferred corridor may also serve the new transmission lines. Land uses after routing of the transmission line will reflect the existing land uses.

The preferred corridor does not contain known archeological or historic sites as listed in the National Register of Historic Sites. However, limited areas within the corridor may contain archeological sites, as indicated by the State of Florida Division of Archives and History and illustrated in Appendix K. A survey of such areas would be required if the new ROW were to involve new clearcutting or placement of new towers in the indicated areas.

The socioeconomic impact of transmission line construction is not expected to be significant. The preferred corridor remains within Duval County and will require a combined labor force of only approximately 20 persons for construction. Duval County is expected to provide nearly all of the required labor. The economic impacts of line construction are therefore aggregated with the plant construction analysis in Chapter 7.

Specific local impacts of transmission line construction include construction staging areas and highway crossings. Staging areas will be located in already stressed areas such as existing ROW to minimize any serious impacts on surrounding developments. Construction equipment will disrupt traffic flow for short periods of time at points where the ROW crosses roads. When possible, work at these points will be avoided during periods of peak traffic flow.

4.3.6 Viewshed

The visual impacts of transmission towers and the ROW are expected to be minimal and are discussed in Chapter 5, Section 5.5.

4.3.7 Solid Waste Disposal

Solid wastes generated during transmission ROW clearing and line construction will be disposed according to guidelines outlined in Section 4.2.

4.3.8 Mitigating Measures

Mitigation measures are discussed within each appropriate impact discussion above.

4.3.9 References

Federal Power Commission, 1971. Electric Power Transmission and the Environment. Washington, D.C.

Jacksonville Area Planning Board. Land Use Plan for the Year 2005.

Table 4.3-1

LINEAR DISTANCES OF EXISTING TRANSMISSION LINES
THROUGH SENSITIVE AREAS

<u>Sensitive Area</u>	<u>Corridor^c</u>	<u>Approximate Linear Distance</u>
Wooded Wetlands	G	500'
	J	1000'
Residential Areas (Med. Density)	G	2500'
	E	2500'
	I'	1000'
Proposed High Density Residential Areas	H	2500'
Salt Marsh	A'	1400'
Open Water	A'	7300'
Recreational Area (Golf Course)	A'	2500'
Blount Island Ponds (^a Wood Stork Feeding Area)	A'	3800'
Blount Island Spoil Area (^b Least Tern Nesting Area)	A'	1000'

-
- a Listed as endangered by the Florida Game and Fresh Water Fish Commission
 b Listed as threatened by the Florida Game and Fresh Water Fish Commission
 c Appendix K

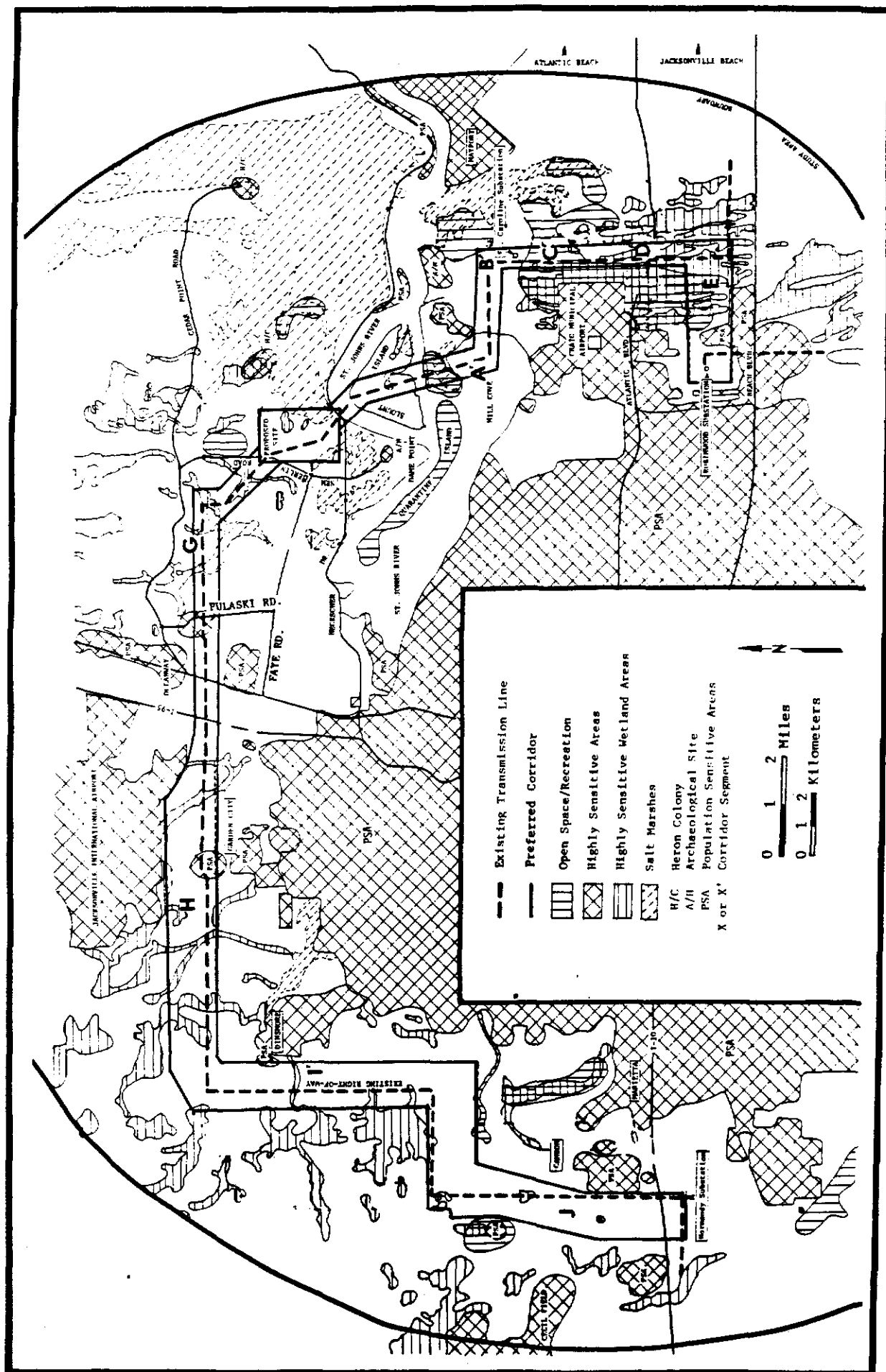
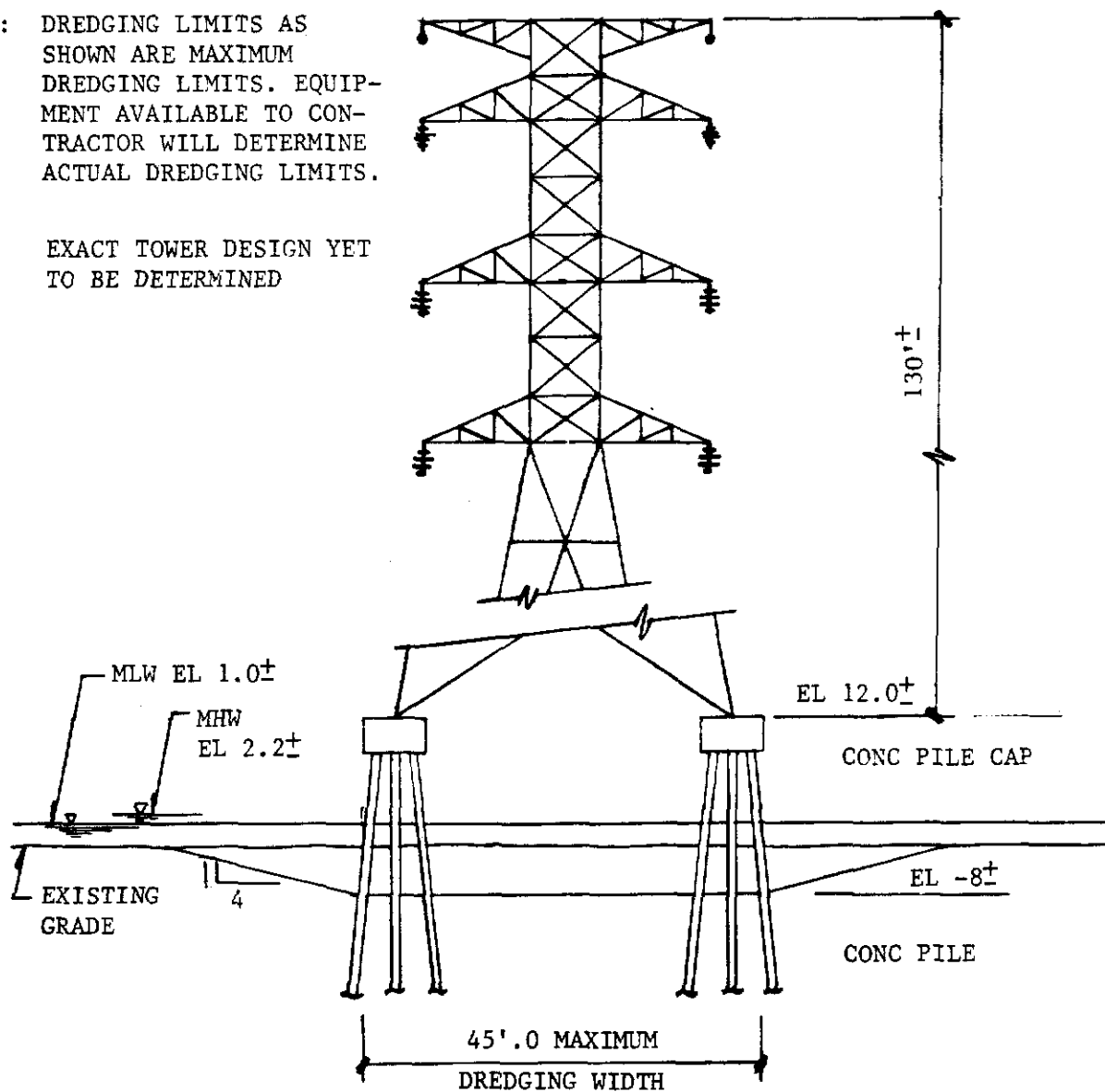


Figure 4.3-1

Preferred Transmission Line Corridor

NOTE: DREDGING LIMITS AS SHOWN ARE MAXIMUM DREDGING LIMITS. EQUIPMENT AVAILABLE TO CONTRACTOR WILL DETERMINE ACTUAL DREDGING LIMITS.

EXACT TOWER DESIGN YET TO BE DETERMINED



45,000 CU YD MAXIMUM DREDGING VOLUME TO BE BACKFILLED UPON COMPLETION OF TOWER CONSTRUCTION

Figure 4.3-2 Cross Section of a Typical Tower Foundation to be Used in Mill Cove

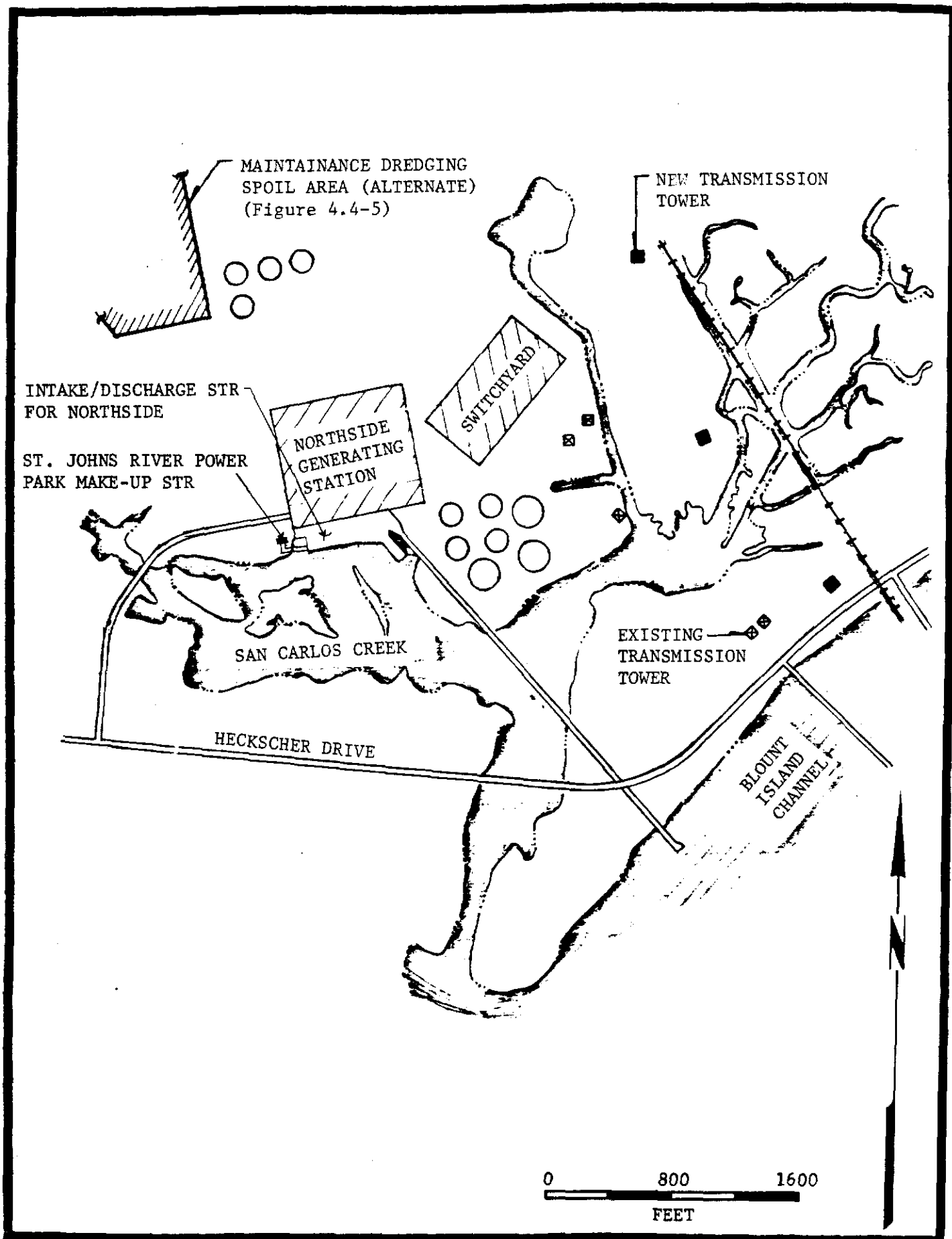


Figure 4.3-3 Approximate Tower Placement Adjacent to Northside Station

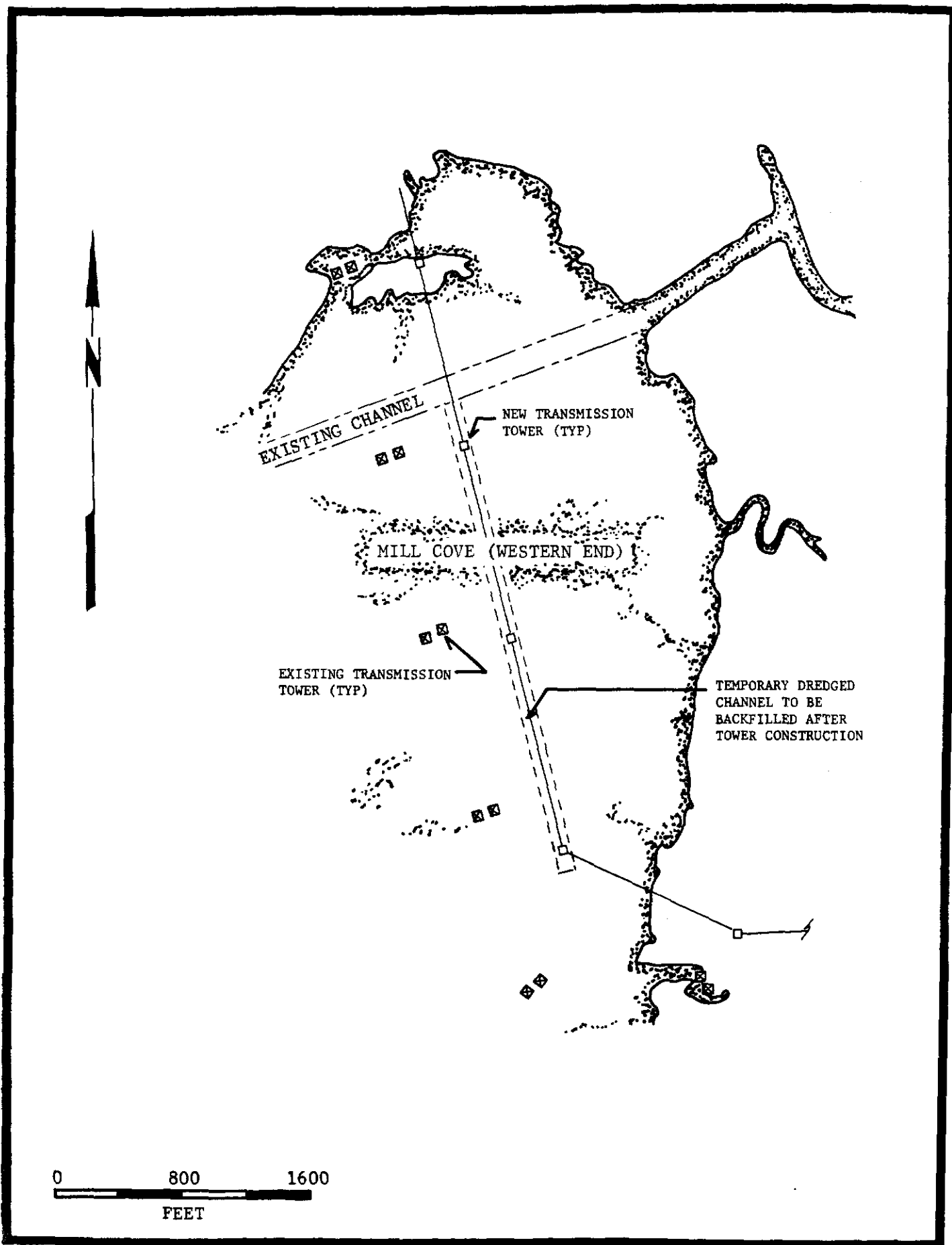


Figure 4.3-4 Approximate Tower Placement in Mill Cove

4.4 CONSTRUCTION OF OTHER ASSOCIATED FACILITIES

Figures 4.4-1 through 4.4-3 show the location and layout of the proposed coal unloading facility on Blount Island. The facility, excluding new trackage, will occupy a total of approximately 55 acres, and will include an unloading wharf, stacker-reclaimer, active and emergency coal stackout areas and rail car loading facility (see Chapter 3, Section 3.10). The railroad loop track will connect with the plant and the existing rail line to the Jacksonville Port Authority (JPA) facilities.

The wharf will be a pile-supported structure, faced with a sheet pile wall and parallel to the existing channel. All piling will be driven, anchored and capped prior to any dredging activity. Figure 4.4-2 shows the proposed dredge cut and quantities (a description of the offshore borehole program by which these quantities were determined is contained in Appendix E). Figure 4.4-3 is an extension of the facility layout showing the railroad loop as it exits the facility along an existing drainage easement and JEA transmission line.

Figure 4.4-2 presents dredging estimates for the proposed coal unloading facility on the Fulton-Dame Point Cutoff side of Blount Island. Of the approximately 551,000 cubic yards of material removed, 170,000 cubic yards will be spoil and the remaining 381,000 cubic yards will be used as fill on the proposed site. Dredged material will be removed with a suction dredge to minimize the generation of turbidity and release of other pollutants to the St. Johns River. Spoil material will be pumped to receiving area(s) on Quarantine Island via a submerged pipeline. This area, shown in Figure 4.4-4, was used previously by the U.S. Army Corps of Engineers (COE) as a spoiling area. The pipeline will follow bottom contours such that accidental rupture by ship traffic is precluded. Settling pond dikes and earthen berms will be modified to COE specifications. The spoil site and settling pond(s) will be designed by the COE. Overflow from the settling pond will be released to the St.

Johns River through a standpipe and culvert. Fill runoff will be collected with other surface runoff from the plant site in a sedimentation pond before being discharged into the St. Johns River.

Sampling in the St. Johns River south of Blount Island indicates that there may be temporary localized changes in the water quality due to dredging activities necessary for construction of the proposed coal unloading facility. Anticipated water column effects will include slight increases in levels of certain chemical constituents in the dredge material discharge during active operation.

Table 4.4-1 allows a comparison between results of chemical analyses performed on the elutriate from the material to be dredged, the River water in the dredging area and in Blount Island Channel, and historical River quality data in the vicinity of the proposed dredging, for those parameters which exceed Class III water quality standards. Concentrations equal to or in excess of standards for cadmium, copper, lead, silver and possibly mercury (standard is less than reported analytical level of detection) were observed during dredging site water quality monitoring analyses (November 13, 1980). The elutriate test sampling procedure is described in Chapter 6, Section 6.2.4 while details of the boring program are discussed in Appendix E.

Results of the elutriate analyses approximate concentrations of constituents from the disposed dredged material at the time of discharge (complete results are included in Appendix C, Table C-35). Results presented in Table 4.4-1 do not account for dilution effects anticipated within a mixing zone in the St. Johns River. Thus, those parameters whose expected elutriate concentrations exceed Class III standards at the point of discharge (antimony, cadmium, copper, cyanide, lead, oil and grease, silver and possibly mercury), may not exceed standards beyond the mixing zone. The ambient silver concentration observed during the elutriate test, while much higher than any of the other observed values, was considered to be valid, based on quality control measures utilized in sampling and

analysis and a lack of any other reasons for disregarding the value. Results of a mixing zone model indicate that cadmium, copper, lead, mercury and silver could occur in concentrations greater than their respective Class III water quality criteria at the edge of a maximum sized mixing zone allowed by FDER regulations.

Other parameters included in Table 4.4-1 - aluminum, cyanide, iron, and mercury - were observed during pre-application monitoring at Transect F-2 in concentrations exceeding their respective water quality criteria (see Appendix C, Section C.5). Thus, there is potential for these additional constituents to exceed the standards during the active dredging operation. However, impacts on the receiving water are expected to be non-persistent and minor, given the limited duration of the dredging operation and the dispersion of constituents after discharge. As stated in Chapter 4, Section 5.8, variances or other relief from water quality standards will be requested for the parameters which, potentially, could be found in the River in excess of their respective water quality criteria as a result of dredging activities.

Where possible, dredging activities will be confined to the late fall and early winter, approximately November through early January. It is during these periods that ichthyoplankton and benthic macroinvertebrate densities are lowest (Chapter 2, Section 2.8.4.1 and 2.8.5.1, respectively), thus minimizing any impact to these communities. Likewise, the substrate exposed by dredging would be available for benthic macroinvertebrate colonization during the spring and summer peak spawning. It also is during these months that the commercial fishery in the area is at a low.

The material resulting from any subsequent maintenance dredging will also be pumped to the Quarantine Island disposal area if adequate capacity is available and permitted by the JPA and the COE. If not, an alternative existing spoil area to the north-northeast of the NGS will be used. This area, shown in Figure 4.4-5, was licensed for the dredging of the Blount

Island Channel adjacent to the NGS under the condition that the excess water, after sufficient settling to meet turbidity guidelines, be pumped back to the St. Johns River to avoid any impact on San Carlos Creek. This procedure will also be followed during the coal unloading facility maintenance dredging, as required.

4.4.1 Effects on Vegetation, Wildlife and Aquatic Life

4.4.1.1 Vegetation

Direct Losses

Construction of the proposed coal unloading facility and the associated rail loop on Blount Island will disturb approximately 86 acres of the vegetation community types identified on Table 4.4-2. The two community types with the largest total areas that would be disturbed are the Baccharis shrub and grassy scrub types. Approximately 14 acres of the Baccharis shrub community will be disturbed (Figure 4.4-6). This acreage represents 22 percent of the total area of this community type on Blount Island. Baccharis is considered to be a transitional species commonly found on disturbed areas. The loss of this amount of Baccharis shrub type is not considered to be a significant impact.

Approximately 46 acres of the grassy scrub type would be disturbed, representing 50.2 percent of the site. However, this acreage is only 8.2 percent of the total areal extent of the grassy scrub vegetation type on Blount Island. The grassy scrub vegetation type is comprised largely of weedy species on an area disturbed by spoil disposal. The loss of this vegetation type is not considered to be a major impact.

The 4.4 acres of Myrica shrub community that would be disturbed by construction of the coal unloading facility is 9.6 percent of the total area of this type on Blount Island and only 5.1 percent of the proposed coal unloading facility site. The Myrica shrub community type is not

common on Blount Island due to the industrial development and dredge spoil disposal practices. As such, the loss of 4.4 acres is not considered to be a serious adverse impact.

Approximately 2.8 acres of the mixed hardwood vegetation type would be disturbed by construction of the proposed rail loop. The 2.8 acres comprise 4.2 percent of the total amount of this vegetation type on Blount Island. This vegetation type is common along the banks of the St. Johns River and as such, the loss of only 2.8 acres is not considered to be significant.

Approximately 0.9 acres of salt marsh will be disturbed. The 0.9 acres is about 1 percent of the proposed coal unloading facility site and is 2.2 percent of the salt marsh occurring on Blount Island. The salt marsh is an important vegetation type, providing feeding, spawning and nesting areas for a variety of terrestrial and aquatic organisms. However, the loss of such a small amount as 0.9 acres of salt marsh is not considered to be a serious adverse impact.

The remaining 17.8 acres required for the construction of the proposed Blount Island facilities are characterized as open water, beach, or industrial. Each of these areas has already been disturbed and do not support any vegetation; as such, their loss is not significant from an ecological perspective.

Dusting

Dust emissions from construction activities may accumulate on the leaves of vegetation within the immediate vicinity of the construction activity. Although dust accumulations have been reported (Parish, 1910; Czaja, 1961; Spinka, 1971) to cause leaves to overheat during sunny periods and thereby cause premature leaf death, such impacts are not expected to be significant based on: (1) utilization of dust suppression measures such as paving of major access roads and periodic spraying with water; (2) the

small area affected; (3) the tendency for localization within the area of the activity; and (4) the frequency of rain showers, which would tend to wash off dust accumulations.

4.4.1.2 Wildlife

Impacts Due to Habitat Loss

Contruction of the proposed coal unloading facilities will result in the loss of approximately 86 acres of wildlife habitat. A large portion (70 percent) of the 86 acre area is characterized as Baccharis shrub and grassy scrub which are used primarily by certain bird species of which Ground and Mourning Doves, Mockingbirds, Blue Jays, Painted Buntings, and Rufous-sided Towhees were the most conspicuous. Birds are highly mobile and should adjust easily to the projected loss of habitat. Less mobile resident mammal, amphibian, and reptile populations may be lost. However, this will not have a significant impact when viewed from a regional perspective.

Noise Impacts

Increased noise levels associated with the construction phase are a potential problem. However, much of the area already supports various industrial and commercial activities with their associated noise. Therefore, the noise contributed by construction activities is not predicted to have a significant additional impact.

Impacts on Biologically Sensitive Areas

Least Tern Nesting Areas

No development is scheduled for any of the known Least Tern nesting areas (Figure 4.4-7). This species is reasonably tolerant of human activity and therefore should not be affected by the proposed

construction. With proper disposal, the dredge material produced during construction may create additional nesting habitat for this small tern. Downing (1973) during a study of Least Tern nesting areas, found that 80 percent were man-made and composed primarily of dredging and development spoil. Therefore, no significant impact is foreseen and a positive effect may result since disposal of dredge material will be timed so it does not disturb nesting birds.

Impacts on Commercially or Recreationally Valuable Species

Due to the restricted access, no species present on the proposed coal unloading site are considered commercially or recreationally valuable.

Impact on Endangered or Threatened Species

Wood Stork

Wood Storks were observed on several occasions feeding in various open water habitats on Blount Island. The proposed facility will not directly affect any of these areas. There is also an abundance of alternative feeding sites. Therefore, no significant impact is expected.

Least Tern

This species was discussed above.

4.4.1.3 Aquatic Life

Construction of the proposed coal unloading facility will have temporary effects on the aquatic flora and fauna of Blount Island and the Fulton-Dame Point Cutoff (Chapter 4, Section 4.1.7). The proposed coal unloading facility site is on previously deposited spoil. Important spawning or nursery areas for commercial or sport fisheries on or contiguous to the site (Chapter 2, Section 2.8.5) are absent. Fulton-Dame

Point Cutoff channel periodically is dredged by the Army Corps of Engineers. Spring and summer 1980 bottom samples show that the benthic fauna is depauperate (Chapter 2, Section 2.8.4.1). Therefore, loss of benthic habitat from construction of the proposed coal unloading facility is expected to have negligible effects.

Based on elutriate test results, ten water quality parameters are expected to exceed Class III standards in the dredge spoil discharge (Table 4.4-1). Toxicity information for these parameters are listed in Chapter 5, Table 5.1-5 and Appendix B, Tables B-22 through B-31 (oil and grease information is not listed since specific constituents cannot be predicted). Silver is the only parameter of these which exceeds the acute toxicity level (one-third of the 96 hr LC_{50}) of a significant indigenous species. As stated in Section 4.4.1, the concentration of silver in the water sample used for the elutriate test was uncharacteristically high. All of the parameters in excess of Class III standards will be at or near ambient levels within 150 meters. No significant biological effect due to this discharge is expected outside of the mixing zone. Since the dredging is anticipated to last approximately 3 months, no permanent biological effect is expected within the mixing zone.

4.4.2 Visually Sensitive Areas

There are no visually sensitive lands within the site boundaries of the proposed coal unloading facility. The aesthetic impact to visually sensitive lands within the vicinity of the proposed coal unloading facility are discussed in Chapter 5, Section 5.6.2.3.

4.4.3 New Roads

Access to the proposed coal unloading facility on Blount Island will be provided by use of existing traffic routes on the island. The main drive on Blount Island is controlled by the Jacksonville Port Authority. Crossing the St. Johns River at the north end of the island, the main drive

is routed down the west side of Blount Island and continues to the docks located at the southwest corner of the island as shown in Figure 4.4-1. Just before the docks there is a service road which runs east-west on the island. This road, which is paved for about the first quarter of a mile and then becomes a dirt road, will be improved and used to service the coal unloading facility. The rail line parallels the road and will also be used to serve the coal unloading facilities. Since existing routes are being used, the construction improvements to them are not expected to produce significant changes in surface water flow.

4.4.4 Erosion and Sedimentation

Accelerated erosion of the Blount Island coal handling site during facility construction will be controlled by compaction of embankments, early soil stabilization, limitation of exposed areas, maintenance of relatively flat grades, stabilized storm water flat grades, stabilized storm water outlets, and flat bottom ditches, as well as other appropriate erosion control techniques.

Sedimentation will be controlled during construction by use of sediment control basins and traps, filter berms, straw bales, perforated user pipes at drainage structures, or other applicable devices as appropriate.

4.4.5 Land Use

The coal unloading facility should have very little impact on the surrounding area. The impact will be negligible since most of Blount Island is devoted to industrial or transportation land uses. The island is used by numerous shipping firms. The largest single use of Blount Island is as a receiving port by foreign car dealers, and serves as a storage area for automobiles. While this storage function takes place on the west side of the island, the east side is occupied by Offshore Power Systems. The center of Blount Island is not currently in use but has been cleared and graded.

Because most of Blount Island has been graded, there are no historic, cultural or archeologically significant features believed to exist.

4.4.6 Viewshed

The visual impacts of the coal unloading facility proposed for Blount Island are discussed in Chapter 5, Section 5.6.2.3.

4.4.7 Mitigating Measures

Spoil from dredging activities at the coal unloading facilities will be disposed of in previously spoiled areas that have been specifically designated and licensed for this purpose. Blount Island and Fulton-Dame Point Cutoff exist as an engineered rather than natural system. All water draining from dredge spoil deposit areas will be controlled by earth berms and routed to a settling pond or ponds before being discharged. Dredge spoil discharge water will be monitored as described in Chapter 6, Section 6.3 and will meet applicable state standards for Class III waters. However, variances or other relief for several parameters will be sought in those cases where the ambient receiving waters exceed the standards.

4.4.8 References

Czaja, A.T., 1961. Zementstaubwir - Kungen auf Pflanzen: Die Enstehung der Zementkrusten. Qual. Plant Mater Veg. 8:201-238.

Downing, R.L., 1973. A Preliminary Nesting Survey of Least Terns and Black Skimmers in the East. American Birds 27:946-949.

Parish, S.B., 1910. The Effects of Cement Dust on Citrus Trees. Plant World. 13:288-291.

Spinka, J., 1971. Effects of Polluted Air on Fruit Trees and Legumes. Ziva 19:13-15.

Table 4.4-1 (Revision 1)

ELUTRIATE TEST RESULTS FOR CHEMICAL PARAMETERS
EXCEEDING CLASS III WATER QUALITY STANDARDS

Parameter	Class III Standards ^a	Ambient Concentration Dredging Area Water ^b (11/13/80)	Blount Island Elutriate Data (11/13/80)			Blount Island Channel Sta. F2 ^d		Historical Conditions ^e
			BI-4 ^c	Percent Above Ambient	BI-6 ^c	Percent Above Ambient	Mean	Max.
Aluminum, mg/l	1.5	0.033	0.033	0	0.066	100	0.613	3.34 ^f
Antimony, mg/l	0.2	0.18	0.23 ^f	27.8	0.23 ^f	27.8	<0.0002	0.0009
Cadmium, ug/l	5.0	8.2 ^f	11 ^f	34.1	10 ^f	22	0.25	0.7
Copper, mg/l	0.015	0.015 ^f	0.017 ^f	13.3	0.017 ^f	13.3	0.074 ^f	0.185 ^f
Cyanide, mg/l	0.005	<0.002	<0.010 ^f	-	<0.010 ^f	-	0.007 ^f	0.031 ^f
Iron, mg/l	0.30	0.12	0.16	33.3	0.13	8.3	0.767 ^f	2.2 ^f
Lead, mg/l	0.05	0.062 ^f	0.072 ^f	16.1	0.072 ^f	16.1	0.0001	0.009
Mercury, ug/l	0.10	<0.2 ^f	<0.2 ^f	-	<0.2 ^f	-	<0.22 ^f	0.4 ^f
Oil and Grease, mg/l	5.0	3.6	6.0 ^f	66.7	5.0 ^f	38.9	1.7	3.2
Silver, mg/l	0.05	6.1 ^f	7.9 ^f	29.5	8.4 ^f	37.7	<0.16 ^f	0.25 ^f

- a See Table 2.5-1
b Water sample taken in Fulton Dam Point Channel in the area where core samples for elutriate testing were collected.
c Locations BI-4 and BI-6 are shown on Figure E-19.
d Concentrations at Station F2 observed during pre-application monitoring program, 11/79-10/80.
e See Station 11, Table C-23 and Figure 2.5-13.
f Exceeds Class III water quality standards

Table 4.4-2

**AREAL SUMMARY OF VEGETATION COMMUNITY TYPES TO BE AFFECTED
BY CONSTRUCTION OF THE PROPOSED COAL UNLOADING FACILITY**

Vegetation Community Type	Area Affected (Ac)			Total Area on Blount Island (Ac)	Total Area Not Affected (Ac)	Percent of Total Area on Blount Island Affected ^b
	Coal Handling and Storage	Rail Loop ^a	Rail Car Unloading Area			
Mixed hardwood	0.0	2.8	0.0	65	62.3	4.2
Baccaharis shrub	13.3	0.8	0.0	63	48.9	22.3
Grassy scrub	29.8	15.3	1.0	560	513.9	8.2
Myrica shrub	1.6	2.8	0.0	45	40.6	9.6
Salt marsh	0.9	0.0	0.0	40	39.1	2.2
Open (water/beach)	1.7	0.0	0.0	115	113.3	1.5
Industrial	7.6	8.5	0.0	620	603.9	2.6
Total	54.9	30.2	1.0	1508	1422	5.7

^a Assumes a 100 foot right-of-way

^b Total area of each vegetation type within Blount Island

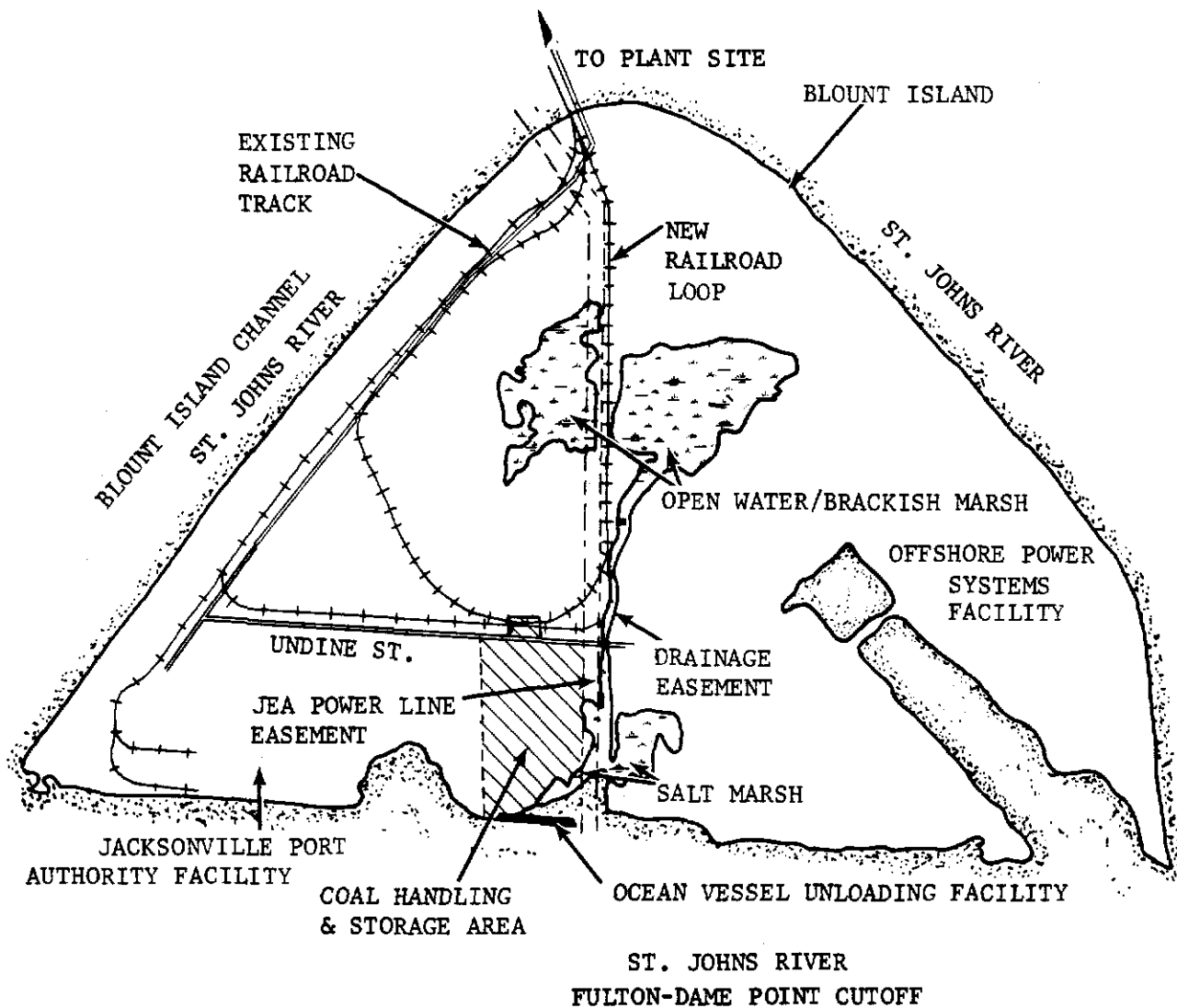


Figure 4.4-1

Coal Unloading Facility Location

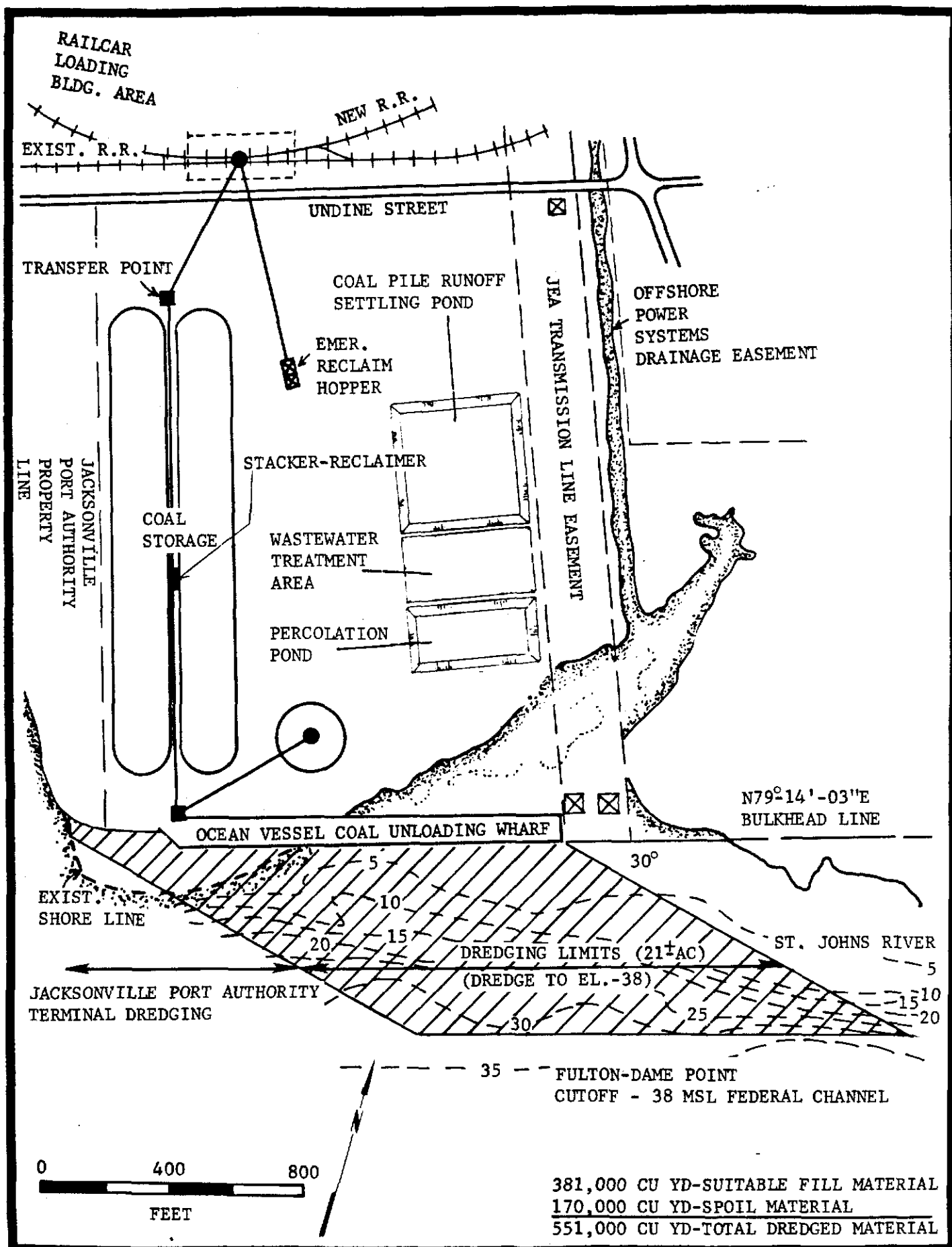


Figure 4.4-2 Coal Unloading Facility Layout and Dredging Plan

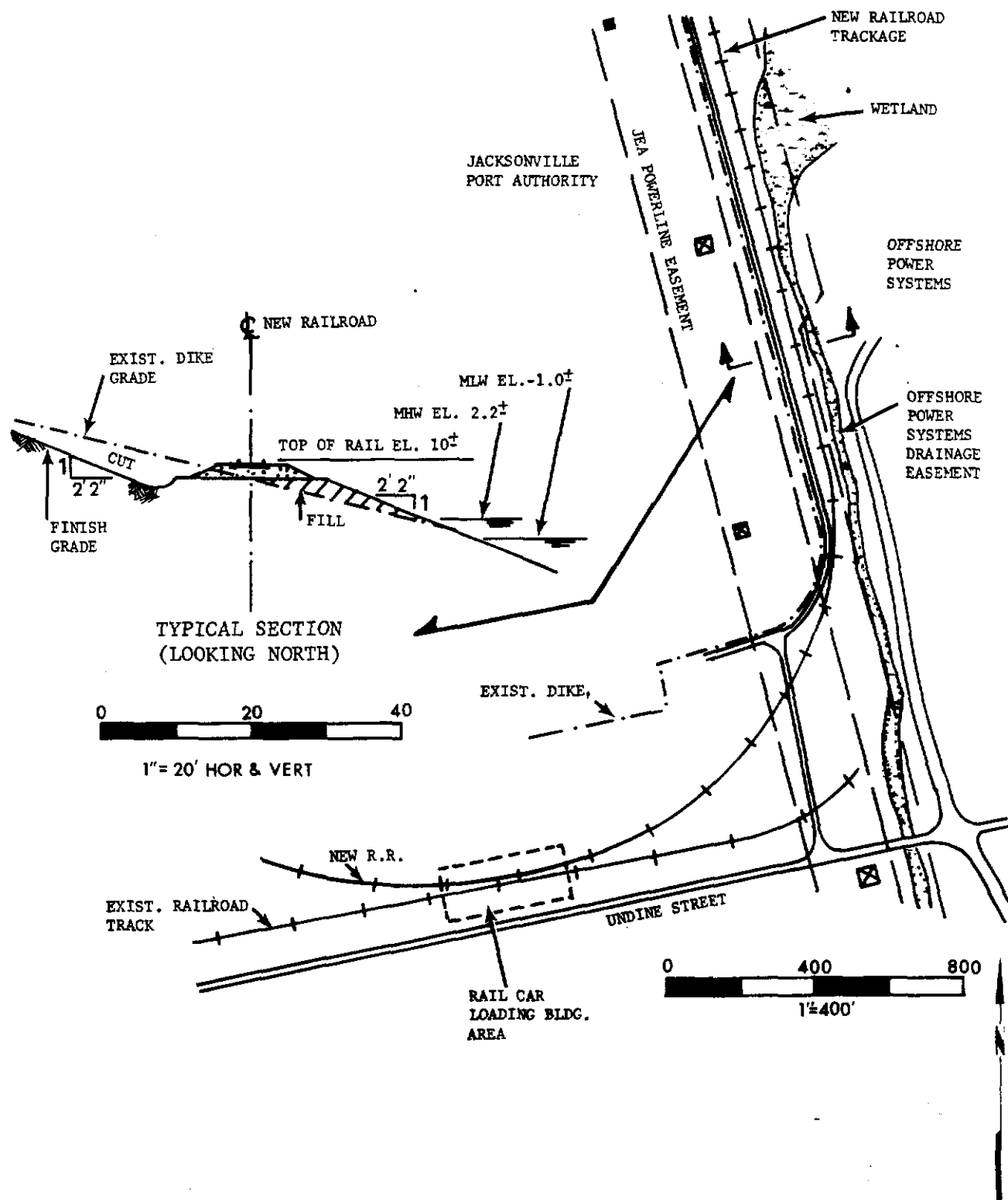


Figure 4.4-3

Coal Unloading Facility Trackage

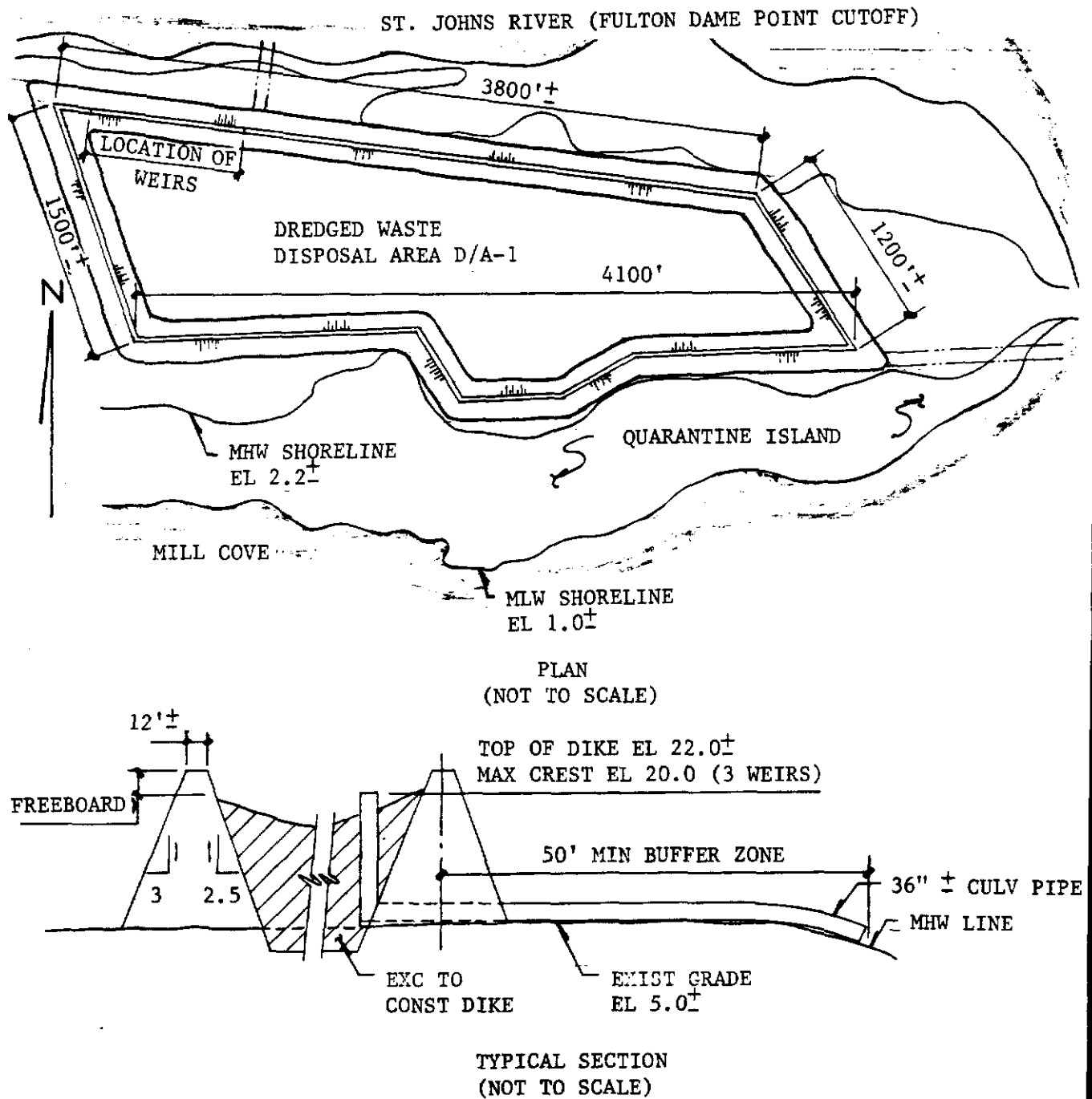
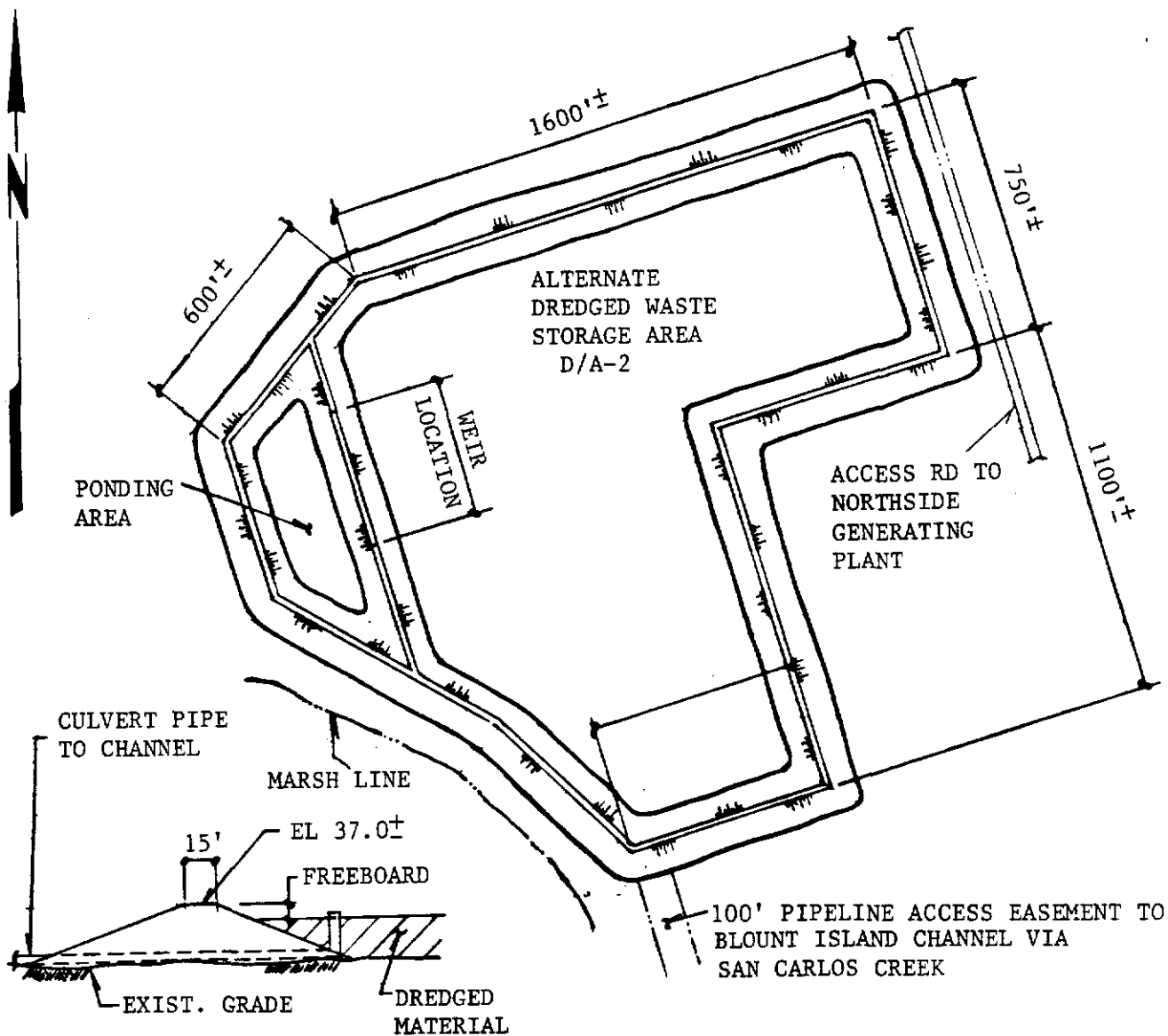


Figure 4.4-4 Dredge Spoil Disposal Area



LOCATION SHOWN ON FIGURE 4.3-3

Figure 4.4-5

Alternate Maintenance Dredge Spoil Disposal Area

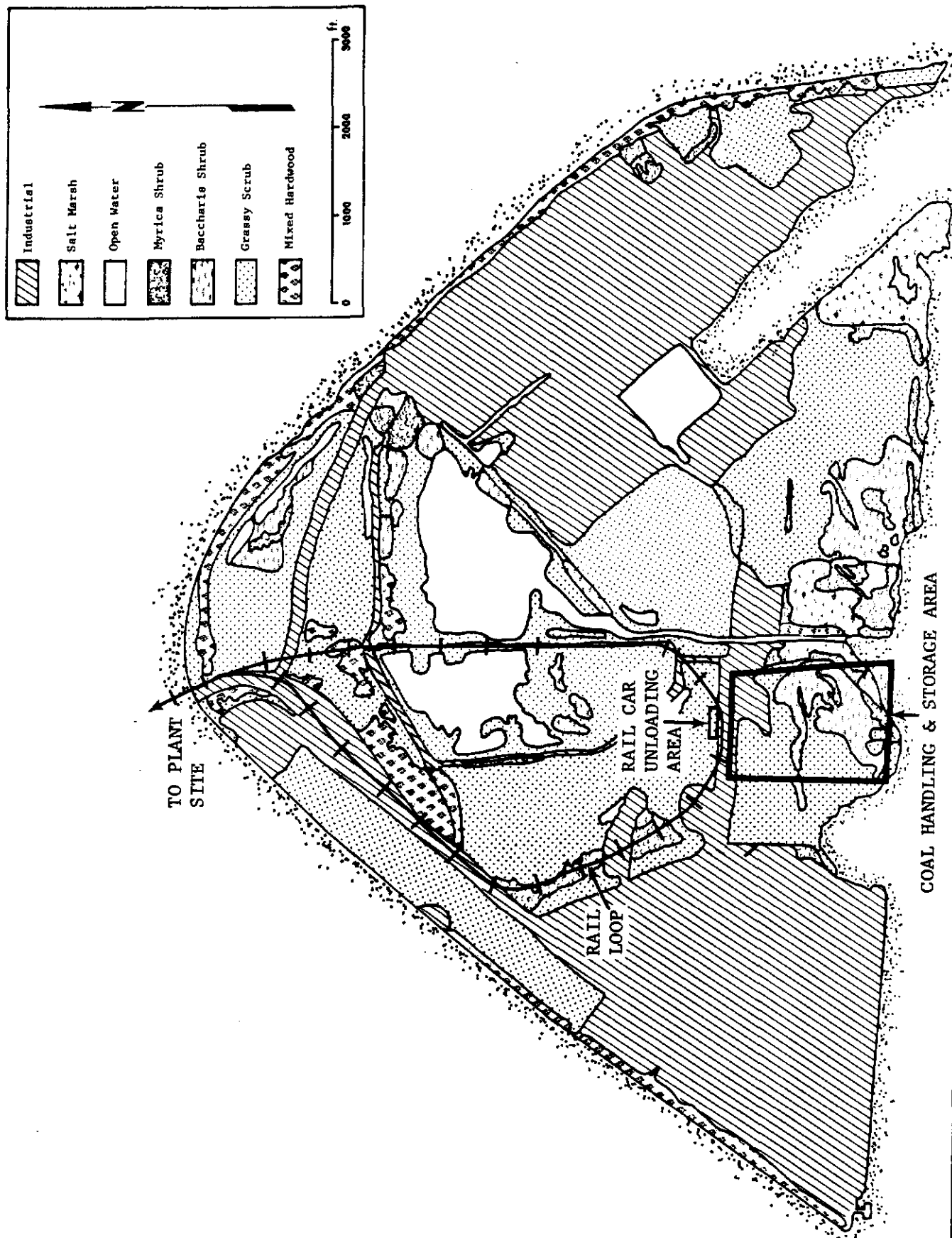
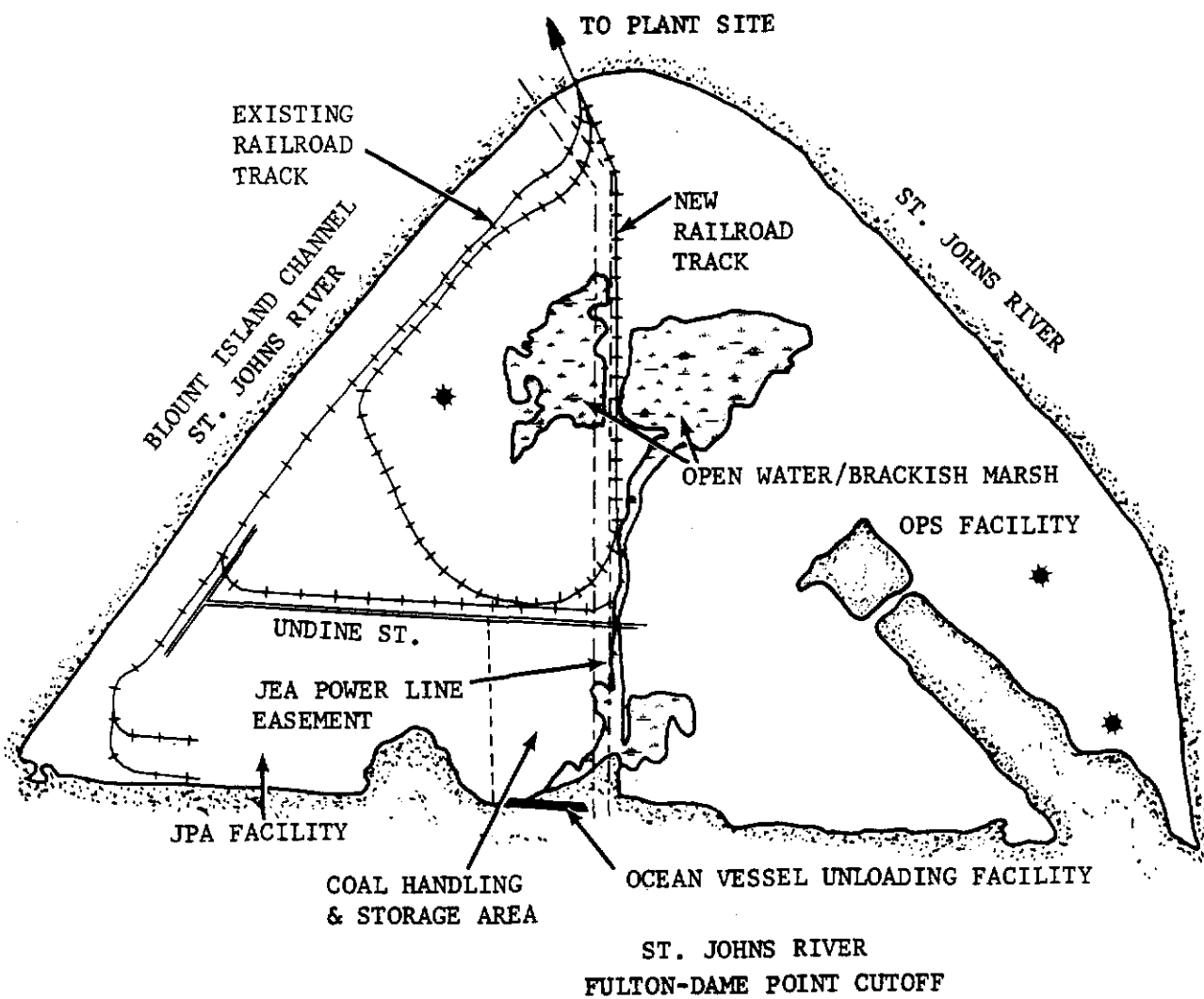


Figure 4.4-6

Location of Facility Components on Blount Island
in Relation to Vegetation Community Types



JPA-JACKSONVILLE PORT AUTHORITY
OPS-OFFSHORE POWER SYSTEMS

★ Least Tern Nesting Areas



Figure 4.4-7 Least Tern Nesting Areas on Blount Island

4.5 RESOURCES COMMITTED

A total of 1,711 acres of mostly vacant land will be impacted by the construction of the proposed plant and the coal unloading facility. The 2005 Comprehensive Plan by the Jacksonville Area Planning Board indicates that the site is in an area designated for port related industrial uses, therefore qualifying for the construction of a generating facility. The site is presently zoned for heavy industry, although the land in the site area is not currently being used as such. However, the NGS is adjacent to the site and is an industrial use. Construction of the proposed plant would preclude the use of this land by another industry during its 40 year life.

Eight hundred and ninety-six acres of wildlife habitat will be lost for at least the 40 year operational life of the proposed plant. An additional 55 acres will be lost by construction of the proposed coal unloading facility. The affected habitat types are regionally abundant with no observed unique wildlife characteristics. The acreages of each community type committed are presented in Chapter 4, Tables 4.1-1 and 4.4-1.

Construction of the proposed plant will result in 896 acres of potential hunting habitat being lost for at least the 40 year operational life of the facility. Although population levels of game species are low and only one group of hunters was observed on the proposed plant site during the monitoring program, the area has a certain significance as a hunting resource when viewed in light of development in Duval County.

Certain of the less mobile mammalian, amphibian and reptilian populations will be destroyed during site preparation and plant construction. No wildlife species that is currently listed as endangered or threatened on either the state or federal list will be adversely affected with the possible exception of the gopher tortoise. A proposed tortoise relocation project, if feasible, would lessen the impact on this species of special concern. All other expected losses are not significant from a regional perspective.

There are four archeologically sensitive areas within the site boundaries that will be lost, in part or in total, due to construction activities. These are described in more detail in Appendix J. These sites have been studied to record their contents. Recovered material and records will be stored at the Florida Division of Archives History and Records Management.

Construction of the proposed plant will result in approximately 88.3 acres of wetland type vegetation being disturbed. However, 202 acres will remain undisturbed. The types and amounts of wetlands affected are presented in Table 4.5-1.

Commitment of resources that will be irretrievable will include the use of materials and energy to construct the facilities.

Table 4.5-1 (Revision 1)

WETLAND VEGETATION COMMUNITY ACREAGES AFFECTED

<u>Wetland Type</u>	<u>Area Disturbed (Acres)</u>	<u>Area Undisturbed (Acres)</u>
A. Plant Site		
Bottomland Hardwood	0.0	79.9
Cypress Swamp	32.6	7.5
Hardwood Swamp	33.0	67.8
Bayhead	22.7	5.6
Salt Marsh	0.0	41.1
Total	88.3	201.9
B. Coal Unloading Site		
Salt Marsh	0.00	4.4
Total	0.00	4.4

Table 4.5-1

WETLAND VEGETATION COMMUNITY ACREAGES AFFECTED

<u>Wetland Type</u>	<u>Area Disturbed (Acres)</u>	<u>Area Undisturbed (Acres)</u>
A. Plant Site		
Bottomland Hardwood	1.6	78.3
Cypress Swamp	35.2	4.9
Hardwood Swamp	29.6	70.4
Bayhead	25.1	3.2
Salt Marsh	0.0	41.0
Total	91.5	197.8
B. Coal Unloading Site		
Salt Marsh	0.00	4.4
Total	0.00	4.4