

APPLICANT INFORMATION

Applicant's Official Name: Tampa Electric Company

Address: Post Office Box 111, Tampa, Florida 33601-0111

Address of Official Headquarters: 702 North Franklin Street,
Tampa, Florida 33602

Business Entity (corporation, partnership, cooperative): Corporation

Names, Owners, etc.: Tampa Electric Company

Name and Title of Chief Executive Officer: G.F. Anderson, President

Name, Address, and Phone Number of Official Representative

Responsible for Obtaining Certification: A. Spencer Autry, Director,

Environmental, Tampa Electric Company, P.O. Box 111, Tampa, Florida 33601-0111
813/228-4111

Site Location (County): Polk County, Florida

Nearest Incorporated City: Bowling Green

Latitude and Longitude: Latitude 27° 43' 43", Longitude 81° 59' 23"

UTMs Northerly: 3067.35

UTMs Easterly: 402.45

Section, Township, Range: All or portions of Sections 1 through 4 and
7 through 12, Township 32 South, Range 23 East and Sections 34 and 35,

Township 31 South, Range 23 East

Location of Any Directly Associated Transmission Facilities

(Counties): Polk County

Name Plate Generating Capacity: 1,150 megawatts (nominal net)

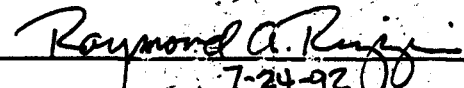
Capacity of Proposed Additions and Ultimate Site Capacity (where applicable): 1,150 megawatts (nominal net)

**SITE CERTIFICATION APPLICATION
FOR
TAMPA ELECTRIC COMPANY
POLK POWER STATION PROJECT**

Environmental Consulting &
Technology, Inc.
5200 Newberry Road, Suite E-1
Gainesville, Florida 32607


7/25/92
Thomas W. Davis, P.E.
Florida No. 36777

United Engineers & Constructors, Inc.
30 South 17th Street
Philadelphia, Pennsylvania 19101


7-24-92
Raymond A. Rizzi, P.E.
Florida No. 21834

Tampa Electric Company
702 North Franklin Street
Tampa, Florida 33602

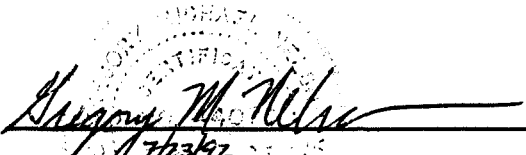

7/23/92
Gregory M. Nelson, P.E.
Florida No. 44078

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LIST OF ACRONYMS

7Q10	7-day, 10-year flow rate
AADT	average annual daily trips
AAQS	ambient air quality standard
ACSR	aluminum conductor steel reinforced
Agrico	Agrico Chemical Company
AM	amplitude modulation
A/RR	Agricultural/Residential Rural
ASTM	American Society for Testing and Materials
BACT	best available control technology
BEBR	Bureau of Economic and Business Research
BLIS	BACT/LAER information system
BOCC	Board of County Commissioners
BOD	biochemical oxygen demand
Btu	British thermal unit
Btu/ft ³	British thermal units per cubic foot
Btu/gal	British thermal units per gallon
Btu/lb	British thermal units per pound
°C	degree Celsius
CaCO ₃	calcium carbonate
CC	combined cycle
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CFRPC	Central Florida Regional Planning Council
cfs	cubic foot per second
CG	coal gasification
CGCU	cold gas cleanup
CITES	Convention on International Trade in Endangered Species
cm	centimeter
cm/sec	centimeter per second

LIST OF ACRONYMS
(Continued, Page 2 of 8)

CO	carbon monoxide
CO ₂	carbon dioxide
COD	chemical oxygen demand
COS	carbonyl sulfide
CPT	cone penetration test
CR	County Road
CS ₂	carbon disulfide
CSM	cubic foot per second per square mile
CT	combustion turbine
CUP	Conditional Use Permit
CWA	Clean Water Act
°	degree
d	Shannon Weaver diversity index
dBA	A-weighted decibel
dbh	diameter at breast height
DO	dissolved oxygen
DOE	U.S. Department of Energy
DSM	demand-side management
ECT	Environmental Consulting & Technology, Inc.
EEL	Edison Electric Institute
EIS	environmental impact statement
EIV	Volume of Environmental Information
EMF	electromagnetic field
EMS	emergency medical services
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
°F	degree Fahrenheit
F.A.C.	Florida Administrative Code
FCC	Federal Communications Commission

LIST OF ACRONYMS
(Continued, Page 3 of 8)

FCG	Florida Electric Power Coordinating Group
FCREPA	Florida Committee on Rare and Endangered Plants and Animals
FDACS	Florida Department of Agriculture and Consumer Services
FDCA	Florida Department of Community Affairs
FDER	Florida Department of Environmental Regulation
FDER/PSES	FDER Point Source Evaluation Section
FDHR	Florida Division of Historical Resources
FDLES	Florida Department of Labor and Employment Security
FDNR	Florida Department of Natural Resources
FDOT	Florida Department of Transportation
FEECA	Florida Energy Efficiency and Conservation Act
FEMA	Federal Emergency Management Agency
FEPPSA	Florida Electrical Power Plant Siting Act
FGD	flue gas desulfurization
FGFWFC	Florida Game and Fresh Water Fish Commission
FGS	Florida Geological Survey
FGT	Florida Gas Transmission Company
FLUCCS	Florida Land Use and Cover Classification System
FLUCFS	FDOT Land Use, Cover, and Forms Classification System
FM	frequency modulation
FNAI	Florida Natural Areas Inventory
FPC	Florida Power Corporation
FPSC	Florida Public Service Commission
FR	Federal Register
F.S.	Florida Statutes
FSRI	Florida Sinkhole Research Institute
ft	foot
ft bls	foot below land surface
ft/day	foot per day

LIST OF ACRONYMS
(Continued, Page 4 of 8)

ft ² /day	square foot per day
ft ³ /day	cubic foot per day
ft ³ /day/ft ³	cubic foot per day per cubic foot
ft/ft	foot per foot
ft ³ /hr	cubic foot per hour
ft-msl	foot above mean sea level
ft-NGVD	foot national geodetic vertical datum
FTE	full-time equivalent
GE	General Electric Company
GEESI	General Electric Environmental Systems, Inc.
gpd	gallon per day
gpm	gallon per minute
gpm/ft	gallon per minute per foot
gpm/ft ²	gallon per minute per square foot
gr/scf	grains per standard cubic foot
gr/100 scf	grains per 100 standard cubic feet
H ₂ S	hydrogen sulfide
H ₂ SO ₄	sulfuric acid
HGCU	hot gas cleanup
HHV	higher heating value
HRSR	heat recovery steam generator
HUD	Housing Urban Development
IGCC	integrated coal gasification combined cycle
IWTP	industrial wastewater treatment plant
kg	kilogram
km	kilometer
kV	kilovolt
kV/m	kilovolt per meter
kw	kilowatt

LIST OF ACRONYMS
(Continued, Page 5 of 8)

kwh	kilowatt hour
LAER	lowest achievable emission rate
lb/day	pound per day
lb/ft ³	pound per cubic foot
lb/hr	pound per hour
lb/MMBtu	pound per million British thermal units
L _{dn}	day-night sound level
L _{eq}	equivalent noise level
L _{eq} (24)	equivalent sound level for 24-hour periods
LHV	lower heating value
LOLP	loss of load probability
LOS	level of service
LRU	logical reclamation unit
m	meter
m ²	square meter
MCR	maximum current rating
mG	milligauss
mg/L	milligram per liter
MGD	million gallons per day
mi ²	square mile
mL	milliliter
mph	miles per hour
MVA	megavolt amperes
MW	megawatt
NAS	National Audubon Society
NEPA	National Environmental Policy Act of 1969
NESC	National Electrical Safety Code
NESHAPS	National Emission Standard for Hazardous Air Pollutants
NGVD	National Geodetic Vertical Datum

LIST OF ACRONYMS
(Continued, Page 6 of 8)

NH ₃	ammonia
NO ₂	nitrogen dioxide
NO _x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NSCR	non-selective catalytic reduction
NSPS	new source performance standards
NSR	New Source Review
NTU	nephelometric turbidity unit
NWS	National Weather Service
O ₃	ozone
OAQPS	Office of Air Quality Planning and Standards
organisms/m ²	organisms per square meter
PCB	polychlorinated biphenyl
pCi/L	picoCurie per liter
persons/mi ₂	persons per square mile
PHX	primary heat exchanger
PM	particulate matter
PM ₁₀	particulate matter less than or equal to 10 micrometers aerodynamic diameter
POS	plan of study
POTW	publicly owned treatment works
ppb	part per billion
ppm	part per million
ppmv	part per million volumetric
ppmvd	dry volume parts per million
PRECO	Peace River Electric Cooperative
PSD	prevention of significant deterioration
psia	pound per square inch absolute
psig	pound per square inch gauge

LIST OF ACRONYMS
(Continued, Page 7 of 8)

Pt-Co	platinum-cobalt
PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
R-1	Residence
RC	Rural Conservation
RCC	Rural-Cluster Center
R.O.	reverse osmosis
RCRA	Resource Conservation and Recovery Act
RMD	Rural Mixed-Use Development
rpm	revolutions per minute
RRD	Rural Residential
RV	recreational vehicle
SARA	Superfund Amendment and Reauthorization Act
SCA	Site Certification Application
scf	standard cubic foot
SCR	selective catalytic reduction
SCS	Soil Conservation Services
SF-1M	Single Family-Mixed
SIC	Standard Industrial Classification
SMSA	Standard Metropolitan Statistical Area
SNCR	selective non-catalytic reduction
SO ₂	sulfur dioxide
SO ₃	sulfur trioxide
SOP	standard operating procedure
SPCC	Spill Prevention, Control, and Countermeasure
SPT	standard penetration test
SR	State Road
ST	steam turbine
stpd	short-tons per day

LIST OF ACRONYMS
(Continued, Page 8 of 8)

SUS	Saybolt Universal seconds
SWFWMD	Southwest Florida Water Management District
TCLP	toxicity characteristic leaching procedure
TDS	total dissolved solids
Texaco	Texaco, Inc.
tpd	ton per day
tpy	ton per year
TSP	total suspended particulate
TSS	total suspended solids
UE&C	United Engineers & Constructors
$\mu\text{g/L}$	microgram per liter
$\mu\text{g/m}^3$	microgram per cubic meter
$\mu\text{mhos/cm}$	micromhos per centimeter
U.S.C.	United States Code
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator
VOC	volatile organic compound
WUP	water use permit

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CHAPTER 1.0

NEED FOR POWER AND THE PROPOSED FACILITIES

1.1 INTRODUCTION

Tampa Electric Company is an investor-owned electric utility which serves west-central Florida, primarily Hillsborough County and portions of Polk, Pasco, Pinellas, and Highlands Counties (see Figure 1.1.0-1). Currently, Tampa Electric Company serves more than 467,000 residential, commercial, industrial, and governmental Customers within its service area. Tampa Electric Company's system has an installed net electric generating capacity of 3,281 megawatts (MW) from 24 generating units located at five different sites--Big Bend, Gannon, Hookers Point, Phillips, and Dinner Lake stations.

As a public utility, Tampa Electric Company has the obligation to provide reliable and economical electric power service to its existing and future Customers. To meet this obligation, Tampa Electric Company conducts ongoing, long-range power resource planning and load (i.e., demand) forecasting programs to predict its future power supply needs and to evaluate available options to meet these needs. These programs also consider Tampa Electric Company's extensive efforts to encourage conservation, load management programs, and cogeneration projects to reduce future power needs. As a result of these programs, Tampa Electric Company has determined the need for approximately 1,150 MW of new electric generating capacity (i.e., new power plant facilities) to meet its Customer power demands beginning in the mid-1990s and continuing into the early 21st century. These additional power supply needs are primarily based on future electricity demands created by ongoing and projected population growth within its service area.

Tampa Electric Company is proposing to license/permit, construct, and operate the needed, new power plant and associated facilities on an approximately 4,348-acre site in southwest Polk County, Florida. Figure 1.1.0-2 shows the location of the site within the State of Florida. The proposed facilities will be known as the Tampa

**POLK
POWER
STATION**

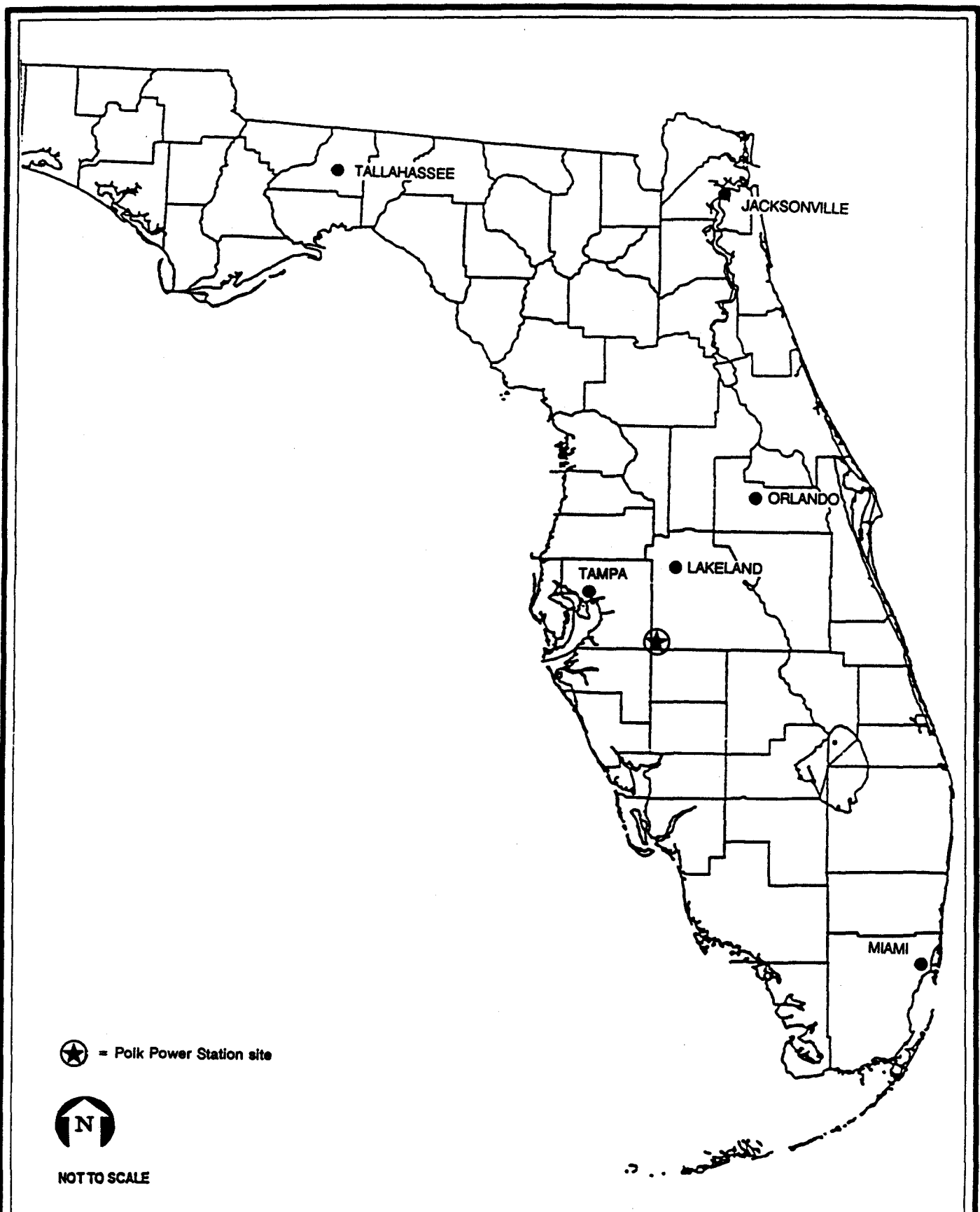


FIGURE 1.1.0-2.

LOCATION OF THE POLK POWER STATION WITHIN
THE STATE OF FLORIDA

Source: ECT, 1992.

 **TAMPA
ELECTRIC**
A TECO ENERGY COMPANY

**POLK
POWER
STATION**

Electric Company Polk Power Station. The total generating capacity of the units at the site will be approximately 1,150 MW. The generating units planned for the Polk Power Station will be developed at the site according to a phased schedule which matches Tampa Electric Company's forecasted growth in electricity demands beginning in 1995 and continuing into the year 2010. The first generating facilities at the Polk Power Station site will be an integrated coal gasification combined cycle (IGCC) demonstration project developed by Tampa Electric Company and supported in part through funding from the U.S. Department of Energy (DOE) under the Clean Coal Technology Demonstration program. The coal-fueled IGCC unit will consist of a nominal net 150-MW advanced combustion turbine (CT), fueled by low sulfur No. 2 fuel oil during the first year of operation in 1995. Heat recovery steam generator (HRSG), steam turbine (ST), and coal gasification (CG) facilities will be added and integrated with the advanced CT a year later to complete the nominal net 260-MW IGCC unit. After integration of these facilities, the IGCC unit will be fueled by coal-derived gas (i.e., called coal gas or syngas) which is produced in the CG facilities, with low sulfur No. 2 fuel oil as a backup fuel. This IGCC unit will be known as Polk Unit 1. Tampa Electric Company's current Power Resource Plan indicates that later facilities will consist of two combined cycle (CC) generating units and six simple-cycle CTs fueled by natural gas with low sulfur No. 2 fuel oil as the backup fuel.

Tampa Electric Company is proposing to license the Polk Power Station site for all the currently planned electric generating units (i.e., total nominal net generating capacity of 1,150 MW) and associated facilities. Therefore, all generating units and associated facilities planned for the ultimate site capacity are the subject of this Site Certification Application (SCA).

1.2 PURPOSE OF THE SITE CERTIFICATION APPLICATION

The licensing or permitting of power plants and associated transmission lines and facilities in Florida requires compliance with applicable federal, state, and local laws, regulations, and ordinances. The two most comprehensive laws governing the licensing of the Tampa Electric Company Polk Power Station project are the Florida Electrical Power Plant Siting Act (FEPPSA), Section 403.501-403.519, Florida Statutes (F.S.), and the National Environmental Policy Act of 1969 (NEPA), 42 United States Code (U.S.C.) 4321 *et seq.*

FEPPSA establishes the policy of the state to balance the need for new power plant facilities with the potential effects of the facility construction and operation on human health, welfare, and environmental resources of the state in conjunction with state and local agency permit decisions and recommendations regarding the proposed facilities. To implement this policy, FEPPSA established a centrally coordinated permit application, agency review, and approval process known as the site certification process. Within the site certification process, the Florida Public Service Commission (FPSC) is the exclusive forum for the determination of need for the proposed plant based on electric system reliability and integrity considerations and whether the proposed plant is the most cost-effective alternative to provide the needed power. The certification proceedings are initiated by the applicant filing an SCA with the Florida Department of Environmental Regulation (FDER) which administers and centrally coordinates the process with affected agencies, governmental entities, other parties, and the applicant. The process concludes with the approval or certification of the power plant and associated facilities by the Governor and Cabinet, sitting as the Siting Board. The FDER procedures for implementing FEPPSA are contained in Chapter 17-17, Florida Administrative Code (F.A.C.).

In accordance with FEPPSA, FDER is required to notify all affected or other agencies of the filing of the SCA, ensure the timely distribution of copies of the SCA and any amendments to the application by the applicant to the affected agencies, and establish a schedule of dates for submission of inputs and reports from affected

agencies during the certification process. Inputs requested by FDER from affected agencies include statements of issues, reports on the sufficiency of the SCA, requests for supplemental information, and reports on the consistency or compliance of the proposed project with applicable policies and regulatory requirements within their jurisdictions. Under FEPPSA, the affected agencies are also statutory parties to the certification hearing to be held on the SCA. For the Tampa Electric Company Polk Power Station project, the affected agencies in the certification process designated under FEPPSA requirements include:

- FDER,
- FPSC,
- Florida Department of Community Affairs (FDCA),
- Florida Department of Natural Resources (FDNR),
- Florida Game and Fresh Water Fish Commission (FGFWFC),
- Southwest Florida Water Management District (SWFWMD),
- Central Florida Regional Planning Council (CFRPC), and
- Polk County.

NEPA provides the basic national charter for protection of the environment. NEPA establishes national policy, sets goals, and provides means for carrying out the policy. Under NEPA provisions, federal agencies have the responsibility to consider the environmental consequences of actions or decisions which may significantly affect the quality of the human environment. The Council on Environmental Quality (CEQ) has promulgated regulations for implementing the provisions of NEPA by establishing uniform procedures that must be followed by all federal agencies [Code of Federal Regulations (CFR), Chapter 40, Parts 1500 through 1508]. DOE has also promulgated regulations and guidelines for the implementation of NEPA under NEPA and CEQ requirements [10 CFR 1021 and 52 Federal Register (FR) 47662, December 15, 1987]. In accordance with these regulations, DOE has determined that certain decisions to fund or share in costs for projects under programs which it administers are major federal actions subject to NEPA regulations.

DOE has committed to provide a portion of the funding for the IGCC generating facilities at the Polk Power Station through the Clean Coal Technology Demonstration program under a cooperative agreement with Tampa Electric Company. Further, DOE has determined that the decision to provide partial funding for the Tampa Electric Company project is an action subject to NEPA regulations. To fulfill its responsibilities under NEPA, DOE is required to prepare an Environmental Impact Statement (EIS) for the Tampa Electric Company Polk Power Station project. DOE will be the lead federal agency, while other federal agencies such as the U.S. Environmental Protection Agency (EPA) will participate with DOE in the EIS preparation as cooperating agencies. In implementing its NEPA responsibilities and procedures, DOE publishes a Notice of Intent to prepare an EIS for the Polk Power Station project and to conduct a public scoping meeting. The purposes of the public scoping meeting are to receive public and affected agency comments on significant environmental issues and concerns associated with the proposed project and the scope of the EIS.

Typically, the DOE EIS is based on information provided by the project sponsor in a document called a Volume of Environmental Information (EIV) prior to the public scoping meeting for the project. Tampa Electric Company submitted the EIV for the project to DOE in early June 1992 (Tampa Electric Company, 1992a). However, some of the detailed engineering, design, and environmental studies for the Polk Power Station project were still in progress when the EIV was submitted to DOE by Tampa Electric Company. Therefore, the final results of these detailed studies which are included in this SCA, as well as the EIV, will be used by DOE to fully assess the environmental consequences of and potential alternatives to the Polk Power Station project in preparation of the EIS.

It is expected that EPA, Region IV will determine that the three ST electric generating units proposed for the Polk Power Station project will be "new sources," as defined by Section 306 of the Clean Water Act (CWA), as amended (33 U.S.C. 1251 *et seq.*). The ST electric generating units are components of the IGCC unit and

the two CC units planned for the project. In addition, it is expected that EPA will determine that the CG facilities associated with the IGCC unit are not new sources since there are no new source performance standards (NSPS) applicable to CG facilities. As new sources, the construction and operation of the ST electric generating units which are components of the overall project will require a National Pollutant Discharge Elimination System (NPDES) permit from EPA. Tampa Electric Company has submitted an NPDES permit application for the project to EPA. This NPDES permit application is provided in Appendix 11.1.1 of this SCA.

The issuance of an NPDES permit would be a major federal action which is also subject to the provisions of NEPA and would require preparation of an EIS under the requirements of EPA. To fulfill both of their responsibilities under NEPA, DOE and EPA entered into a memorandum of understanding whereby DOE, as lead federal agency, will prepare the EIS in cooperation with EPA. Other federal agencies which may also participate with DOE as cooperating agencies in the EIS preparation for the proposed Polk Power Station project include the U.S. Army Corps of Engineers (USACE) pursuant to Section 404 of the CWA which requires permits for dredge-and-fill activities in Waters of the United States, and the U.S. Fish and Wildlife Service (USFWS) pursuant to its consultation requirements under Section 7 of the Fish and Wildlife Coordination Act of 1934, as amended, and the Endangered Species Act of 1973, as amended.

Thus, the purpose of this SCA is to provide a single, comprehensive environmental document for the Tampa Electric Company Polk Power Station project which will be submitted to FDER, other state and local agencies, and to DOE and EPA to fulfill the requirements of FEPPSA and NEPA as well as other applicable laws and regulatory requirements. This SCA provides the most currently available and detailed engineering and environmental information regarding the Tampa Electric Company Polk Power Station project. Information in the SCA includes descriptions of the existing environmental conditions on the proposed site and its vicinity and of the proposed power plant and associated facilities, assessments of the expected effects

of the facility construction and operation, and discussions of alternatives considered for the proposed project and site. The SCA has been prepared and complies with the regulatory, procedural, and informational requirements for the application under FEPPSA and FDER implementation procedures and instruction guide for certification applications [FDER Form 17-1.211(1), F.A.C.]. In addition, the SCA and supporting data have been developed in accordance with the scope, quantity, and specificity of information presented in the Environmental Licensing Plan of Study for the Polk Power Station project [Environmental Consulting & Technology, Inc. (ECT), 1991]. This plan of study (POS) was reviewed and approved by various federal, state, regional, and local agencies.

Prior to submission of the SCA, Tampa Electric Company has had numerous meetings, presentations, and discussions with federal, state, and local agencies and the public regarding potential concerns and issues associated with the Polk Power Station project. A listing of these agency and public coordination efforts is provided in Chapter 10.0 of this SCA. The information and impact evaluations contained in the SCA address these issues and demonstrate that the project fulfills and complies with applicable laws, regulations, and standards for the proposed project.

1.3 NEED FOR THE PROJECT

1.3.1 NEED DETERMINATION BY FLORIDA PUBLIC SERVICE COMMISSION

As discussed in Section 1.2, the FPSC has the statutory responsibility for determining and approving the need for construction of new power plants in Florida. According to Section 403.519, F.S., the FPSC must consider four specific items in determining the need for a new power plant:

- Need for electric system reliability and integrity,
- Need for adequate electricity at a reasonable cost,
- Cost-effectiveness of the proposed power plant versus available alternatives, and
- Conservation measures which might mitigate the need for the proposed power plant.

The FPSC must evaluate these specific items in relation not only to the system needs of the applicant proposing the new power plant, but also to the power supply and Customer needs of peninsular Florida. The FPSC evaluation must consider compliance of the proposed project with the mandates of the Florida Energy Efficiency and Conservation Act (FEECA) to ensure the most economical use of natural gas and oil. Finally, in accordance with state regulations, a formal determination of need must be made by the FPSC and a report provided to FDER prior to final certification of a proposed power plant under FEPPSA.

During the decision-making process, the FPSC reviews information provided by the applicant, conducts its own evaluations, and holds a formal public hearing to obtain additional inputs from the applicant, the FPSC staff, and other parties regarding the need for the new power plant. Key considerations in this process are the identification and evaluation of reasonable alternatives to the construction of the proposed power plant while maintaining electric system reliability and minimizing the cost of electric power to Customers. The alternatives considered by the FPSC include available means to mitigate or avoid the need to construct a new power plant such as conservation, load management, and power purchases from other generators, as

well as alternative generation technologies and fuels, to ensure that the proposed project represents the most cost-effective means of supplying reliable electric power.

On September 5, 1991, Tampa Electric Company filed a "Petition to Determine Need for Electrical Power Plant and Related Facilities" with the FPSC pursuant to Section 403.519, F.S., and designated Docket No. 910883-EI. A copy of this petition is provided in Appendix 11.14. In conjunction with this filing, Tampa Electric Company submitted to the FPSC a document entitled "Polk Unit One Need Determination Study" to support the petition and provide the information required under the FPSC rule Chapter 25-22.081, F.A.C. Copies of this document are available for inspection at the FPSC, Division of Records and Reporting, 101 East Gaines Street, Tallahassee, Florida.

In the petition to determine need and the supporting study, Tampa Electric Company provided the FPSC with information from its Power Resource Plan which demonstrated the need for an additional 440 MW of new generating capacity during the period of 1995 through 2000. The information also showed that the company's total resource needs to meet Customer demands for the 5-year period were almost 800 MW and that more than 40 percent of these needs would be met through the company's extensive programs to promote conservation and load management and by power purchases from cogenerators. According to its Power Resource Plan, the remaining resource needs would be most cost-effectively and reliably met by the construction of the proposed IGCC unit with a commercial operation date of July 1996 and a phased 220-MW CC unit with an in-service date of 2001.

A public hearing on Tampa Electric Company's petition to determine need for electrical power plant was held by the FPSC on December 10 and 11, 1991, in Tallahassee, Florida. Prior notice of this hearing was published in the Florida Administrative Weekly and local newspapers according to the requirements of Section 403.519, F.S. Subsequent to these proceedings, Tampa Electric Company submitted to the FPSC a document entitled "Post-Hearing Statement and Brief," which provided additional

information on the specific issues addressed at the public hearing. This document is also available for inspection at the FPSC office in Tallahassee, Florida.

The FPSC held a Special Commission Conference on January 31, 1992, to consider and make a final decision regarding the Tampa Electric Company petition for determination of need for a proposed electrical power plant and related facilities. At these proceedings, the FPSC voted to approve and issue a certification of need order for the IGCC power plant, Polk Unit 1. The order determining the need for Polk Unit 1 was issued on March 2, 1992, and is provided in Appendix 11.14.

In its order, the FPSC determined that Polk Unit 1 was needed to maintain electric system reliability and integrity. Tampa Electric Company used a combination of planning criteria in assessing the need for additional generating capacity, including a minimum of 20 percent winter reserve margin and an assisted loss of load probability (LOLP) of 0.1 days per year. These criteria were considered reasonable by the FPSC for planning purposes. Based on the power resource planning information provided by Tampa Electric Company in support of the petition to determine need and its own evaluations, the FPSC concluded in its order that:

"Tampa Electric Company's reliability criteria of 0.1 days per year LOLP and minimum winter reserve margin of 20 percent would be violated with a delay in the in-service date of the proposed unit. If no capacity is added to Tampa Electric Company's system in 1995, Tampa Electric Company's LOLP is estimated to be 0.140 days per year and its winter reserve margin will be 19.1 percent. If no capacity is added in 1996, the net LOLP will deteriorate to 0.199 days per year and the winter reserve margin will drop to 16.2 percent. Thus, the addition of capacity from the proposed IGCC unit is needed for Tampa Electric Company to maintain acceptable reliability criteria." (FPSC, 1992)

Further, the FPSC concluded that the proposed IGCC unit is also needed to contribute to the reliability and integrity of the electric system of the state as a whole.

Next, in its order determining need, the FPSC concluded that the proposed IGCC unit is the most cost-effective alternative to provide the additional needed capacity

for Tampa Electric Company and peninsular Florida. Based on information provided by Tampa Electric Company to support the petition to determine need, the proposed IGCC unit is estimated to save Tampa Electric Company's ratepayers up to \$195 million over the life of the unit compared to the next best option. These savings are primarily attributable to fuel savings resulting from the use of coal and the \$120 million DOE contribution for construction of the unit and the first 2 years of operation and maintenance.

Finally, in the order determining the need for Polk Unit 1, the FPSC concluded that Tampa Electric Company's residential conservation programs were reasonable in saturating the eligible market and that no additional conservation measures were reasonably available to Tampa Electric Company to avoid the need for the proposed IGCC unit. The FPSC also evaluated alternatives available to Tampa Electric Company to purchase power from cogenerators and other utilities in order to avoid the need for the proposed unit and concluded that Tampa Electric Company had adequately explored these alternatives. As discussed previously, Tampa Electric Company's total resource needs to meet Customer demands in the 1995 through 2000 period are almost 800 MW and that more than 40 percent of these needs will be met through the company's conservation and load management programs and power purchases from cogenerators.

Based on these findings, the FPSC approved and granted Tampa Electric Company's Petition to Determine Need for the proposed electrical power plant and related facilities at the Polk Power Station site.

Although the FPSC need order is specifically for Polk Unit 1, the IGCC unit which is planned to be phased into service in 1995 and 1996, Tampa Electric Company's ongoing, long-range power resource planning studies have determined the need for an additional 220 MW of new generating capacity in the 1999 to 2001 timeframe and another approximately 670 MW of new generating capacity by the year 2010. Therefore, at the present time, Tampa Electric Company's total new electric

generating capacity needs, including the proposed nominal net 260-MW IGCC unit, are approximately 1,150 MW in order to meet its projected Customer demands over the 1995 through 2010 timeframe. The need for this new generating capacity remains after the implementation by Tampa Electric Company of all reasonably available, cost-effective alternatives to construction of new generating facilities. These non-construction alternatives consider both demand and supply side alternatives including:

- Conservation,
- Load management,
- Interruptible load,
- Qualifying cogeneration power purchases, and
- Other purchased power.

Tampa Electric Company's analyses show that the implementation of all of these non-construction alternatives will reduce the need for future generating capacity by approximately 1,000 MW or by almost 50 percent compared to its total projected resource needs in the 1995 through 2010 period.

The following section provides a summary of Tampa Electric Company's ongoing, long-range power resource planning process. Additional descriptions of the power resource planning studies and results are provided in Chapter 8.0 of this SCA which addresses the wide range of alternatives considered by Tampa Electric Company for the proposed Polk Power Station project. It should be noted that some of the numerical estimates and projections presented in the following and elsewhere in this SCA may vary from figures presented in other published documents and information since such projections are continually under revision and updating as part of the ongoing power resource planning process.

1.3.2 POWER RESOURCE PLAN SUMMARY

Tampa Electric Company conducts ongoing power resource planning studies to ensure that the future demands of Customers for reliable and economical electric power are met. In general, this complex planning process consists of two major components: (1) forecasts of Customer demands and energy needs, fuel prices, and economic and financial conditions; and (2) evaluations and optimization of the timing and options to supply the future electricity requirements. These options include demand- and supply-side power resources. The demand-side options include Tampa Electric Company's continuing programs in energy conservation, load management, and cogeneration. The supply-side options include different types of power generating unit additions. The results of these efforts form the basis for Tampa Electric Company's future power resource plan which provides the best mix of demand-side and supply-side alternatives for Tampa Electric Company's Customers in terms of reliability and the cost of future electric energy, while meeting applicable environmental regulations and standards. Tampa Electric Company's overall power resource planning process is illustrated in Figure 1.3.2-1.

1.3.2.1 Future Energy and Demand Forecasts

Tampa Electric Company's Customer demand and energy forecasts are the foundation from which the power resource plan is developed. Because of their critical importance, Tampa Electric Company combines state-of-the-art methodologies and proven statistical techniques with practical experience to develop forecasts with the highest probability of occurrence. The complex process results in forecasts of both Tampa Electric Company's peak monthly electricity usage (i.e., demand) and its total monthly electricity usage (i.e., energy). Since many factors can influence future demand and energy forecasts (e.g., weather, economic conditions, population growth, fuel prices), Tampa Electric Company continuously evaluates potential changes in these factors and, in turn, potential changes in its long-range forecasts.

In practice, the Tampa Electric Company demand and energy forecasting process involves five separate models or analyses:

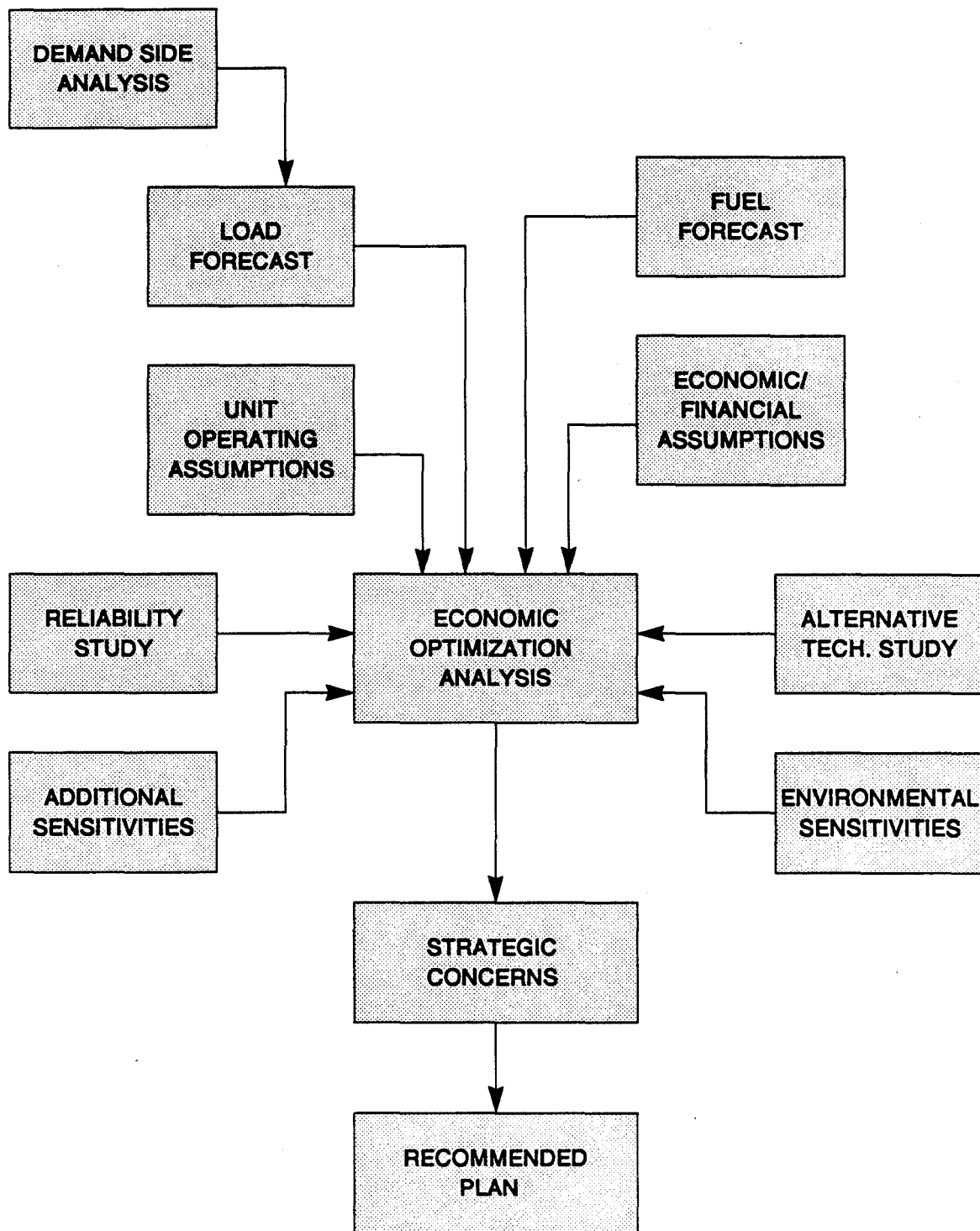


FIGURE 1.3.2-1.

POWER RESOURCE PLANNING PROCESS

Source: Tampa Electric Company, 1992.



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1. Detailed end-use model,
2. Multiregression model,
3. Trend analysis,
4. Phosphate method, and
5. Conservation program analysis.

Figure 1.3.2-2 shows the general flow of the Customer demand and energy forecasting process. The first three techniques are combined to develop a demand and energy projection, excluding the phosphate industry electricity needs. The phosphate demand and energy requirements are forecasted separately and then combined in the final forecast. The effects of Tampa Electric Company's conservation, load management, and cogeneration programs are incorporated into the process by subtracting their expected reduction in demand and energy from the forecast. The final energy and demand forecast is established by combining the results of the five forecasting methods. In its order determining the need for Polk Unit 1, the FPSC concluded that the forecasting methodology used by Tampa Electric Company produced a reasonable prediction of the company's future energy demands (i.e., load).

According to the demand and energy forecasts presented in its petition to determine need, Tampa Electric Company's firm summer and winter peak loads are projected to grow at an average annual rate of 2.7 and 2.6 percent, respectively, during the 1991 through 2000 period.

1.3.2.2 Forecast of Power Resource Requirements

Based on the forecasted energy demands, the second major component of the power resource planning process involves evaluations of future demand- and supply-side options to meet future Customer power needs. The objective of the power resource expansion planning process is to determine the long-range mix of power resource options which represents the best plan to provide economical and reliable electric service to Tampa Electric Company's Customers. As shown in Figure 1.3.2-1, the expansion planning process incorporates a reliability analysis to determine the timing

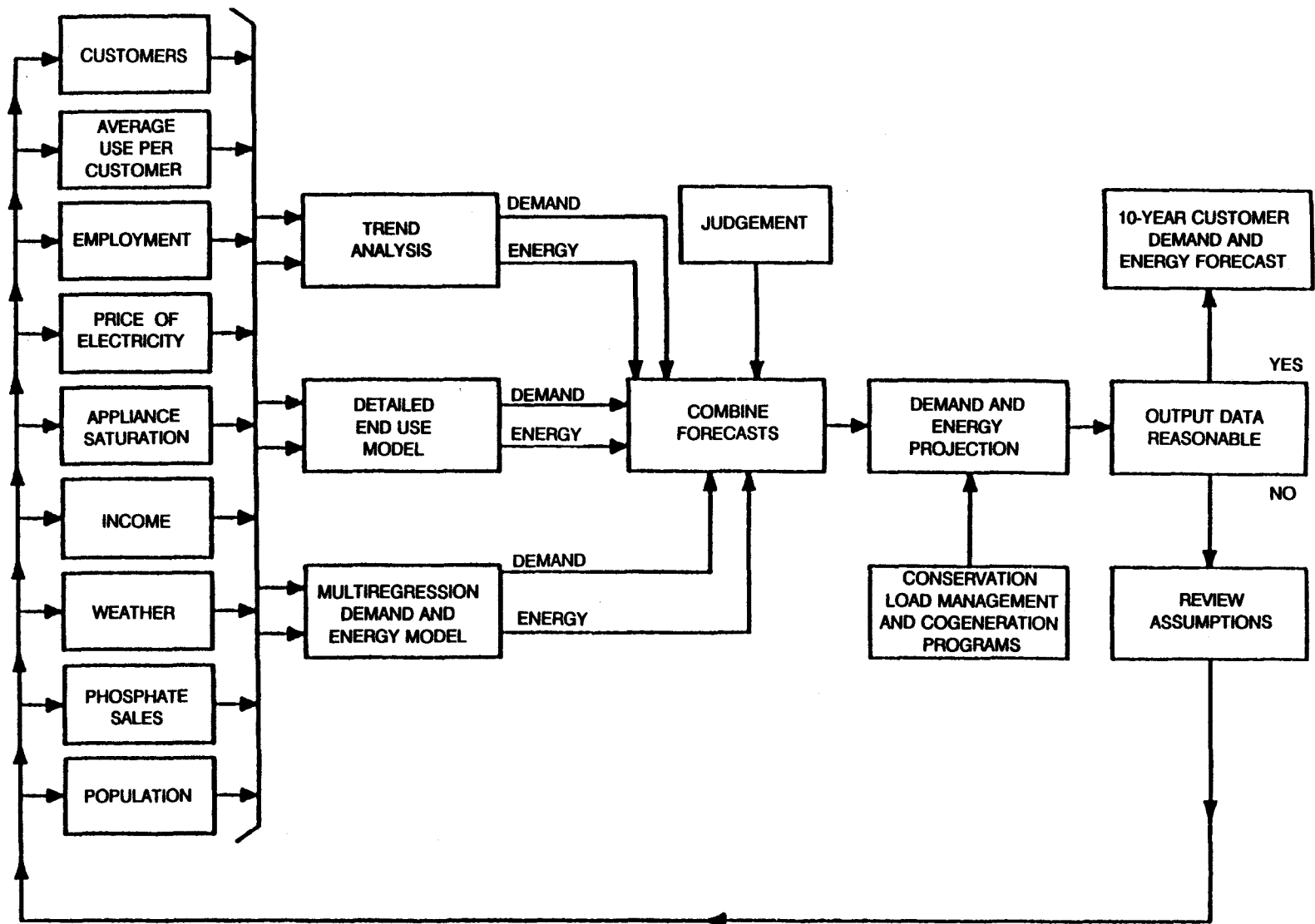


FIGURE 1.3.2-2.

CUSTOMER DEMAND AND ENERGY FORECAST PROCESS

Source: Tampa Electric Company, 1992.



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of future need, alternative technology screening to select options to meet future needs, and a supply-side analysis and optimization evaluation to determine what alternatives best meet future needs. Finally, a sensitivity/strategic concerns analysis is conducted to ensure that the best plan is chosen under various changes in the planning assumptions. The following subsections summarize the results of these analyses.

System Reliability and Integrity Analysis

As discussed previously, Tampa Electric Company used a combination of criteria to determine the need for additional generating capacity in the 1995 through 2000 timeframe, including a minimum 20-percent winter reserve margin and assisted LOLP of 0.1 day per year. These criteria are considered to be reasonably adequate for planning purposes by the FPSC. The 0.1-day-per-year LOLP criterion is consistent with the LOLP criteria used by the Florida Electric Power Coordinating Group (FCG), and the winter reserve margin is considered to be reasonable for a utility of Tampa Electric Company's size. These planning criteria were applied to Tampa Electric Company's load forecast and existing power supply resources to determine whether the company needed additional capacity in 1995 and beyond.

To meet the established reliability criteria, the analysis showed a need for a series of generating capacity additions:

<u>Year</u>	<u>Generating Capacity Addition</u>
1993	Met by purchase agreement
1994	--
1995	65 MW
1996	66 MW
1997	43 MW
1998	47 MW
1999	61 MW
2000	65 MW

Based on the results of this analysis, if additional capacity is not placed into service, Tampa Electric Company's winter reserve margin will fall below 20 percent and its

LOLP is projected to rise above the 0.1 day per year in 1995, which exceed the established system reliability criteria (see Table 1.3.2-1).

The FPSC concurred with the results that Tampa Electric Company's reliability criteria of 0.1-day-per-year LOLP and minimum winter reserve margin of 20 percent would be violated with a delay in the in-service date of the proposed Polk Unit 1. Thus, additional generating capacity is needed for Tampa Electric Company to maintain acceptable reliability criteria in the future.

Alternative Technology Study

An integral step in Tampa Electric Company's power resource planning process is the identification and consideration of alternative generation technologies which could be constructed to meet future Customer demands. The objective of the alternative generation technology study is to identify the most reliable, feasible, environmentally acceptable, and cost-effective generating facilities for consideration in a comprehensive power resource plan.

The alternative technology study conducted by Tampa Electric Company involved a systematic review and assessment of a wide variety of conventional and nonconventional energy generation technologies. Initially, 46 technologies were identified for evaluation. These alternative technologies were screened in a two-step process: preliminary and economic screening analyses. In step one, a preliminary screening analysis was conducted to eliminate those technologies which could not be utilized because regional geography and/or weather are not suitable for a technology, costs were higher when compared to similar type technology alternatives, proven demonstration of the technology has not been performed, public opposition to technology exists, and/or questions exist regarding the technology safety.

In step two of the screening analysis, the economics of the technologies which were selected in the preliminary screening were compared using economic screening curves which reflect levelized annual/lifecycle costs of the technologies at different capacity

Table 1.3.2-1. Tampa Electric Company System Reliability Excluding New Unit Additions

Year	Net LOLP (days per year)	Winter Reserve Margin (percent)
1993	0.045	25.2
1994	0.067	22.2
1995	0.140	19.1
1996	0.199	16.2
1997	0.259	13.4
1998	0.361	10.8
1999	0.526	8.3
2000	0.770	5.9

Note: Figures include Tampa Electric Company's capacity from TECO Power Services Purchase Agreement in 1993.

Source: Tampa Electric Company, 1991.

factors. Based on this screening analysis, a final group of technologies was selected for the detailed economic optimization analysis. These screening analyses of the alternative technologies are described in Section 8.2 of this SCA.

Based on these analyses, the technologies selected for the economic optimization analysis included:

Baseload Technologies

- Conventional pulverized coal with flue gas desulfurization (FGD), and
- IGCC,

Intermediate Load Technologies

- IGCC,
- CC,
- Phosphoric acid fuel cell,
- Photovoltaic solar cell, and
- Solar thermal, and

Peaking Technologies

- CT.

The baseload conventional coal and IGCC technologies were maintained because of their relatively lower levelized costs compared to other baseload technologies and because of the favorable environmental performance of IGCC units compared to conventional coal units. The CC technology had the best economics of all of the intermediate technologies, but the fuel cells and solar technologies were advanced into the economic analysis because of their exceptional environmental performance (very low noise, extremely low or no emissions, and possibility of siting in or close to load centers).

Economic Optimization Analysis

The goal of the economic optimization analysis was to identify the best supply side plan for serving the forecasted energy requirements. The development of the supply side plan involved the use of dynamic programming to optimize the mix of generating

capacity on the system. The objective function of the optimization analysis was to minimize present worth revenue requirements for the Tampa Electric Company system.

First, in the analysis, various power resource scenarios, comprised of a mixture of generating technologies, joint participation and purchased power generation, and demand-side management (DSM) programs were developed. Next, these alternatives were analyzed, along with future system demand and energy requirements, future DSM programs, and existing generating capabilities, to arrive at a number of viable generating expansion alternatives. Each alternative satisfied the established reliability criteria.

The capital expenditures associated with each capacity addition were determined based on the types of generating unit, fuel type, and in-service year. The fixed charges resulting from the capital expenditures were expressed in *present-worth* dollars for comparison purposes.

The fuel and the operation and maintenance costs associated with each scenario were projected based on estimated unit dispatch. The projections, also expressed in present-worth dollars, were combined with the fixed charges to obtain the total present worth of revenue requirements for each alternative power resource plan.

The expansion plan which was initially identified by this analysis as having the lowest revenue requirements was then compared to other generation plans which may be strategically superior for Tampa Electric Company and its Customers. These various expansion plans were again compared to one another on an economic basis, including an analysis of the sensitivity of the revenue requirement projections to changes in base case assumptions regarding fuel availability and costs.

Strategic Considerations

The final step in the power resource planning process was a strategic issues/risk analysis which was conducted to compare the overall performance of each individual generation expansion plan alternative under additional factors that were not easily quantified. These strategic issues may affect the type, capacity, and/or timing of Tampa Electric Company's future generation resource requirements. These issues, such as high and low fuel prices, natural gas availability, environmental legislation, and potential joint ownership projects, were evaluated in the process of determining the optimal expansion plan. In this way, an economically sound expansion plan was selected which has the flexibility to respond to future technological and economical changes.

1.3.2.3 Selection of Optimum Power Resource Plan

The results of Tampa Electric Company's power resource planning efforts demonstrated that the best series of generating capacity additions to meet its Customer needs during the 1995 through 2001 period is as follows:

<u>Year In Service</u>	<u>Nominal Generating Capacity Addition</u>	<u>Ultimate Unit Configuration</u>
1995	150/190 MW advanced CT*	} 260 MW IGCC (Polk Unit 1)
1996	70 MW HRSG/ST/CG	
1997	--	
1998	--	
1999	75 MW CT	} 220 MW CC
2000	75 MW CT	
2001	70 MW HRSG/ST	

- * 150 MW when operated in simple-cycle or CC mode and fired on fuel oil.
190 MW when operated in IGCC mode with gasifier and air separation unit.

1.3.3 PLANNED ULTIMATE SITE CAPACITY

Tampa Electric Company's power resource planning efforts have also analyzed its new generating capacity needs beyond the typical 10-year planning timeframe. Such long-range analyses are important in planning efforts to meet the future Customer electricity demands due to the long lead-time needed to license/permit, design, and construct new electric generating facilities. Tampa Electric Company's site selection program, which resulted in the selection of the Polk Power Station site, also considered its generating capacity needs into the early 21st century. Tampa Electric Company recognizes that its long-range power resource plans may change based on such factors as changes in planning assumptions (e.g., the rate of projected population growth in its service area and costs of alternative fuels), the availability of power supplies from other sources (i.e., cogeneration and power supply purchase agreements with other generators), the relative success of DSM programs (i.e., conservation and load management), and advances in electric generation technologies.

Tampa Electric Company's current long-range power resource plans show that its Customer demands will continue to grow beyond the year 2001. These plans project the need for additional resources of more than 1,300 MW from 2002 through 2010. These plans also project that more than 650 MW of these additional resource needs will be met through non-construction alternatives, including conservation, load management, and power purchases from cogenerators. Thus, over the total 15-year period of 1995 through 2010, Tampa Electric Company's need for new generating capacity will be reduced by almost 50 percent through the effective implementation of these non-construction alternatives.

In addition to the 480 MW of generating capacity in the 1995 to 2001 timeframe, Tampa Electric Company's long-range power resource plan demonstrates the need for approximately 670 MW in new generating capacity in the 2002 through 2010 period. These generating capacity additions are again needed to meet projected increases in Customer electricity demands primarily due to forecasted population

growth in west-central Florida. Thus, Tampa Electric Company currently has the need for a total of approximately 1,150 MW in new generating capacity from 1995 through 2010.

Based on these long-range planning studies, the phased schedule for operation of all needed electric generating units at the Polk Power Station site is presented in Table 1.3.3-1. This long-range generating capacity plan reflects the future power supply needs of Tampa Electric Company beyond the needs addressed by the need determination petition filed with the FPSC for Polk Unit 1 and the supporting power resource planning information showing the need for an additional 220-MW CC unit.

In this SCA, Tampa Electric Company is seeking certification of the planned ultimate electric generating capacity (i.e., approximately 1,150 MW) at the Polk Power Station site as presented in Table 1.3.3-1. Tampa Electric Company recognizes that certain changes in these ultimate capacity plans may require the filing of supplemental applications pursuant to the requirements and procedures of Section 403.517, F.S., and Chapter 17-17.231, F.A.C.

1.4 OVERVIEW OF THE POLK POWER STATION PROJECT

The following provides an overview of the comprehensive efforts conducted by Tampa Electric Company to select the Polk Power Station site, the general site location, and the planned power plant and directly associated facilities at the site. A summary description of the DOE Clean Coal Technology Demonstration program is also provided. More detailed information regarding the project site and the planned facilities is provided in Chapters 2.0 and 3.0, respectively, of this SCA.

1.4.1 POWER PLANT SITE SELECTION AND SITING TASK FORCE

In order to identify a suitable site for the needed power plant facilities, Tampa Electric Company conducted a Power Plant Site Selection Assessment program between September 1989 and November 1990. The overall objective of this site selection program was to select a site or sites which were considered the most suitable for developing the needed power plant based on a combination of environmental, socioeconomic, land use, and engineering/economic factors. The six-county study area for the siting program in west-central Florida is shown on Figure 1.1.0-1. An integral aspect of this program was the formation by Tampa Electric Company of a public Siting Task Force which actively participated in the site selection efforts. The Siting Task Force was comprised of 17 private citizens from environmental groups, businesses, and universities in the Tampa Electric Company service area and throughout Florida. Tampa Electric Company's objective for involving the Siting Task Force in the site selection process was to ensure that local and statewide public issues and environmental concerns relative to new power plant development were adequately and accurately considered in selecting a suitable site for the new power plants. Appendix 11.15 provides a listing of the Siting Task Force members and a brief description of their backgrounds. Descriptions of the Power Plant Site Selection Assessment program approach, evaluation methodologies, and findings are provided in Section 8.1.

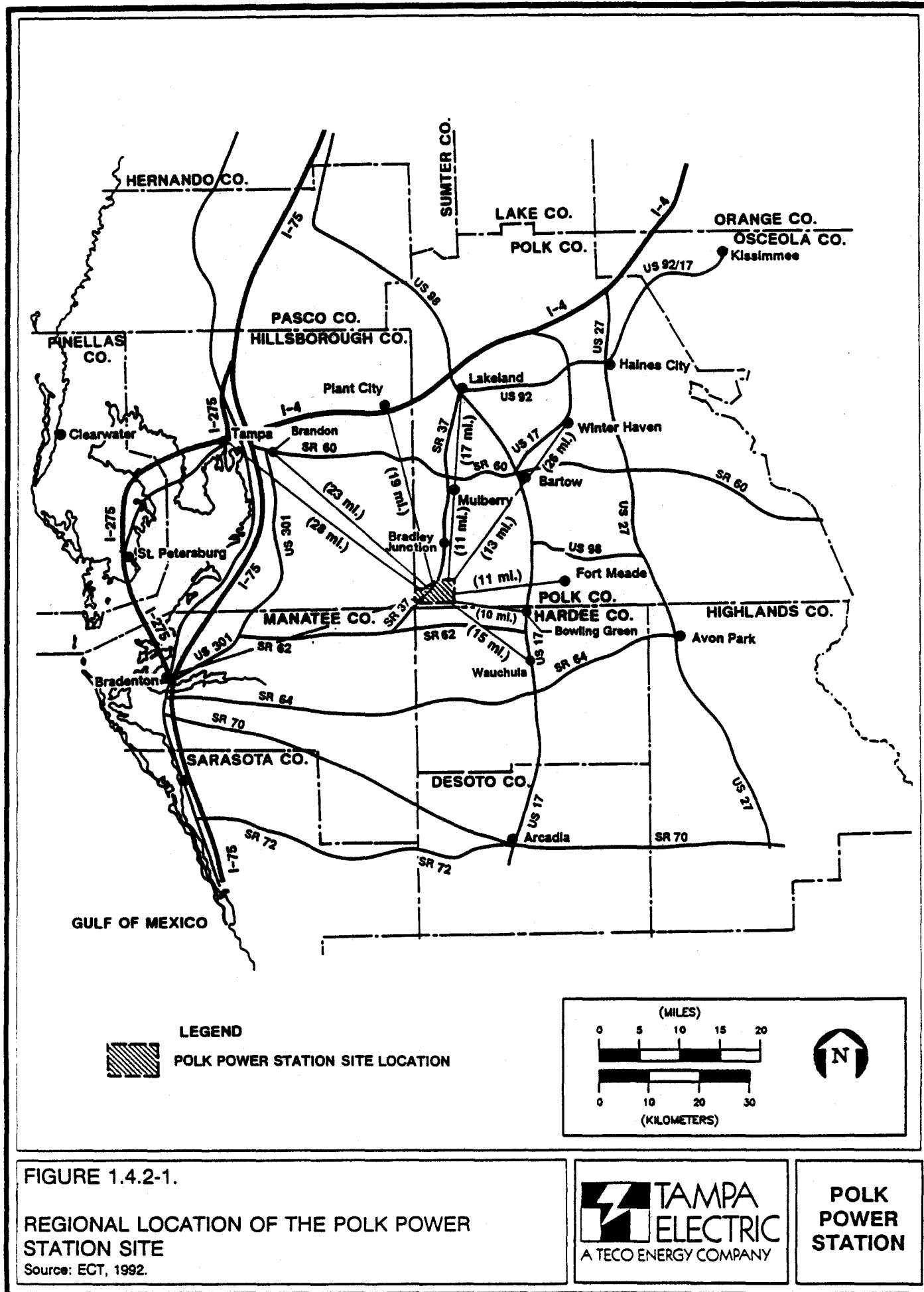
Based on the results of detailed environmental and engineering/economic evaluations, the Siting Task Force recommended three adjacent areas located in southwest

Polk County as the most suitable or *preferred sites* for locating the planned power plant facilities. The three preferred sites had similar environmental characteristics in that each had been disturbed by previous and ongoing phosphate mining activities. The Task Force recommended that Tampa Electric Company pursue acquisition and environmental licensing efforts for any one of the three preferred sites. Tampa Electric Company concurred with the recommendations of the Siting Task Force and selected one of the preferred sites in southwest Polk County as the location for the planned power plant which is the proposed Tampa Electric Company Polk Power Station site. This site is the subject of this SCA.

1.4.2 GENERAL SITE LOCATION AND DESCRIPTION

The Tampa Electric Company Polk Power Station site is located approximately 17 miles south of the City of Lakeland, approximately 11 miles south of the City of Mulberry, and 13 miles southwest of the City of Bartow in southwest Polk County, Florida. Figure 1.4.2-1 shows the general location of the site in west-central Florida, and Figure 1.4.2-2 provides a vicinity location map and approximate boundaries of the site. The site consists of approximately 4,348 acres and is bordered by the Hillsborough County line along the western boundary; Fort Green Road [County Road (CR) 663] on the east; CR 630, Bethlehem and Albritton Roads along the north; and State Road (SR) 674 and several phosphate clay settling ponds on the south. SR 37 bisects the property, running in a southwest to northeast direction. The portion of the property to the east of SR 37 consists primarily of mined-out lands with water-filled mine cuts between spoil piles surrounding an unmined parcel of land and old mined and unreclaimed lands. The area to the west of SR 37 is currently being mined for phosphate matrix and these operations are scheduled to continue into 1994. In general, lands surrounding the site and in the region have also been impacted by previous and ongoing phosphate mining operations.

The majority of the site has been mined by Agrico Chemical Company (Agrico), a division of Freeport MacMoRan, Ltd., as part of Agrico's Fort Green Mine. The remaining acreage, approximately 775 acres, located south of CR 630, is property of American Cyanamid Company. A portion of American Cyanamid property has been leased, re-mined, and recently reclaimed by IMC Fertilizer, Inc. Tampa Electric Company intends to acquire all of these lands prior to commencement of construction for the Polk Power Station.



1.4.2-3

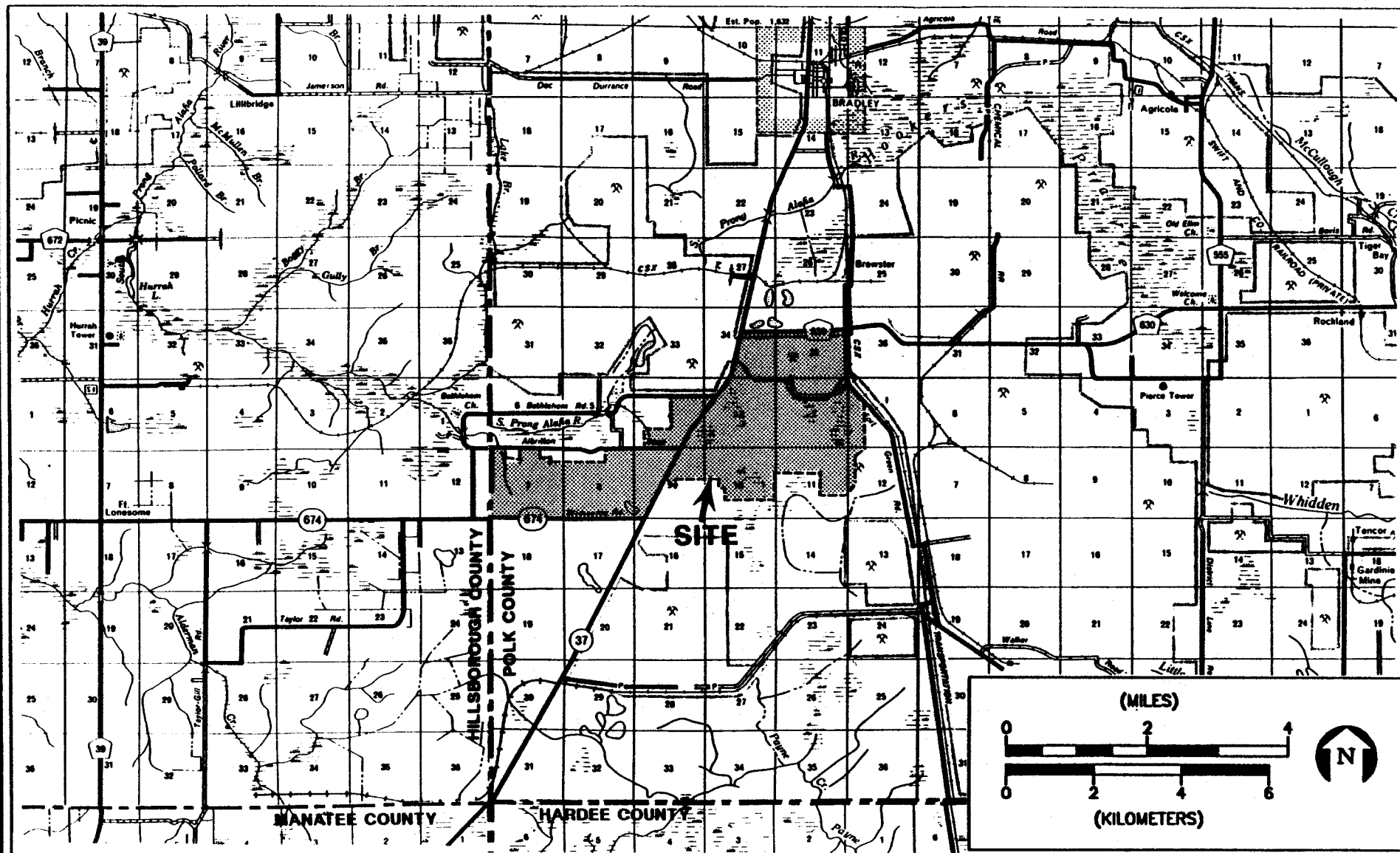


FIGURE 1.4.2-2.

VICINITY MAP AND BOUNDARIES OF POLK POWER STATION SITE

Sources: FDOT Map, FL. ECT, 1992.



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1.4.3 GENERAL PROJECT DESCRIPTION

Tampa Electric Company is planning to construct and operate new electric generating units at the Polk Power Station site with units added according to a phased schedule designed to match the projected growth of Tampa Electric Company's Customer power demands, and subject to obtaining need for power certifications from the FPSC. The total nominal generating capacity of the units at the site will be approximately 1,150 MW. The first generating facilities at the Polk Power Station site will be an IGCC unit developed by Tampa Electric Company supported in part through funding from DOE under the Clean Coal Technology Demonstration program. The coal-fueled facilities will consist of a nominal net 150-MW advanced CT, initially fueled by low sulfur No. 2 fuel oil, with HRSG, ST, and CG facilities added 1 year later to complete the nominal net 260-MW IGCC unit. Tampa Electric Company's current long-range power resource planning efforts indicate that later facilities will consist of two nominal net 220-MW CC generating units and six stand-alone nominal net 75-MW CTs fueled primarily by natural gas with low sulfur No. 2 fuel oil as the backup fuel.

The IGCC facilities will consist of an oxygen-blown entrained flow gasification system to produce syngas fuel for the CT. The planned CG system is based on the Texaco, Inc. (Texaco) commercially available technology. The CC power block facilities are based on a General Electric Company (GE) advanced nominal net 150-MW 7F CT and nominal net 70-MW HRSG/ST configuration. The GE 7F CT is expected to be capable of a nominal net 190-MW capacity when operating with the coal gasifier and air separation unit. The other two CC units are based on a configuration of two nominal net 75-MW CTs with a nominal net 70-MW HRSG/ST facilities. The six stand-alone CTs are currently assumed to be nominal net 75-MW units.

The primary power plant facilities (i.e., power block and fuel storage) will be located on unmined land on the east side of SR 37. The surrounding mined-out land to the east and south of the plant facilities will be developed as a primarily below-grade cooling reservoir surrounded by a low-profile earthen berm with a top elevation of

145 feet National Geodetic Vertical Datum (ft-NGVD). Potable and process water will be provided by onsite wells. Stormwater runoff on the plant site will be collected, detained, recycled, and treated, as appropriate, in accordance with applicable regulations. The current designs for the plant systems are based on criteria to maximize plant water recycling and re-use, and to minimize groundwater withdrawals and offsite discharges. Discharges from the cooling reservoir will be routed to the Little Payne Creek drainage system.

Tampa Electric Company will be its own provider for most utilities at the Polk Power Station. Electricity, potable water, and sanitary sewerage treatment services will be provided by onsite facilities. Therefore, no interconnection to or demands on public utilities for these services will be created by the operation of the project. Domestic, construction, and certain industrial solid waste disposal services will be provided by licensed waste carriers/disposal contractors serving the region.

Four 230-kilovolt (kV) electric transmission circuits will be needed to connect the Polk Power Station with the Tampa Electric Company and Florida transmission grid. Two of the circuits will run northeast from the onsite Polk Power Station Substation to interconnect with Tampa Electric Company's existing Hardee Power Station-Pebbledale 230-kV transmission line adjacent to the Polk Power Station site along Fort Green Road. Thus, the corridor for these two circuits will be located within the site boundaries. The other two circuits will run west from the onsite substation to SR 37, then north along SR 37 approximately 5 miles to interconnect with Tampa Electric Company's existing Mines-Pebbledale 230-kV transmission line at a point to the west of the community of Bradley Junction. These two circuits will be located within a new transmission line corridor adjacent to SR 37.

As part of the development activities for the Polk Power Station, reclamation of lands disturbed by phosphate mining will occur in accordance with the requirements of Section 211, F.S., and Chapter 16C-16, F.A.C., and the Polk County Phosphate Mining Ordinance 88-19. The state reclamation requirements are administered by

FDNR. Tampa Electric Company will submit to FDNR and Polk County appropriate modifications to the currently-approved mine reclamation plans for the site which integrate the planned power plants and associated facilities while complying with FDNR and Polk County reclamation requirements. Chapter 9.0 of this SCA presents a summary of Tampa Electric Company's proposed plans to comply with the FDNR and Polk County mined land reclamation requirements. A separate document entitled Conceptual Reclamation Plan Application has also been submitted to FDNR and Polk County which includes more detailed information on the proposed reclamation plans and appropriate forms to modify existing, approved reclamation plans for the site under FDNR requirements.

1.4.4 CLEAN COAL TECHNOLOGY DEMONSTRATION PROGRAM

The DOE Clean Coal Technology Demonstration program is a government- and industry-cofunded technology development effort to demonstrate a new generation of innovative coal utilization processes in a series of large-scale *showcase* facilities built across the country. The program takes the most promising advanced coal-based technologies and moves them into the commercial marketplace through demonstration. These demonstrations are on a scale large enough to generate all the data, from design, construction and operation, that are necessary for the private sector to judge commercial potential and make informed, confident decisions on commercial readiness. The projects in the program are demonstrating technologies capable of being applied to the United States coal resource base and encompass advanced electric power generation systems, high-performance pollution control devices, and coal processing for clean fuels and industrial applications.

The innovative clean coal technologies being demonstrated offer tremendous potential as part of the solution to many complex problems that face the nation--and the world--in a rapidly changing arena dominated by energy, economic, and environmental issues. These issues include the following:

- Air quality,
- Acid rain,
- Global climate change,
- Power production,
- Energy security,
- Technology awareness, and
- International competitiveness.

The dependence of the electricity-producing industry on coal is especially strong, and the burning of coal to provide industrial heat and power is critical to the economy. In 1989, 86 percent of coal consumption went into the generation of electricity. By 2010, coal use in the electricity production industry will increase by at least

50 percent and double by 2030 even with optimistic estimates of contributions from conservation, renewable resources, and nuclear energy.

Currently available technologies will have difficulty in satisfying the rapidly changing environmental, economic, and technical performance requirements being imposed on power plants. The coal-fueled power plant of the future must be capable of meeting stringent siting and environmental demands while producing power efficiently and with a high level of reliability. Further, the ability to rapidly add generation capacity in modules which closely match load growth will be an important factor in keeping reasonable electricity costs to the consumer. Therefore, over the next 10 years, it will be critical to bring new technology options into the marketplace to satisfy not only the requirements of the traditional utility industry but also the requirements of independent power producers and cogenerators which are producing an increasing share of power in the United States. As a result of the Clean Coal Technology Demonstration program, new power production systems using technologies demonstrated in the program will have the potential to gain a major share of the market for replacement and new capacity through 2010, thereby providing a clean, efficient, reliable source of affordable energy.

The commercially-proven IGCC process basically has the following four steps:

1. A fuel gas is formed by reacting coal with air or oxygen;
2. The coal-derived syngas is cooled and purified;
3. The clean gas is burned, and the hot exhaust is routed through a CT to generate electricity; and
4. The residual heat in the exhaust is recovered in a HRSG to form steam for a conventional ST generator to produce additional electricity.

IGCC systems are among the cleanest and most efficient of the emerging clean coal technologies. Sulfur, nitrogen compounds, and particulates are removed before the fuel is burned in the CT.

Tampa Electric Company will demonstrate an oxygen-blown entrained-flow IGCC technology. Such a demonstration is expected to show that an oxygen-blown entrained-flow IGCC unit can achieve significant reductions of sulfur dioxide (SO_2) and nitrogen oxides (NO_x) emissions when compared to existing and future coal-burning power plants using available, conventional pulverized coal technologies. The integrated performance to be demonstrated will include all major subsystems in the IGCC system entailing coal feeding; a pressurized, oxygen-blown entrained-flow gasifier capable of using caking coal; an air separation unit to provide oxygen to the gasifier as an oxidant and also to provide nitrogen to the CT for NO_x control and power augmentation; a commercially-proven cold gas cleanup (CGCU) system capable of treatment of 100 percent of the syngas flow in parallel with a demonstration hot gas cleanup (HGCU) system capable of a nominal 50-percent syngas flow treatment for removing sulfur compounds, particulates, and other contaminants as necessary to meet environmental and CT fuel requirements; an advanced CT appropriately modified to use low-British-thermal-unit (Btu) syngas as fuel; the HRSG system; the system cycle; all control systems; and associated facilities.

In a conventional IGCC system, the syngas is cooled prior to sulfur removal and then reheated prior to firing in the CT. These cooling and reheating processes result in a less efficient power generation system. Part of the reason Tampa Electric Company was awarded this Clean Coal Technology Demonstration program project is due to the demonstration of a HGCU system. By using a bed of metal oxide particles, the syngas can be cleaned without first cooling it down. This will result in a more efficient system.

Under its agreement with DOE, Tampa Electric Company will demonstrate the HGCU system for a 2-year period. The demonstration period will involve significant testing and optimization to determine the cost and performance of the HGCU system as well as the overall integration of the CG and CC technologies. Successful operation will enable future IGCC systems to operate more efficiently, providing

more opportunities to meet the goals of the Clean Coal Technology Demonstration program.

1.5 GENERAL DESCRIPTION OF GENERATING TECHNOLOGIES

The proposed Polk Power Station will consist of three types of electric generating technologies or units: CT units, CC units, and an IGCC unit. While many of the main electric generating components of these units are relatively similar, each type of unit has certain differences in its operational requirements and its emissions and wastes/by-products, which in turn may involve different potential environmental effects. To provide the reader of this SCA with an initial, basic understanding of the generating technologies, the following presents a general description of each type of the generating unit planned for the Polk Power Station. More detailed, technical descriptions of these units and their major systems, designs, and operations are provided in Chapter 3.0.

1.5.1 COMBUSTION TURBINE GENERATING TECHNOLOGY

The CT generating technology is the simplest of the three types of technologies planned for the Polk Power Station. When operated as a separate, distinct generating technology (i.e., not combined with HRSG/ST facilities as in a CC unit), CT units are often referred to as simple-cycle or stand-alone CTs. A basic CT electric generating unit consists of a compressor, a combustor, a turbine, and an electric generator in series and operating similar to a jet aircraft engine. In an aircraft engine, jet fuel is burned to produce hot gases which are used to spin a turbine, which in turn creates the thrust for the aircraft. For power generation, air is compressed in a compressor and delivered along with gaseous or liquid fuel to a high-pressure combustion chamber where the fuel is burned to produce hot gases. These high temperature, high pressure gases then pass and expand through a turbine causing the turbine to spin. The turbine drives a generator which produces electricity. Again, similar to jet aircraft engine operation, the hot combustion gases are released to the atmosphere after passing through the turbine. Figure 1.5.1-1 provides a simplified flow diagram of a CT power system.

Stand-alone CT units are generally used only as peaking units to supply electricity for those days of the year when demand is the highest or peaks. In this role, the

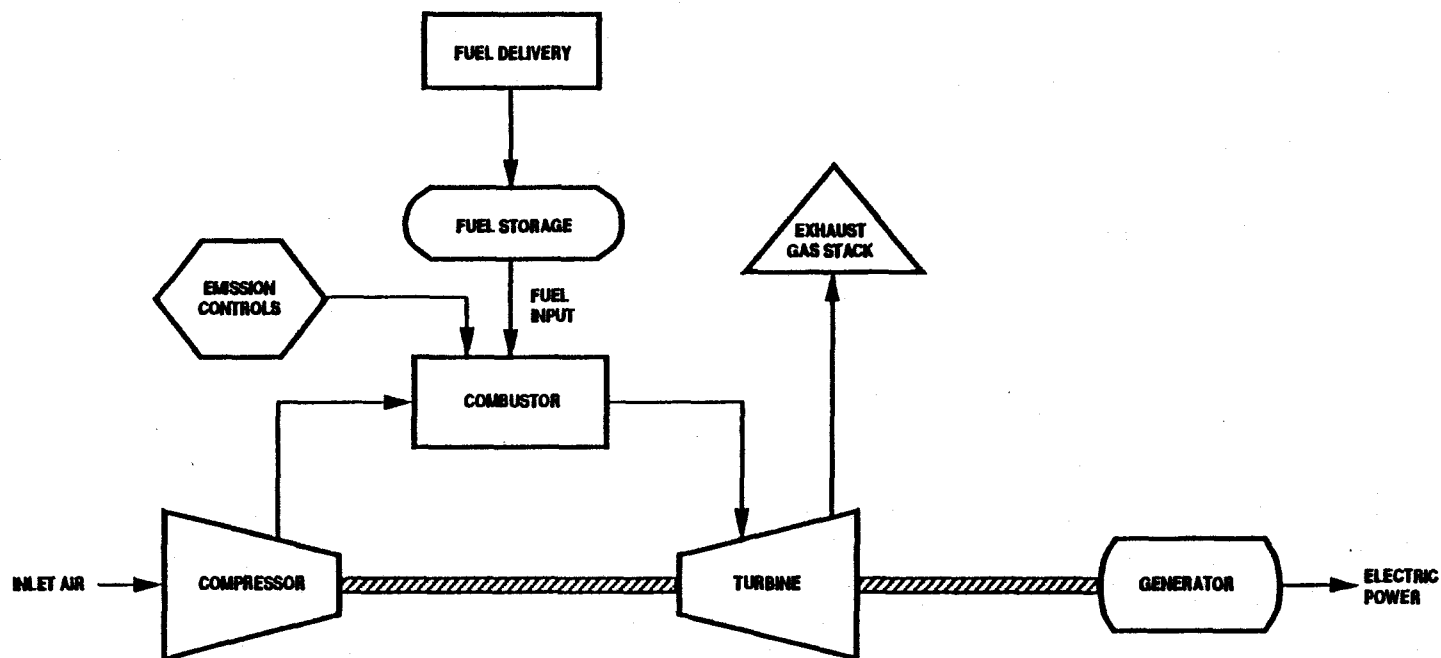


FIGURE 1.5.1-1.

SIMPLIFIED FLOW DIAGRAM OF COMBUSTION TURBINE POWER SYSTEM

Source: ECT, 1992.



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advantage of CTs is that a unit can start and stop generating electricity quickly. This rapid response makes the units effective in providing extra capacity during the periods of peak demand. Other advantages of CTs are that the units are relatively less expensive to build than other types of generating plants and require less time to build and be operational than other types of plants. Also, from an environmental standpoint, stand-alone CT units do not require water for cooling purposes and do not produce solid wastes or by-products.

The disadvantage of CT technology is that it is relatively less efficient in the conversion of energy created by the fuel combustion to electricity than many other available technologies. Thus, the cost of electricity generated by CT units is relatively more expensive than electricity generated by many other technologies. Also, until recently, CT units were generally limited in size with a maximum power-producing capacity of less than 100 MW. However, recent technological advances have allowed development of larger units (e.g., up to 150 MW). These larger CT units are often referred to as advanced CTs.

According to the ultimate site capacity plan shown in Table 1.3.3-1, a total of 11 CT units will be located on the Polk Power Station site; however, only six of the units are planned for long-term operation as stand-alone CTs. One of the units will be an advanced CT (i.e., GE 7F) with a nominal net capacity of 150 MW which will be operated in a stand-alone mode using No. 2 fuel oil only during the first year of operation. After the first year, this advanced CT will be integrated with HRSG, ST, and CG facilities to form the IGCC unit.

Currently, each of the remaining CTs are planned to have a nominal net capacity of 75 MW. Two of these CTs will be operated in a stand-alone mode for 1 to 2 years prior to being integrated to form a CC unit, while two other CTs will be only operated as a CC unit.

The remaining six CTs will be operated as stand-alone units to provide electric power during periods of peak demands. These CT units will use natural gas as primary fuel and No. 2 fuel oil as backup fuel.

Air pollution emission controls for the stand-alone CT units and CTs integrated for CC units will consist of a combination of measures. SO₂ emissions will be controlled by the use of fuels with low sulfur contents (i.e., natural gas with only trace sulfur content and fuel oil with a maximum sulfur content of 0.05 percent). NO_x emissions will be controlled by the use of efficiently designed and operated combustors called dry low-NO_x combustors when the units are fired by natural gas, and water injection when fired on the backup fuel oil. Other potential air pollutants [i.e., carbon monoxide (CO), volatile organic compounds (VOCs), particulate matter less than or equal to 10 micrometers aerodynamic diameter (PM₁₀), and trace elements] will also be primarily controlled by the fuel characteristics and the efficient design and operation of the CT units.

1.5.2 COMBINED CYCLE GENERATING TECHNOLOGY

In general, a CC electric generating unit consists of one or two CT units configured with HRSG and ST facilities and a second electric generator. The efficiency of electric generation is improved when CT units are combined in a CC unit arrangement compared to CT units operated as stand-alone facilities. When CT units are used as stand-alone units, the hot combustion gases are released to the atmosphere after passing through the turbine. In a CC unit, the hot combustion gases from the CT are reused. The hot gases are ducted into an HRSG, where water in boiler tubes is heated to produce steam. The steam is then used to spin an ST which drives a second generator to produce electricity. Therefore, by reusing the waste heat from the CT units, additional electricity is efficiently produced by the ST and generator without additional fuel input.

Due to their improved efficiency, CC units are used to serve intermediate electricity demands or the portion of the utility load that varies daily. For example, intermediate plants may start up every morning and may stop every night when the demand diminishes.

Two CC generating units will be located at the Polk Power Station site. The IGCC generating unit also includes a CC unit, which will be configured slightly different than the two other units. Figure 1.5.2-1 presents a simplified flow diagram of a CC unit.

Each of the two CC units will have a nominal net generating capacity of 220 MW. As currently planned, each CC facility will be comprised of two 75-MW CT units, two HRSGs, and a 70-MW ST. The first CC unit will be developed under a phased schedule with one of the 75-MW CT units placed in service in early 1999, the second unit in service in early 2000, and the HRSG and ST facilities to complete the nominal net 220-MW CC unit scheduled for operation in early 2001. The phased CT units will be operated as stand-alone generating facilities until combined into the CC facility in order to meet Tampa Electric Company's projected peak power demands

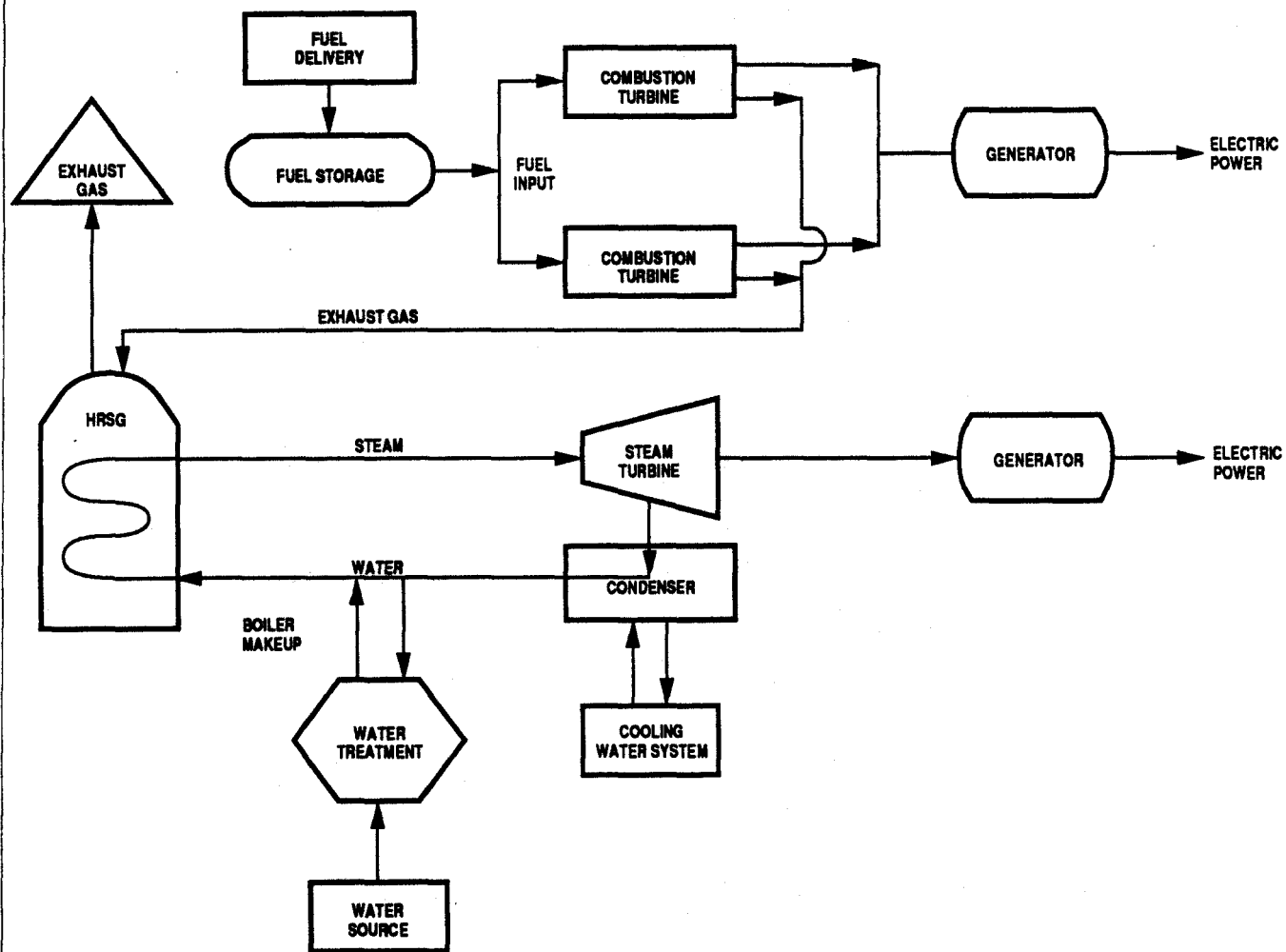


FIGURE 1.5.2-1.

SIMPLIFIED FLOW DIAGRAM OF COMBINED CYCLE POWER SYSTEM

Source: ECT, 1992.



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in the 1999 to 2001 timeframe. The components of the second CC unit are expected to be constructed concurrently beginning in early 2001 with the total nominal net 220-MW unit operational in early 2003.

Similar to the stand-alone CT units, the two CC units will use natural gas as primary fuel and No. 2 fuel oil as backup.

The proposed air pollutant emission controls for the CC units will also be similar to those for the stand-alone CT units (i.e., dry low-NO_x combustors when fired on natural gas and water injection when fired on the backup fuel oil).

Unlike the stand-alone CT units, the CC units will require water for the steam generating cycle as well as for air pollution control and other plant uses. Makeup water for the boiler steam cycle will be provided from the Floridan aquifer by wells on the site. Also, as discussed previously, an 860-acre cooling reservoir, including the area of the surrounding berm, will be constructed to provide circulating water for condenser cooling and system heat dissipation purposes.

1.5.3 INTEGRATED COAL GASIFICATION COMBINED CYCLE TECHNOLOGY

The IGCC generating technology involves the integration of CG facilities with a CC unit. As discussed previously, the initial electric generating facilities at the Polk Power Station site will be an IGCC unit with a nominal net generating capacity of 260 MW. The IGCC unit will be known as Polk Unit 1. The IGCC generating facilities will consist of a nominal net 150-MW advanced CT and nominal net 70-MW HRSG/ST and CG facilities. When the IGCC unit is operated on the syngas and with the associated air separation unit, the nominal net generating capacity of the advanced CT is expected to increase to 190 MW. The CC components (i.e., CT and HRSG/ST) of the unit produce electricity in a similar manner and have similar process and cooling water requirements as described previously for the two CC units at the site. However, instead of using two 75-MW CTs, the IGCC unit will use a single, larger advanced CT (i.e., GE 7F). Construction of the IGCC facilities will begin in early 1994 and the nominal net 150-MW advanced CT will be placed in service in mid-1995. The CT unit will be fueled initially by No. 2 fuel oil. The HRSG/ST and CG facilities will be placed in service 1 year later, or mid-1996, to complete the nominal net 260-MW IGCC unit. When completed, the unit will be fueled by coal gas or syngas produced from the CG facilities with No. 2 fuel oil as backup fuel.

CG involves a method of producing a clean, burnable gas from coal. Gasification is achieved by exposing coal to nearly pure oxygen in a pressurized vessel. Under these controlled conditions, the coal (i.e., the carbon in coal) is partially oxidized to form a combustible gas, consisting mainly of hydrogen and CO. When coal is burned conventionally, complete oxidation of carbon occurs with nearly all the chemical energy of the coal released as heat energy and the remaining gases will not burn. In the gasification process, by restricting the amount of oxygen available to the coal and controlling the temperature and duration of the reaction, only partial oxidation occurs and gases are formed that will burn.

The basic technology of CG has been in commercial use for many years. The first low-Btu gas gasifier for production of coal-derived gas began operation in England in 1832, and extensive use of gasifiers began in 1861. Medium-Btu gas production from coal began in 1875. By the 1920s, approximately 11,000 gasifiers were in use in the United States. The availability of low cost natural gas and oil in the mid-1900s resulted in a loss of interest in the CG process. Worldwide interest in CG renewed in 1973 because of the Arab oil embargo and ensuing drastic rise in the price of oil. The industrial need for more efficient, environmentally clean processes resulted in a number of extensive programs to develop *second generation* CG processes for the production of fuels and electric power.

The Dakota Gasification Company's Great Plains CG plant (Beulah, North Dakota) is an early example of these second generation plants. This facility used the Lurgi oxygen-blown fixed-bed CG technology.

The most prominent modern commercial-scale applications of CG in the United States are the Cool Water power plant in southern California and Tennessee Eastman plant in Kingsport, Tennessee, both of which use the Texaco gasification technology, the Dow Syngas project in Plaquemine, Louisiana, and the Shell CG Process in Deer Park, Texas. These facilities use an oxygen-blown entrained flow gasification process. The oxygen-blown CG system developed by Texaco will be used for the IGCC unit at the Polk Power Station.

As discussed previously, Tampa Electric Company will develop the IGCC unit in conjunction with a cooperative agreement with DOE under the Clean Coal Technology Demonstration program. Under this agreement, DOE will provide \$120 million in funding for construction and operation of the unit to demonstrate the integration of CG and CC technologies and a new, more efficient technology for removing sulfur from the coal gas prior to its combustion. This innovative technology is called HGCU and has been developed by General Electric Environmental Systems, Inc. (GEESI). The demonstration aspects of the IGCC unit provide the opportunity to

commercially demonstrate an economical and environmentally-acceptable means of generating electricity using coal which is the most abundant energy resource in the United States. Therefore, if successful, this demonstration could assist in reducing future reliance on and use of foreign energy resources (i.e., imported oil) for electricity generation in the United States.

The IGCC unit at the Polk Power Station will include both the proven CGCU system and the HGCU demonstration technology to assure the reliable production of clean syngas for the continued operation of the generating unit and compliance with applicable environmental regulations.

Figure 1.5.3-1 provides a simplified flow diagram of the IGCC unit planned for the Tampa Electric Company Polk Power Station. As shown in this figure, coal is fed to a conventional rod-type grinding mill to reduce the coal to the design particle size and mixed with water to create a coal slurry. The coal slurry is pumped to the gasifier which is a refractory-lined vessel capable of withstanding high temperatures and pressures. Pure oxygen is also provided to the gasifier from an air separation unit which separates the two major components of air, oxygen and nitrogen, through a process of cooling compressed air to liquid states, separating the oxygen and nitrogen streams, and re-warming the streams to gaseous states. In the gasifier, the coal slurry and oxygen react at high temperatures to produce syngas. The syngas consists primarily of hydrogen, CO, water vapor, and carbon dioxide (CO₂), with small amounts of hydrogen sulfide (H₂S), carbonyl sulfide (COS), methane, argon, and nitrogen. Heat created by the reaction in the gasifier is used to heat water in boiler tubes to steam which is provided to the HRSG/ST facilities.

Within the gasification process, ungasified components of the coal (primarily ash) are cooled in a pool of water at the bottom of the gasifier and form a solid by-product called slag. The slag material is a vitrified (i.e., glasslike) granular solid that is non-leachable and classified as non-hazardous. The slag has commercial applications such as sand-blasting material and as an aggregate in cement, road construction, and

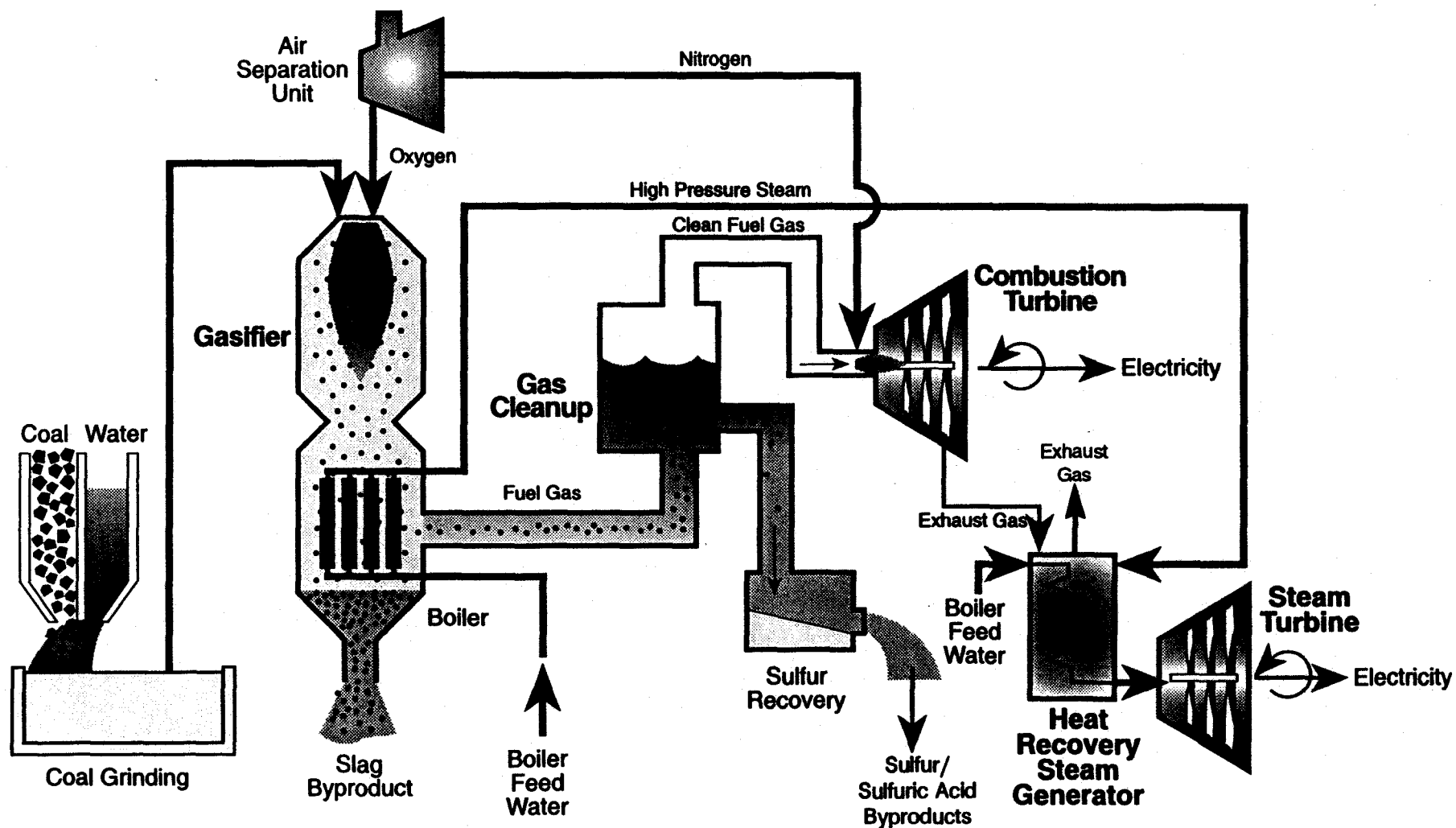


FIGURE 1.5.3-1.

SIMPLIFIED FLOW DIAGRAM OF INTEGRATED COAL GASIFICATION COMBINED CYCLE UNIT

Source: Texaco, 1992. Tampa Electric Company, 1992.



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other building materials. Although a temporary storage area for the slag will be developed onsite, the slag will be actively marketed and sold for offsite uses to minimize the onsite storage requirements. The temporary slag storage area will be lined with a synthetic material or other materials with similar low-permeability characteristics and have appropriate stormwater management control systems.

The syngas from the gasifier will be fed to the gas cleanup systems to remove entrained solids and acid gases such as CO_2 and H_2S . As discussed previously, the gas cleanup systems will include both the conventional CGCU and the demonstration HGCU methods. The CGCU system will be designed to treat 100 percent of the syngas flows for the IGCC unit, while the HGCU system will be capable of treating approximately 50 percent of the gas when the unit is operating at full capacity. Within the CGCU system, the sulfur in the syngas is primarily converted to and recovered as molten, elemental sulfur using a combination of thermal and catalytic reactors. This sulfur recovery process is used extensively in the petroleum refining industry. Elemental sulfur is also a by-product with commercial uses, particularly for the chemical fertilizer industry in central Florida. Some temporary storage for the sulfur by-product in tanks or specially designed railcars will be provided on the site prior to shipment offsite.

For the demonstration HGCU system, the sulfur in the syngas will be converted to sulfuric acid (H_2SO_4) in a skid-mounted unit. Again, H_2SO_4 produced in this cleanup process has commercial uses and will be marketed and sold for these offsite uses.

As shown in Figure 1.5.3-1, the clean syngas is then fed to the advanced CT for firing to produce electricity and the exhaust gas is routed to the HRSG/ST facilities to produce additional electricity as a CC generating unit. Nitrogen from the air separation unit is also fed to the CT unit which increases the overall efficiency of the unit in generating electricity.

Again, the previous descriptions are intended to provide an initial overview of the electric generating technologies and units planned for the Polk Power Station. More detailed descriptions of the designs and operations of these facilities are provided in Chapter 3.0.

1.6 PROJECT TERMINOLOGY

In order to provide the reader of this SCA with a consistent understanding of the Polk Power Station project, Table 1.6.0-1 presents descriptions of certain project terms and components used throughout the SCA.

Table 1.6.0-1. Polk Power Station Project Terminology

Project Term/ Component	Description
Polk Power Station project	The overall Polk Power Station project includes the proposed power plant facilities with a nominal net 1,150-MW generating capacity; fuel delivery and storage facilities; by-product storage areas; cooling reservoir; water supply and wastewater treatment facilities; and associated transmission lines.
Polk Power Station site	The overall 4,348-acre site.
Main power plant facilities site	The approximately 150-acre area to the east of SR 37 on which the main power plant facilities and structures (i.e., power blocks, fuel and by-product storage) will be constructed.
Cooling reservoir	The approximately 860-acre area, including the area of the surrounding earthen berms, within which the cooling reservoir will be constructed. The reservoir will have a maximum bottom elevation of 120 ft-NGVD and the top of the surrounding earthen berms will be at 145 ft-NGVD. The total water surface of the reservoir is approximately 727 acres at the normal operating water level of 136 ft-NGVD. Water discharges (i.e., blowdown) from the reservoir will be routed to the reclaimed lake at the eastern edge of the reservoir and flow into the Little Payne Creek system.
Wildlife corridor or wildlife/ water management area	The approximately 1,511-acre portion of the site to the west of SR 37; this area will be reclaimed in an integrated series of forested and non-forested wetlands and uplands, and will not contain power plant facilities or structures. After reclamation, the entire area will provide a wildlife corridor between the headwater areas of Payne Creek and the Little Manatee River and the South Prong Alafia River system.

Table 1.6.0-1. Polk Power Station Project Terminology (Continued, Page 2 of 3)

Project Term/ Component	Description
Eastern associated transmission line corridor	The 400-ft wide corridor area from the onsite substation to the existing Tampa Electric Company Hardee-Pebbledale 230-kV transmission line along the eastern edge of the site. This corridor is contained completely within the Polk Power Station site boundaries. Two 230-kV electric transmission circuits and structures will be constructed within the corridor.
Northern associated transmission line corridor	The corridor area from the onsite substation to the existing Tampa Electric Company Mines-Pebbledale 230-kV transmission line at a point west of the community of Bradley Junction. The corridor area is 400-ft wide as it runs west on the site from the substation to SR 37 and widens to 0.5 mile centered on SR 37 as it runs north along SR 37. The corridor width increases to 1 mile southwest of Bradley Junction as it turns northwest to interconnect to the existing line. Two 230-kV transmission line circuits and structures will be constructed within this corridor.
IGCC generating unit	The nominal net 260-MW IGCC unit consisting of an advanced CT and HRSG/ST facilities and integrated CG facilities including air separation unit, coal grinding facilities, gas cleanup systems, tail gas treating system, and CG process wastewater treatment facilities.
Stand-alone CC generating units	Two nominal net 220-MW CC units each consisting of two nominal net 75-MW CTs and nominal net 70-MW HRSG/ST facilities.
Stand-alone CT generating units	Six CT units each with a nominal net generating capacity of 75 MW.

Table 1.6.0-1. Polk Power Station Project Terminology (Continued, Page 2 of 3)

Project Term/ Component	Description
Syngas/coal gas	Syngas and coal gas are used interchangeably in this SCA to refer to the combustible coal-derived gas produced in the gasification process and, after appropriate cleanup, used as fuel in the advanced CT in the IGCC unit.

Source: ECT, 1992.

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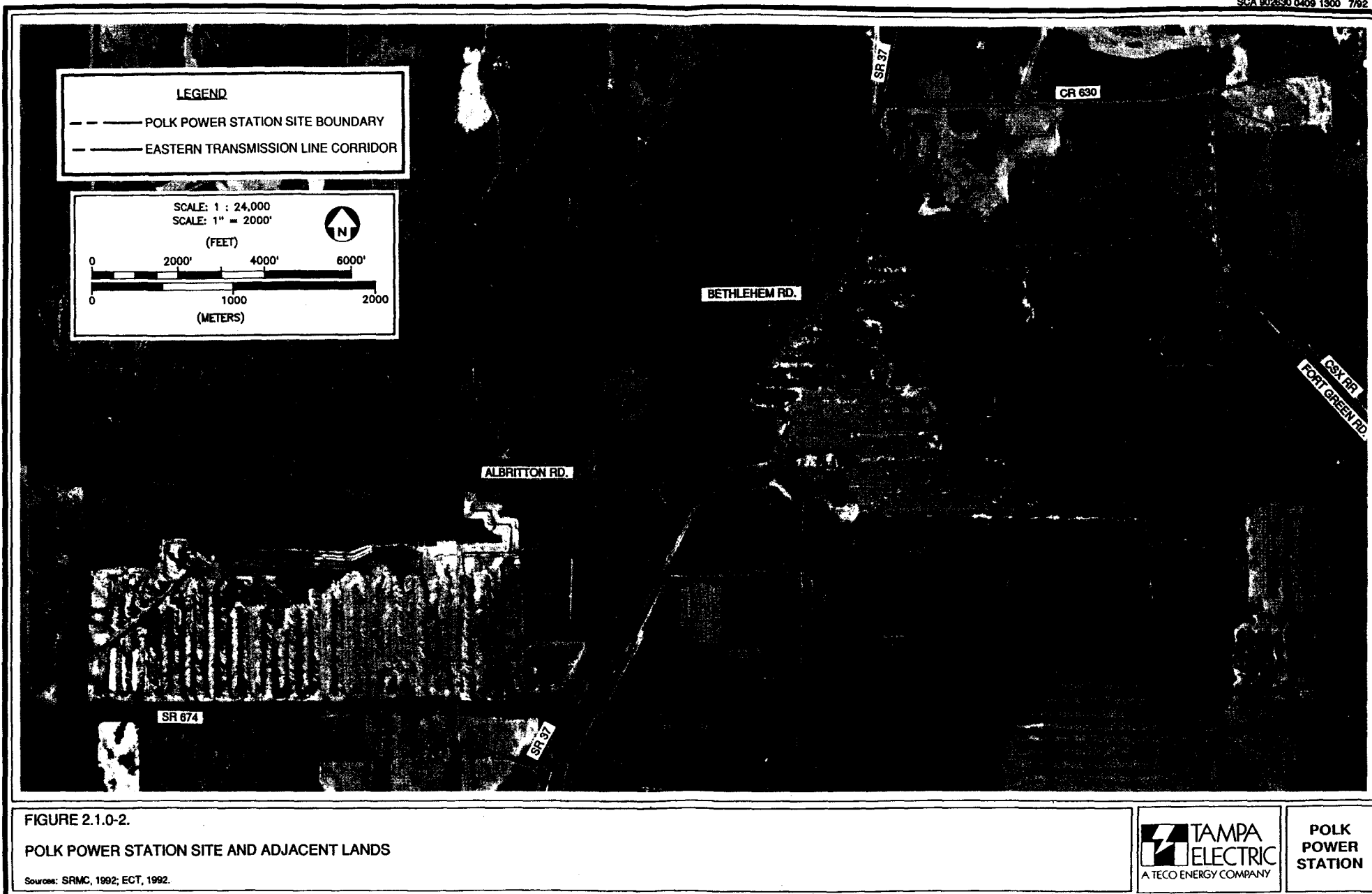
CHAPTER 2.0

SITE AND VICINITY CHARACTERIZATION

2.1 SITE AND ASSOCIATED FACILITIES DELINEATION

The Polk Power Station site consists of approximately 4,348 acres in southwest Polk County. The site is bordered by the Hillsborough County line along the western boundary; Fort Green Road (CR 663) on the east; CR 630 and Bethlehem and Albritton Roads along the north; and SR 674 and phosphate clay settling areas on the south. The Polk Power Station site and adjacent areas are shown on Figure 2.1.0-1 at a scale of 1 inch equals 2,000 feet (ft) based on U.S. Geological Survey (USGS) 7.5-minute quadrangle topographic maps, and a recent aerial photograph of the site and adjacent areas at the same scale is shown on Figure 2.1.0-2. A more detailed scale (1 inch equals 1,000 ft) aerial photograph of the site is provided in Appendix 11.16.8. SR 37 bisects the property running in a southwest to northeast direction. As shown on the aerial photograph, the property to the east of SR 37 consists primarily of recently mined areas with water-filled mine cuts between over-burden spoil piles, recently reclaimed areas, and old mined and unreclaimed areas. The area to the west of SR 37 is currently being mined for phosphate matrix. These operations are scheduled to continue into 1994. Except for the approximately 775-acre tract south of CR 630 (Sections 34 and 35), the site has been part of the Agrico Fort Green Mine.

Southwest Polk County is relatively flat, with elevations generally ranging between 120 and 150 feet above mean sea level (ft-msl). The prevalent land use in the area is phosphate strip mining. The Polk Power Station site itself fits this description. The elevation of the plant site is approximately 140 ft-msl. More than 94 percent (i.e., approximately 4,110 acres) of the 4,348-acre site has been or will be mined or disturbed by phosphate mining activities prior to Tampa Electric Company's use of the site. Some of the mined-out areas will be developed into a cooling reservoir.



The 100-year floodplains for the pre-mining conditions onsite have been documented by the Federal Emergency Management Agency (FEMA), and are shown on Figure 2.1.0-1. Only a small portion of the site area to the west of SR 37 is located within the 100-year floodplain. Under pre-mining conditions, portions of the site area to the east of SR 37 contained floodplains primarily associated with the headwaters of Little Payne Creek. As shown on the aerial photograph in Figure 2.1.0-2, the majority of these floodplains have been mined and are not currently connected to the nearby creek systems.

2.2 SOCIO-POLITICAL ENVIRONMENT

Certification of the Polk Power Station site requires the analysis of various land use and socioeconomic baseline conditions and projected impacts in accordance with guidelines established by FDER Form 17-1.211(1), F.A.C. and local government comprehensive plans, zoning ordinances, and development regulations. The various planning issues relevant to the Polk Power Station fall within the following generalized categories: existing land use, comprehensive plans and zoning ordinances, infrastructure and growth management, cultural resources, aesthetics, and socioeconomics.

Based on the preliminary evaluation of existing conditions, consistency with land development plans and ordinances, and sufficient capacity of public facilities, the Polk Power Station is a compatible development and should represent no significant negative impacts to the socio-political environment in the surrounding area.

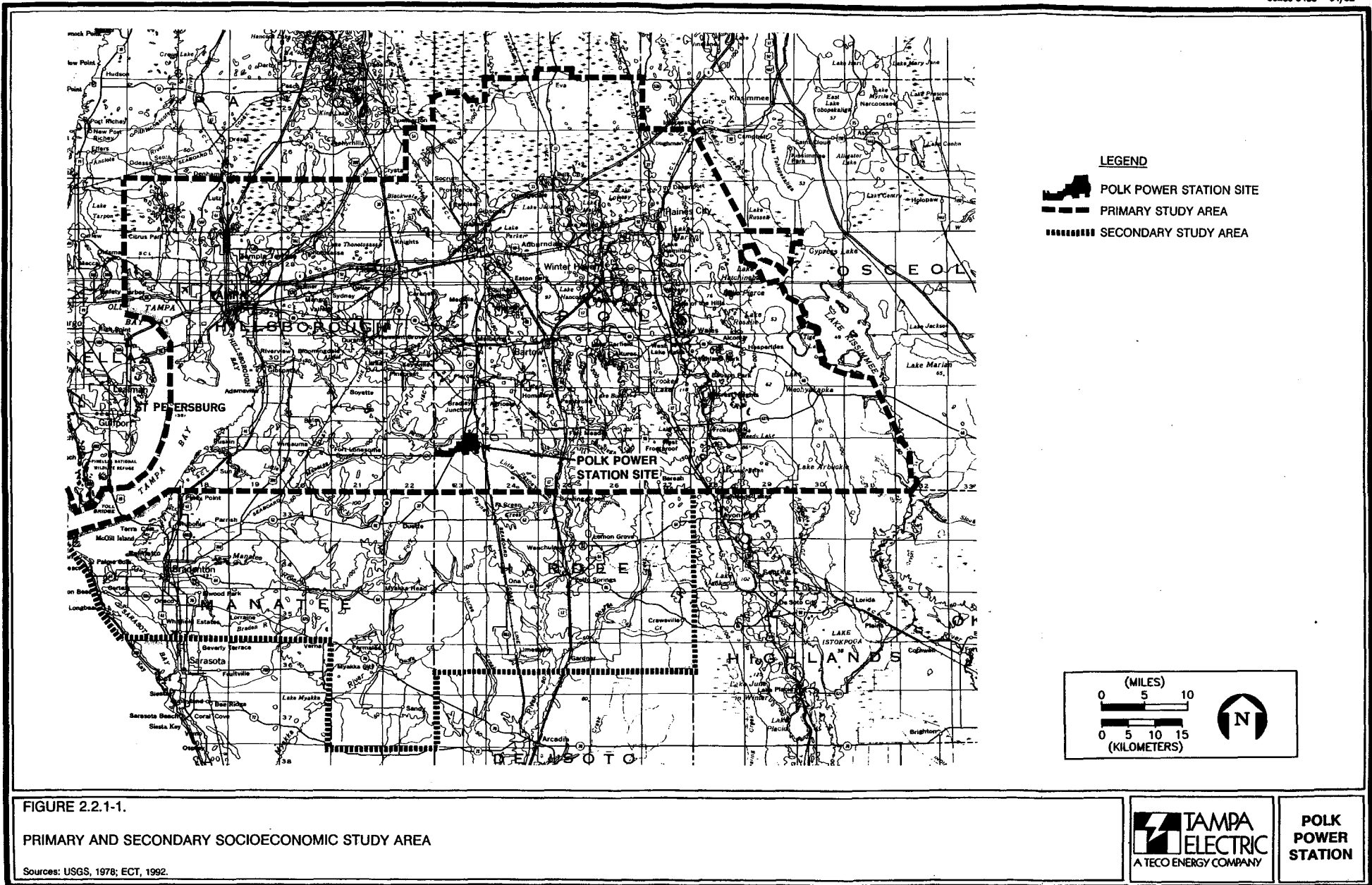
2.2.1 SOCIOECONOMIC STUDY AREA

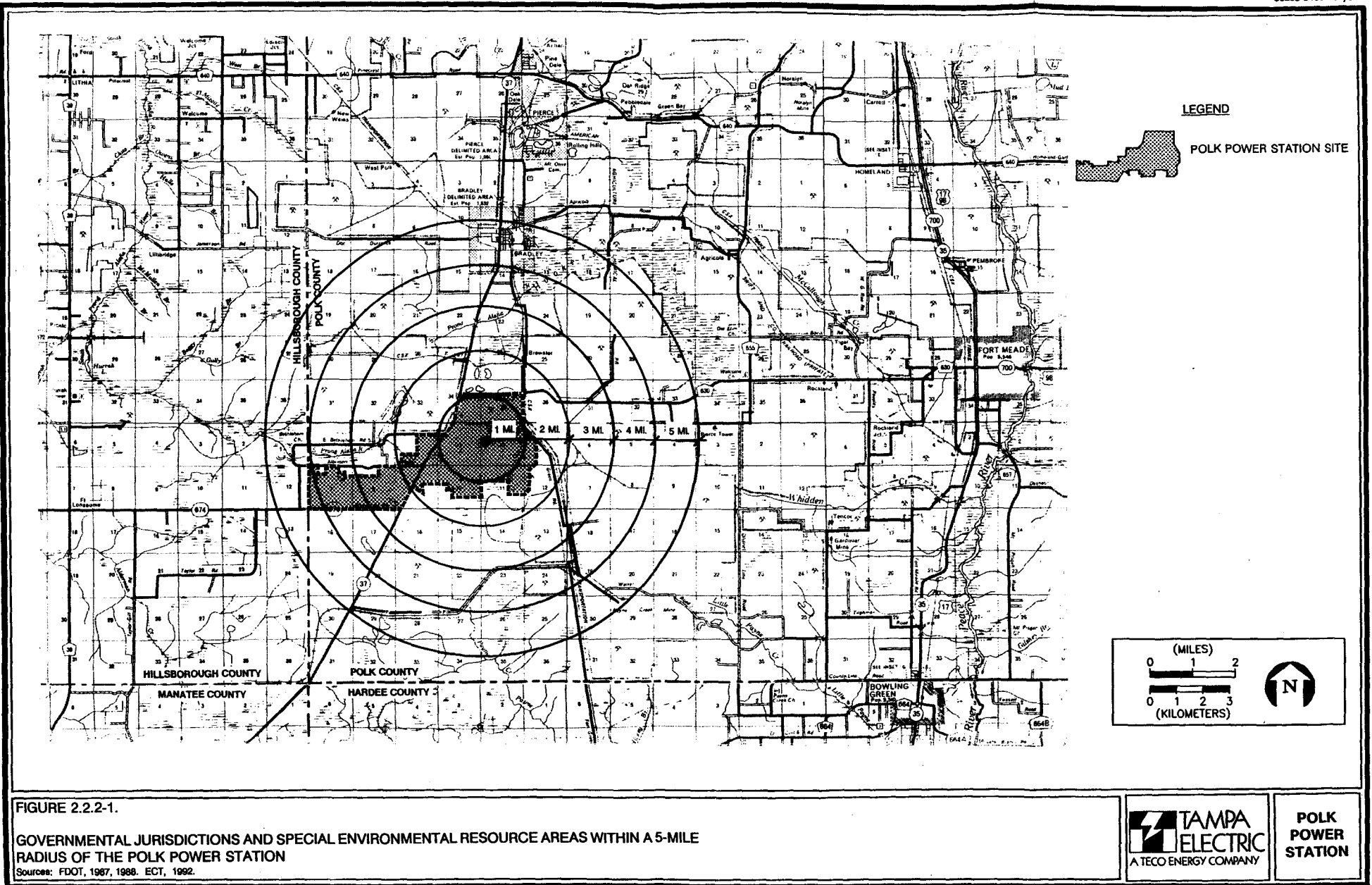
For purposes of this application, two study areas have been defined as being within the geographic influence of the Polk Power Station. As shown on Figure 2.2.1-1, the primary socioeconomic study area was defined to include Polk and Hillsborough Counties, based on the projected primary source of employment and commuting patterns. The secondary socioeconomic study area was defined to include Manatee and Hardee Counties, based on the location of the Polk Power Station relative to these county boundaries. Only small percentages of the workforce are expected to be drawn from Manatee and Hardee Counties, with correspondingly minimal impacts anticipated (see Sections 4.6 and 5.9). Therefore, certain socioeconomic characteristics (e.g., police protection) were described only for the primary and not the secondary study area.

2.2.2 GOVERNMENTAL JURISDICTIONS

As shown on Figure 2.2.2-1, the Polk Power Station site lies entirely within Polk County, and borders the Polk/Hillsborough County line on the western property boundary. The Polk Power Station site is also within the jurisdiction of CFRPC and SWFWMD. No public lands are located directly adjacent to the Polk Power Station, or within a 5-mile radius of the site.

The nearest community is unincorporated Bradley Junction, which lies approximately 4.4 miles to the north of the power block and fuel storage area. As shown on Figure 1.4.2-1, the nearest incorporated municipality to the site is the City of Bowling Green, located approximately 10 miles to the southeast in Hardee County. The nearest incorporated areas in Polk County to the proposed site are the Cities of Fort Meade and Mulberry, which lie approximately 11 miles to the east and north of the site, respectively. Larger incorporated communities lying within a 45-minute commuting distance include: Bartow, approximately 13 miles northeast; Lakeland, approximately 17 miles north; Winter Haven, approximately 26 miles to the northeast; Plant City, approximately 19 miles to the northwest; Bradenton, approximately 35 miles to the southwest; and the Tampa urban area including Brandon, whose outer fringe is located approximately 23 miles west-northwest of the Polk Power Station site.





2.2.3 ZONING AND LAND USE PLANS

Various state, regional, and local comprehensive plans and local zoning ordinances affect the Polk Power Station site. These include:

- State Comprehensive Plan,
- Central Florida Regional Policy Plan,
- Polk County Comprehensive Plan, and
- Polk County Zoning Ordinance.

A review of the compatibility of the Polk Power Station with the goals, objectives, and policies of these plans is contained in Section 4.6. A map of future land use categories found within a 5-mile radius of the Polk Power Station is shown in Figure 2.2.3-1, and a description of permitted uses within those categories is found in Table 2.2.3-1.

The entire Polk Power Station site is designated as Phosphate Mining (PM) in the Future Land Use Element of the Polk County Comprehensive Plan (1991). The construction and operation of Certified Electric Power Generating Facilities (power plants subject to certification under the FEPPSA) are permitted uses within this future land use category. County review and approval of such facilities described by the Comprehensive Plan will be implemented by a Conditional Use Permit (CUP). Site layout of the power block and fuel storage areas of Polk Power Station will satisfy locational, environmental, and development approval criteria contained in Section 2.114-C of the Comprehensive Plan.

The suitability of the Polk Power Station site within southwestern Polk County for the development of an electric generating facility is substantiated within Appendix B 2.100 of the Comprehensive Plan Future Land Use Support Document:

"Southwest Polk County possesses several advantages [for a power plant location] relative to other locations:

1. This area is predominantly reclaimed phosphate mining lands that do not contain a large amount of environmentally sensitive land;

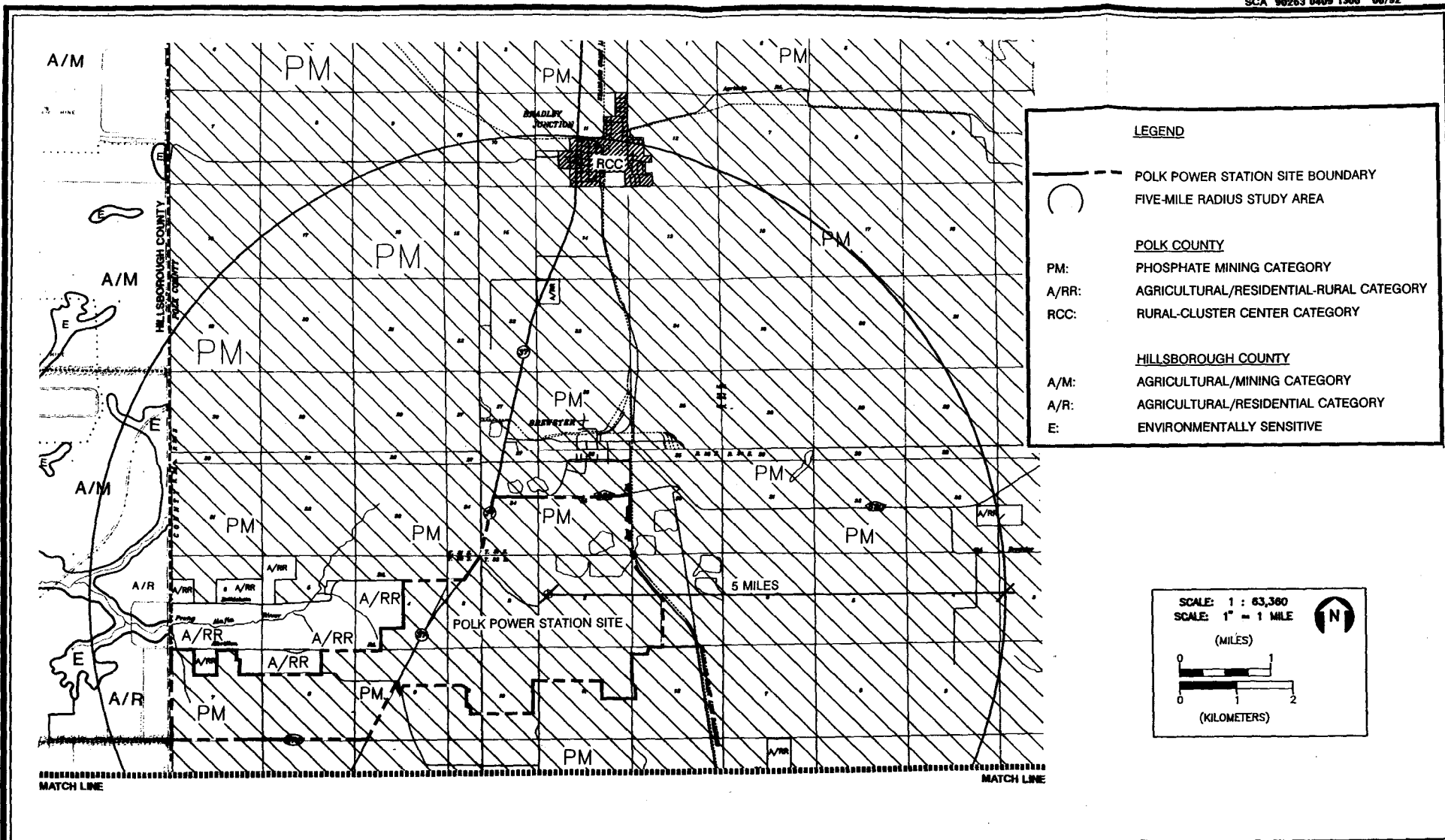


FIGURE 2.2.3-1.

FUTURE LAND USE CATEGORIES WITHIN A 5-MILE RADIUS OF THE POLK POWER STATION SITE
 (PAGE 1 OF 2)

Sources: Polk County, 1991. Hillsborough County, 1991. ECT, 1992.



**POLK
POWER
STATION**

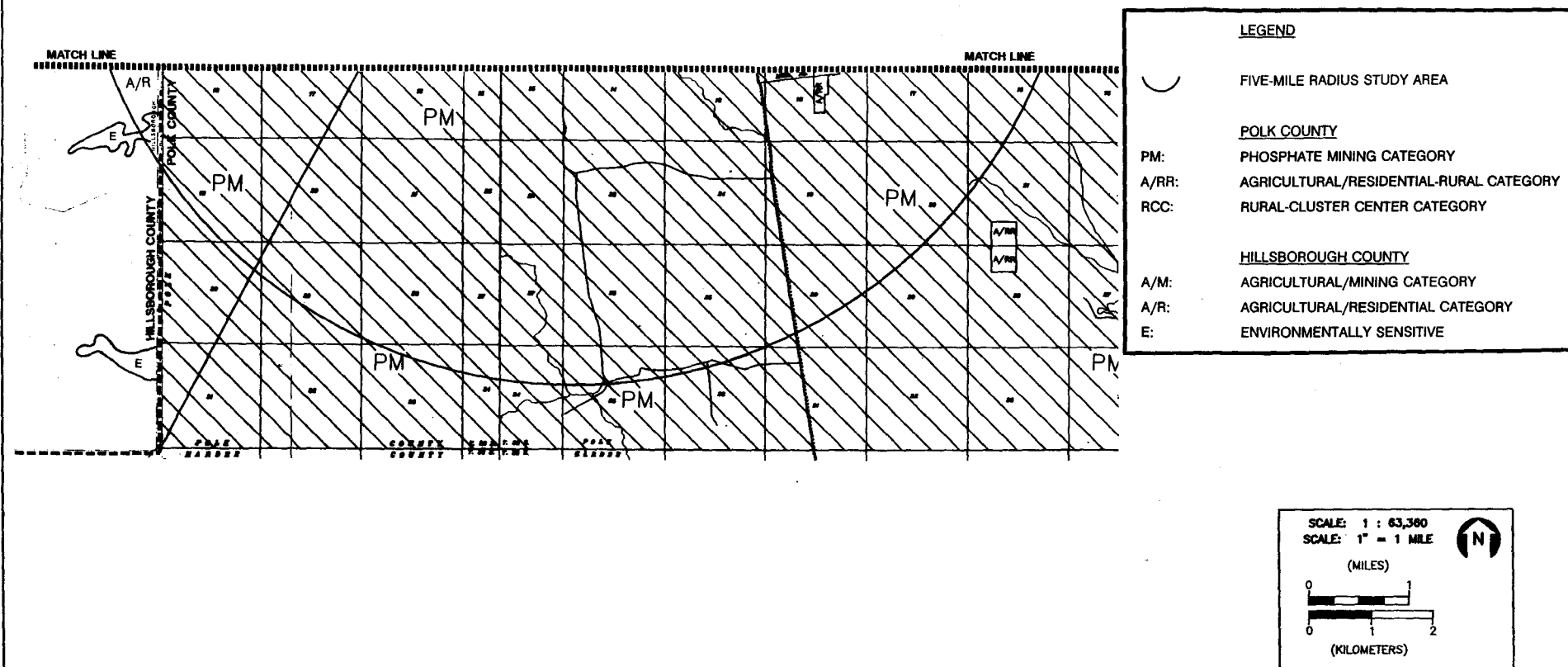


FIGURE 2.2.3-1.

FUTURE LAND USE CATEGORIES WITHIN A 5-MILE RADIUS OF THE POLK POWER STATION SITE
 (PAGE 2 OF 2)

Sources: Polk County, 1991. Hillsborough County, 1991. ECT, 1992.

TAMPA ELECTRIC
 A TECO ENERGY COMPANY

**POLK
 POWER
 STATION**

Table 2.2.3-1. Future Land Use Categories and Zoning Districts Within a 5-Mile Radius of the Polk Power Station

Designation	Permitted Use
-------------	---------------

FUTURE LAND USE CATEGORIES

Polk County

PM	PHOSPHATE MINING-- Phosphate mining and allied industries, land reclamation, agriculture, Certified Electric-Power Generating Facilities and ancillary facilities, Non-certified Electric-Power Generating Facilities and ancillary facilities, commercial hazardous waste treatment facilities, and other land uses with conditional approval that are compatible with phosphate extraction and processing
A/RR	AGRICULTURAL/RURAL RESIDENTIAL-- Single-family homes at a density of one dwelling unit per 5 acres, associated farm labor residential uses, utility structures, and permitted uses within Rural Residential Development (RRD) and Rural Mixed-Use Development (RMD) categories
RCC	RURAL-CLUSTER CENTER-- Single-family homes at or less than a density of two dwelling units per acre, commercial uses compatible with rural population needs for retail and personal services, non-residential uses concentrated at the center of the cluster (i.e., grocery, pharmacy, medical offices) based on location and minimum population support criteria

Hillsborough County

A/M	AGRICULTURE/MINING-- Residential units up to 0.05 dwelling units per acre, RV parks, adult congregate living facilities, rehabilitation centers, farm labor camps, rural scale neighborhood commercial uses, offices, and industrial uses related to agricultural uses, mining-related activities, agricultural uses
A/R	AGRICULTURE/RESIDENTIAL-- Residential units up to 0.2 dwelling units per acre, RV parks, adult congregate living facilities, rehabilitation centers, farm labor camps, rural scale neighborhood commercial uses, offices, and industrial uses related to agricultural uses, mining-related activities, agricultural uses
E	ENVIRONMENTALLY SENSITIVE-- Conservation

Table 2.2.3-1. Future Land Use Categories and Zoning Districts Within a 5-Mile Radius of the Polk Power Station (Continued, Page 2 of 3)

Designation	Permitted Use
<u>ZONING DISTRICTS</u>	
<u>Polk County</u>	
RC	RURAL CONSERVATION--Class III Agricultural Uses, parks and open space, nature preserves and wildlife refuges, single-family detached dwellings, foster homes, home occupations, Class I and II Essential Services, off-premises signs, other uses similar to or customarily accessory to those described
R-3	RESIDENCE--Residential dwellings not to exceed two stories, foster homes, customary accessory structures, parks and playgrounds, Class I and II Agricultural Uses, Class I and II Essential Services, home occupation
R-2	RESIDENCE--Single-family detached dwellings, foster homes, customary accessory structures, public parks and playgrounds, Class I and II Agricultural Services, Class I and II Essential Services, home occupations
R-1	RESIDENCE--Single-family detached dwellings, foster homes, customary accessory structures, public parks and playgrounds, Class I and II Agricultural Services, Class I and II Essential Services
SF-1M	SINGLE FAMILY-MIXED--Single-family detached dwellings, foster homes, customary accessory structures, parks and playgrounds, Class I Agricultural Uses, Class I and II Essential Services
C-2	MULTI-NEIGHBORHOOD COMMERCIAL--Retail establishments, personal service establishments, offices, clinics, home occupations, Class I and II Agricultural Uses, Class I and II Essential Services, restaurants, financial institutions, light repair services, day-care centers, multiple-family dwellings
C-3	REGIONAL COMMERCIAL--Retail establishments, personal service establishments, offices, clinics, Class I and II Agricultural Uses, Class I and II Essential Services, financial institutions, light repair services, day-care centers, multi-family structures, restaurants, transient lodging places, business services, enclosed storage and warehousing, health and service establishments, amusement and recreational services, cultural activities, radio and television stations, kennels, off-premises signs

Table 2.2.3-1. Future Land Use Categories and Zoning Districts Within a 5-Mile Radius of the Polk Power Station (Continued, Page 3 of 3)

Designation	Permitted Use
GI	GENERAL INDUSTRIAL--Manufacturing, processing, and packaging of commercial foods, textiles, furniture and fixtures, printing trades, chemically based products, ceramic goods, office equipment and machinery, electronics, light industrial products, transportation equipment, tobacco products, lumber and wood, paper and paper products, chemical processing, petroleum and rubber, stone and cement products, metal products, and offices and office parks, research, development, and testing centers, training schools, radio and television stations, repair services, Class I, II, and III Essential Services, salvage yards, stockyards, and aviation facilities
Hillsborough County	
M-1	INDUSTRIAL--Manufacturing or the operation of abrasive products, adhesives, asbestos products, blueing, boats and repairing, breweries and distilleries, brick products, calcimine, clay and stone products, commercial docks and marine facilities, concrete products, essential oils, flour, feed and grain packaging and storage, food products, fruit and vegetable processing, galvanizing and plating, glass products, inks, locomotive and railroad car building and repair, monument and architectural stone, paint and varnish products, paper and paperboard, pottery and porcelain products, radio and television stations, refractories, sand-lime products, stone products, wallboard products, and wire rope and cable
A	AGRICULTURE--Conventional single-family and mobile home residential development at a density not to exceed 1 dwelling unit per 10 acres, recreational uses, community residential home, agricultural uses
AA and AS-1*	ACREAGE AGRICULTURAL/AGRICULTURAL, SINGLE FAMILY--Conventional single-family and mobile home residential development at a density not to exceed 1 dwelling unit per acre, agricultural uses, animal hospitals, boat piers and non-commercial boat slips, youth camps, churches, congregate living facilities, country clubs, recreational uses, fish hatcheries, guest houses, libraries, mining, muck lots, sawmills, schools, radio and television stations, land preserves

Note: Permitted uses are summarized. Some uses require conformance with other applicable regulations.

* Zoning districts were promulgated in two different zoning ordinances but allow identical types of development in terms of density, intensity, and character.

Sources: Polk County, 1991, 1983.

Hillsborough County, 1989/1991, 1985/1990.

ECT, 1992.

2. This area of the county is relatively close to population centers along the west coast of the state;
3. This area of the county possesses a full complement of requisite infrastructure (rail spurs, adequate road network, plentiful water supply, etc.) for facilities such as this." (Polk County Comprehensive Plan, 1991).

Zoning districts located within a 5-mile radius of the Polk Power Station are shown in Figure 2.2.3-2, and a description of permitted uses within these districts are summarized in Table 2.2.3-1.

The Polk Power Station site is zoned Rural Conservation (RC), a district which provides for low-density, agricultural, and open space uses (Polk County Zoning Ordinance, 1983). This zoning district allows electric generating facilities as a conditional use as reviewed and approved through a CUP.

2.2.3.1 Zoning

The Polk Power Station is considered a Class III Essential Service by the Polk County Zoning Ordinance, and is an allowable conditional use within the Rural Conservation zoning district subject to submittal of a CUP and discretionary zoning approval by the Polk Board of County Commissioners (BOCC) upon review by the appropriate Polk County staff and subsequent recommendation made to the BOCC by the Polk County Zoning Advisory Board. The site's zoning district was previously shown in Figure 2.2.3-2, and copies of applicable portions of the Polk County Zoning Ordinance 83-2 are contained in Appendix 11.3.1.

On January 17, 1992, a Pre-Application Meeting for the CUP was held in the offices of the Polk County Planning Division between Polk County staff members and representatives of Tampa Electric Company. The CUP application was filed with Polk County Development Services on January 24, 1992, with Supplemental Information provided on February 12, 1992. This information was reviewed by Polk County staff and their comments were provided to representatives of Tampa Electric Company in an Impact Review Meeting held on March 16, 1992, at the Polk County

SEE INSERT, PAGE 3 OF 3

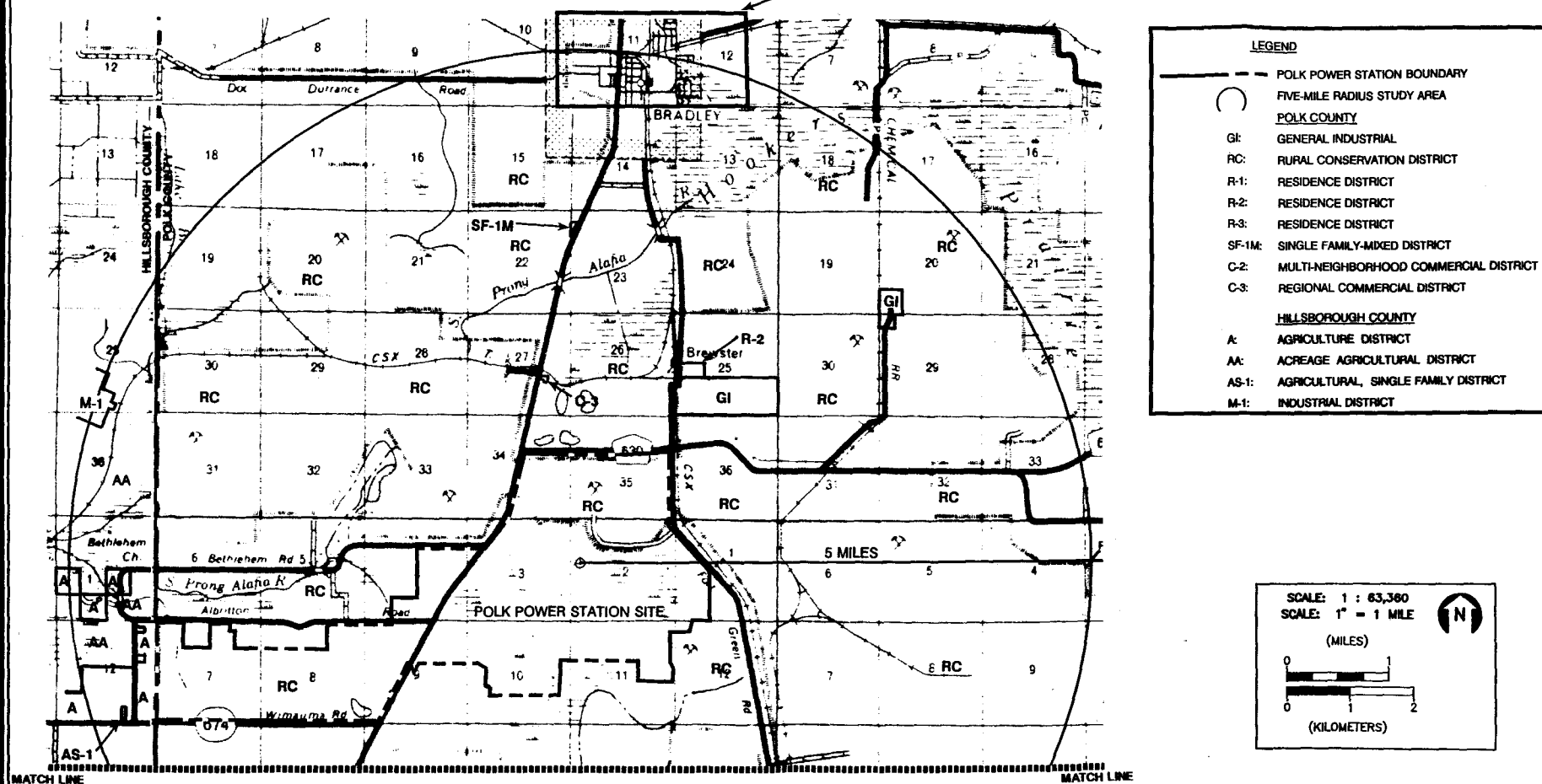


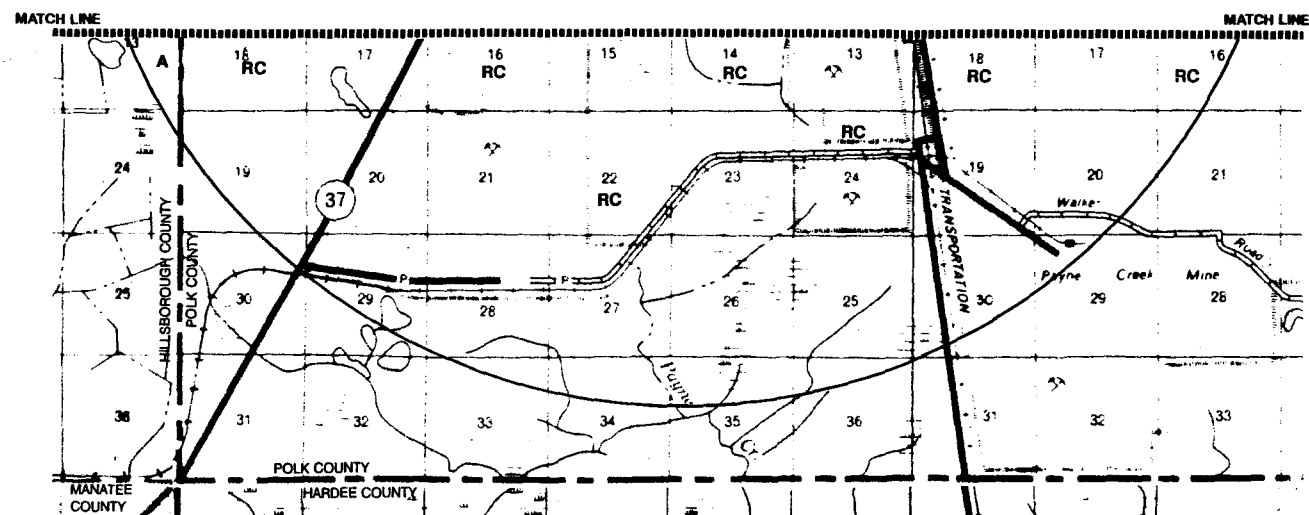
FIGURE 2.2.3-2.

ZONING DISTRICTS WITHIN A FIVE-MILE RADIUS OF THE
 POLK POWER STATION SITE (PAGE 1 OF 3)

Sources: FDOT, 1987, 1988. Polk County, 1991. Hillsborough County, 1989, 1991. ECT, 1992.

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○ FIVE-MILE RADIUS STUDY AREA

POLK COUNTY

GI: GENERAL INDUSTRIAL

RC: RURAL CONSERVATION DISTRICT

R-1: RESIDENCE DISTRICT

R-2: RESIDENCE DISTRICT

R-3: RESIDENCE DISTRICT

SF-1M: SINGLE FAMILY-MIXED DISTRICT

C-2: MULTI-NEIGHBORHOOD COMMERCIAL DISTRICT

C-3: REGIONAL COMMERCIAL DISTRICT

HILLSBOROUGH COUNTY

A: AGRICULTURE DISTRICT

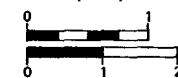
AA: ACREAGE AGRICULTURAL DISTRICT

AS-1: AGRICULTURAL, SINGLE FAMILY DISTRICT

SCALE: 1" = 63,360

SCALE: 1" = 1 MILE

(MILES)



(KILOMETERS)



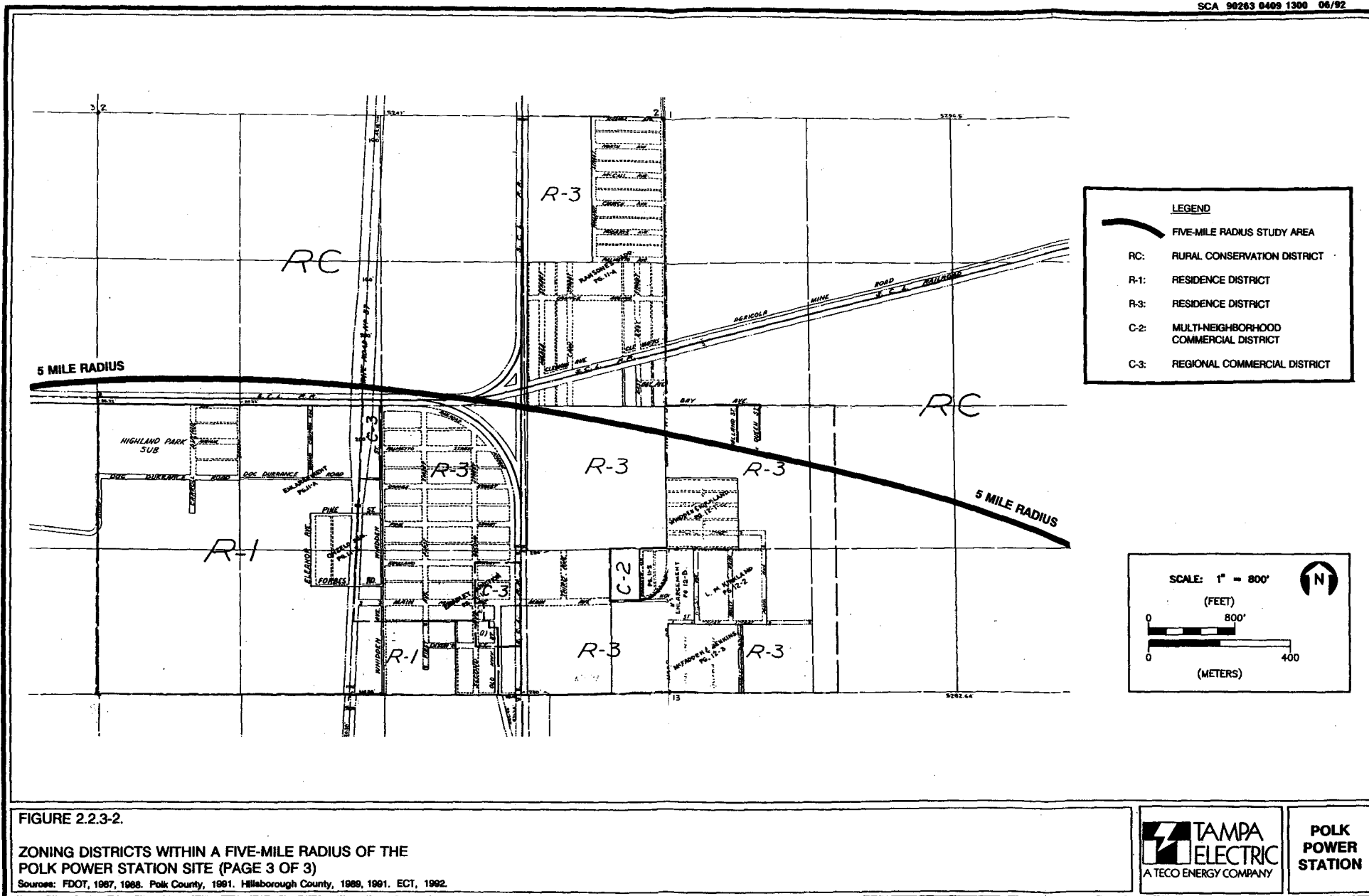
FIGURE 2.2.3-2.

ZONING DISTRICTS WITHIN A FIVE-MILE RADIUS OF THE
POLK POWER STATION SITE (PAGE 2 OF 3)

Sources: FDOT, 1987, 1988. Polk County, 1991. Hillsborough County, 1989, 1991. ECT, 1992.

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Planning Division offices. Responses to comments generated during the Impact Review Meeting were submitted on March 30, 1992, and another review meeting was held on April 1, 1992. The Zoning Advisory Board recommended approval of the CUP on May 13, 1992, and the BOCC approved the CUP on June 2, 1992 (see Appendix 11.3.2).

2.2.3.2 Transportation

Based on review comments made by the Polk County Planning Division, Transportation Planning Section, regarding potential traffic impacts, the submittal of a Land Development Traffic Assessment was required. This assessment was used as the basis for the discussion of baseline traffic conditions and projected traffic impacts contained in this SCA, and a copy of the traffic assessment is contained in Appendix 11.6. A pre-application conference for the traffic assessment was held between Polk County staff and representatives of Tampa Electric Company on April 3, 1992, at the offices of the Polk County Planning Division. The traffic assessment was submitted on April 14, 1992.

2.2.3.3 Growth Management/Concurrency

The Polk Power Station is required to satisfy requirements governing adequate public infrastructure as contained in the Polk County Concurrency Management Ordinance 92-10. As this project is subject to FEPPSA (F.S., 403.501-403.519), the concurrency determination will be approved as part of the SCA process.

2.2.3.4 Land Use and Comprehensive Plan

The Polk Power Station is considered a Certified Electric-Power Generating Facility according to the Polk County Comprehensive Plan, and is a permitted use within the Phosphate Mining future land use category. The site's future land use designation, Phosphate Mining, was previously identified in Figure 2.2.3-1. Copies of applicable portions of the Polk County Comprehensive Plan, including objectives and policies cited in Section 4.6.2, are provided in Appendix 11.4.1

Since the Polk Power Station site falls within the appropriate future land use category, no additional land use or comprehensive planning permits or approvals relative to the Polk County Comprehensive Plan were required.

2.2.3.5 State and Regional Plans

The Polk Power Station furthers or is consistent with applicable goals and policies contained in the Central Florida Comprehensive Regional Policy Plan and State Comprehensive Plan, and as discussed in Section 4.6.2. Copies of these regional and state goals and policies are provided in Appendices 11.4.2 and 11.4.3, respectively.

2.2.4 DEMOGRAPHY AND ONGOING LAND USE

Based on the Polk Power Station site's location, the socioeconomic study region was determined to include Polk, Hillsborough, Manatee, and Hardee Counties. This socioeconomic study area was previously identified in Figure 2.2.1-1. Each of these counties have different socioeconomic characteristics which range from primarily urban in Hillsborough County, to primarily agricultural in Hardee County. Much of Polk County contains agricultural uses such as those surrounding the Polk Power Station; however, the Lakeland/Winter Haven Standard Metropolitan Statistical Area (SMSA) is becoming increasingly urbanized as a result of its proximity to Tampa and Orlando.

2.2.4.1 Population

The population of the State of Florida in general experienced extreme growth between 1970 and 1980, with a 43.5-percent change. This growth slowed during the decade of 1980 to 1990, to a rate of 32.8-percent change [Bureau of Economic and Business Research (BEBR), 1991]. This population growth is attributed primarily to in-migration of new residents. The population counts based on 1980 and 1990 U.S. Census data and population projections to the year 2010 are shown in Table 2.2.4-1. According to the 1990 census data, Hillsborough County is the fifth most populated county in the state with approximately 70.4 percent of the population growth between 1980 and 1990 due to net in-migration and a rate of 28.9-percent change. Polk County is the eighth most populous county in the state, according to 1990 census data, with 76.4 percent of the county's population growth between 1980 and 1990 due to net in-migration and a rate of 2.6-percent change. Manatee County is the sixteenth most populated county (based on 1990 census data), with 100 percent of the growth occurring between 1980 and 1990 due to net in-migration. Hardee County ranked fiftieth in population and experienced a decrease in population between 1980 and 1990, 100 percent of which was accounted for by out-migration (BEBR, 1991).

Another indicator of population growth and level of urbanization is the ratio of persons per square mile (persons/mi²). For 1990, the statewide average was 239 per-

Table 2.2.4-1. Population Statistics: Census Counts and Medium Forecast Projections to 2010 (x 1,000)

	<u>Census</u>		<u>Projections</u>			
	1980	1990	1995	2000	2005	2010
State of Florida	9,746.3	12,937.9	14,451.8	15,728.4	16,946.4	18,096.6
Hardee County	20.4	19.5	19.9	20.2	20.6	21.0
Hillsborough County	646.9	834.1	917.7	987.2	1,053.6	1,116.9
Polk County	321.6	405.4	444.7	477.3	508.4	537.7
Manatee County	148.4	211.7	241.1	266.2	290.1	312.8

Sources: BEBR, 1991.
ECT, 1992.

sons/mi². In 1990, Hillsborough County ranked sixth highest in population density at 792 persons/mi², Manatee County ranked sixteenth highest at 283 persons/mi², Polk County ranked eighteenth highest at 222 persons/mi², and Hardee County ranked fiftieth highest at 31 persons/mi² (BEBR, 1991).

A decreasing trend in population characteristics within the state and socioeconomic study regions of the site is the average household size, which is largely attributable to single parent families and smaller family sizes. Of the four counties in the study region, Polk County experienced the largest decrease in average household size between 1980 and 1990, with a reduction from 2.70 to 2.53 persons per household, a 6.3-percent decrease. The average household size in Hillsborough County decreased from 2.66 persons to 2.51 persons, a 5.6-percent decrease. Hardee County experienced less of a decrease, from 3.05 to 2.95 persons per household, a 3.3-percent decrease. The Manatee County average household size decreased from 2.36 to 2.29 persons, a 3.0-percent decrease.

The population statistic of older persons relates directly to the state's attraction for retirees and can be expected to increase in the future. Additionally, as coastal areas are becoming built out and land prices become higher, the development of retirement centers has shifted towards the interior of the state. Based on 1980 and 1990 census figures, the percentage of population over 65 years old has increased in Polk County from 14.3 to 18.6 percent (30.1-percent change); in Hardee County from 11.4 to 15.2 percent (33.3-percent change); and increasing at a lower rate in Hillsborough County from 11.5 to 12.2 percent (6.1-percent change). In Manatee County, which has the highest percentage of persons over 65 years old of the subject four counties, showed an increase in percentage of persons over 65 years old from 27.1 to 28.1 percent (3.7-percent change) between 1980 and 1990 (BEBR, 1991). This illustrates a slowing trend in retirement aged population moving to Manatee and Hillsborough Counties relative to the other counties in the region of the Polk Power Station site.

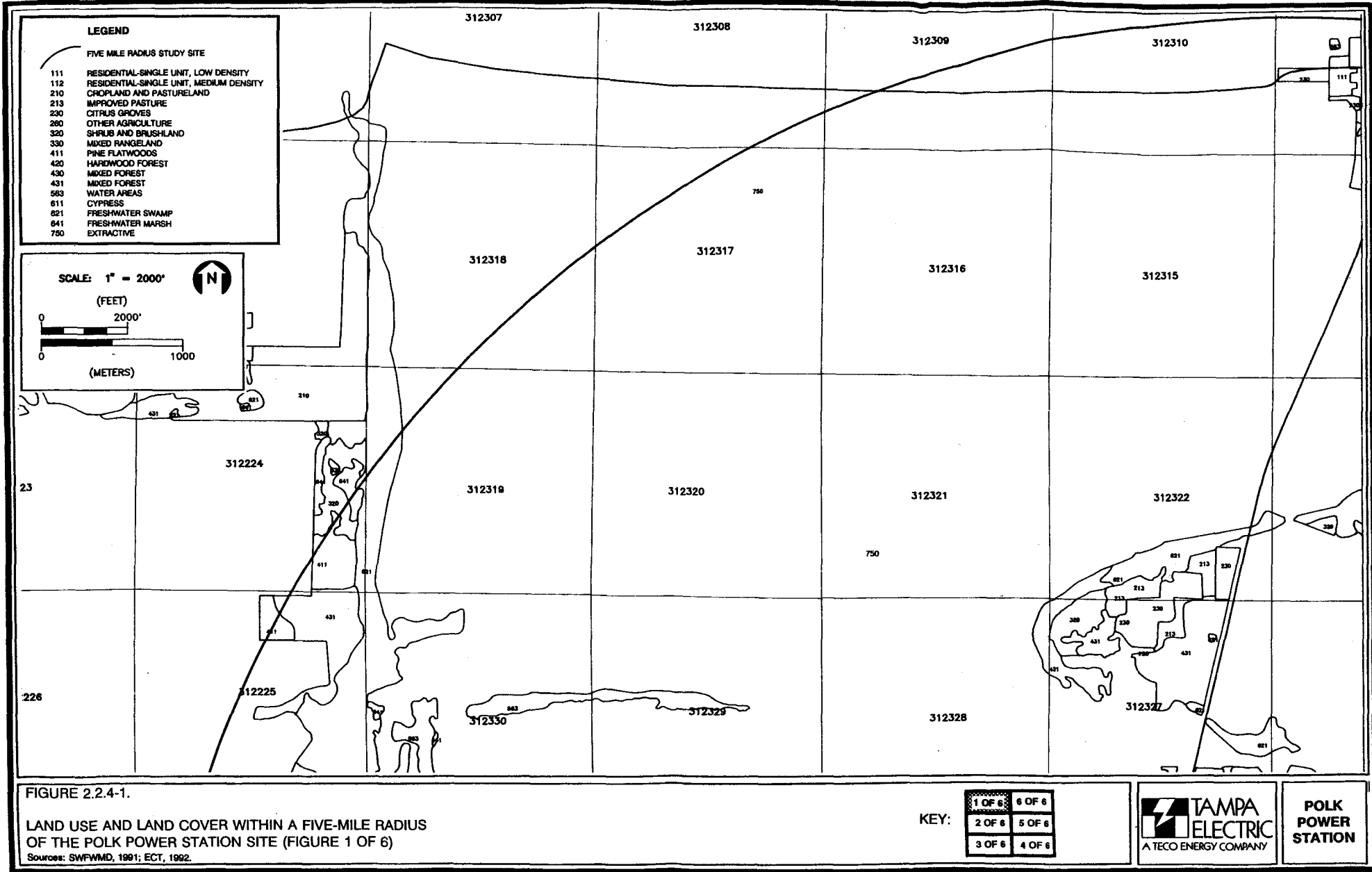
2.2.4.2 Existing Land Use

The majority of the Polk Power Station site has been used for phosphate mining and is in a disturbed state. The existing land use features within this site include recently mined areas containing water-filled mine cuts between over-burden spoil piles, older mined, reclaimed and unreclaimed areas, and minimal areas which are undisturbed. More than 91 percent (i.e., approximately 3,970 acres) of the 4,348-acre site has been or will be impacted by mining activities.

Existing land uses found adjacent to the Polk Power Station site boundaries primarily include areas currently utilized for phosphate mining, and reclaimed and unreclaimed phosphate mining areas. From a land use perspective, those reclaimed areas currently function as agricultural land. Scattered residential areas are also found in some areas around the Polk Power Station site in addition to those lands utilized for current or past mining operations. Approximately 85 homes are located in areas west of SR 37 north of the Polk Power Station site along Albritton and Bethlehem Roads. The Alafia Bible Camp is also located along Bethlehem Road, and the Bethlehem Primitive Baptist Church and Cemetery are located at the western edge of Bethlehem Road. Approximately 14 additional homes are located 1.5 miles to the southeast of the Polk Power Station site, along Mills Road, and approximately 30 other homes are located west of the Polk Power Station site adjacent to SR 674.

The only other areas of residential and commercial development found within a 5-mile radius of the Polk Power Station are located approximately 4 miles to the north, in the unincorporated community of Bradley Junction.

Existing land use and land cover characteristics within the Polk Power Station site and the surrounding area within a 5-mile radius drawn from the IGCC unit exhaust stack are shown at a scale of 1 inch equals 2,000 ft (1:24,000 proportion scale) on Figure 2.2.4-1. The land use and land cover information was generated for SWFWMD by their consultant in late 1991, as classified according to the Florida Department of Transportation (FDOT) Land Use, Cover, and Forms Classification



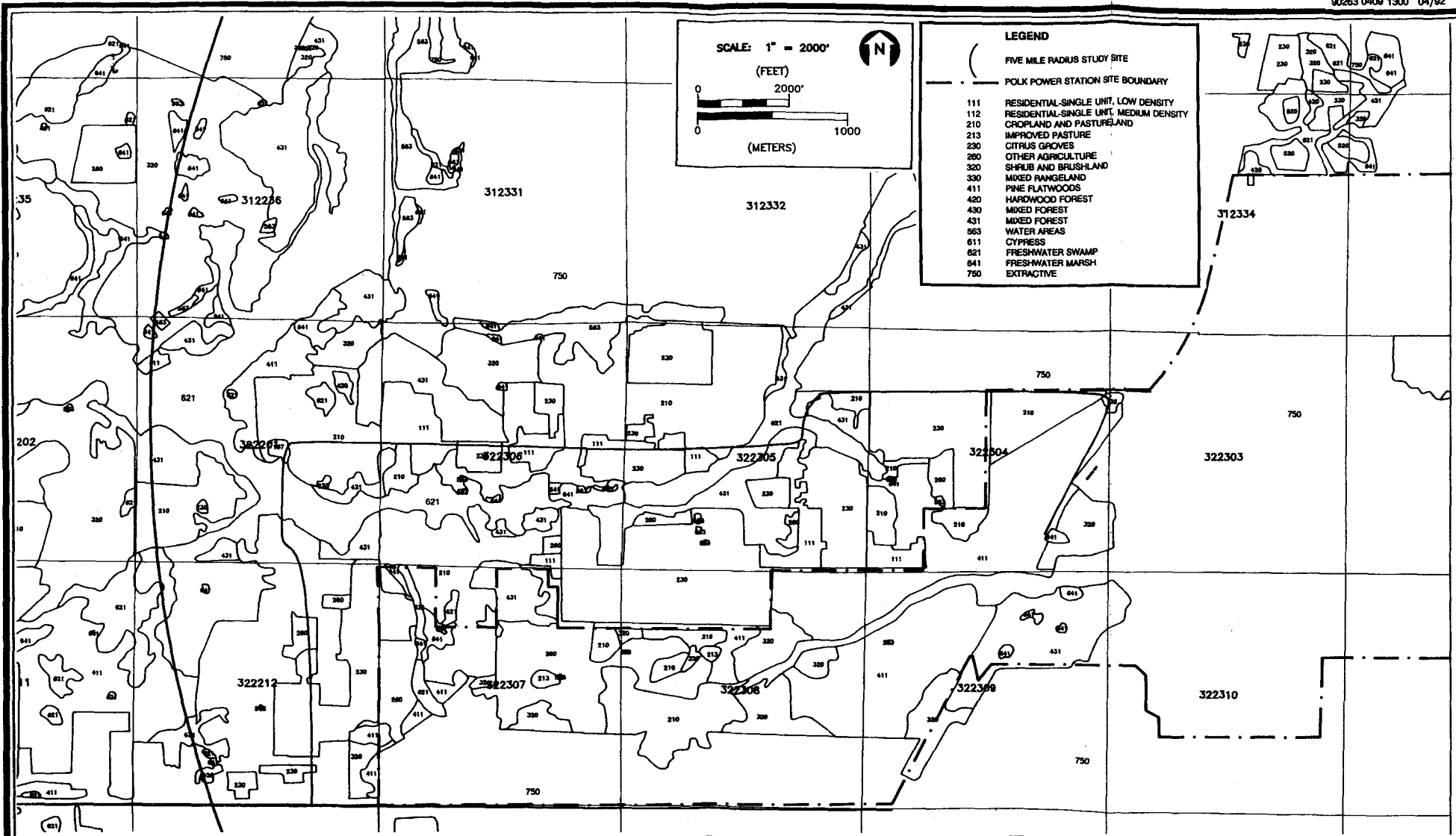


FIGURE 2.2.4-1.

**LAND USE AND LAND COVER WITHIN A FIVE-MILE RADIUS
OF THE POLK POWER STATION SITE (FIGURE 2 OF 6)**

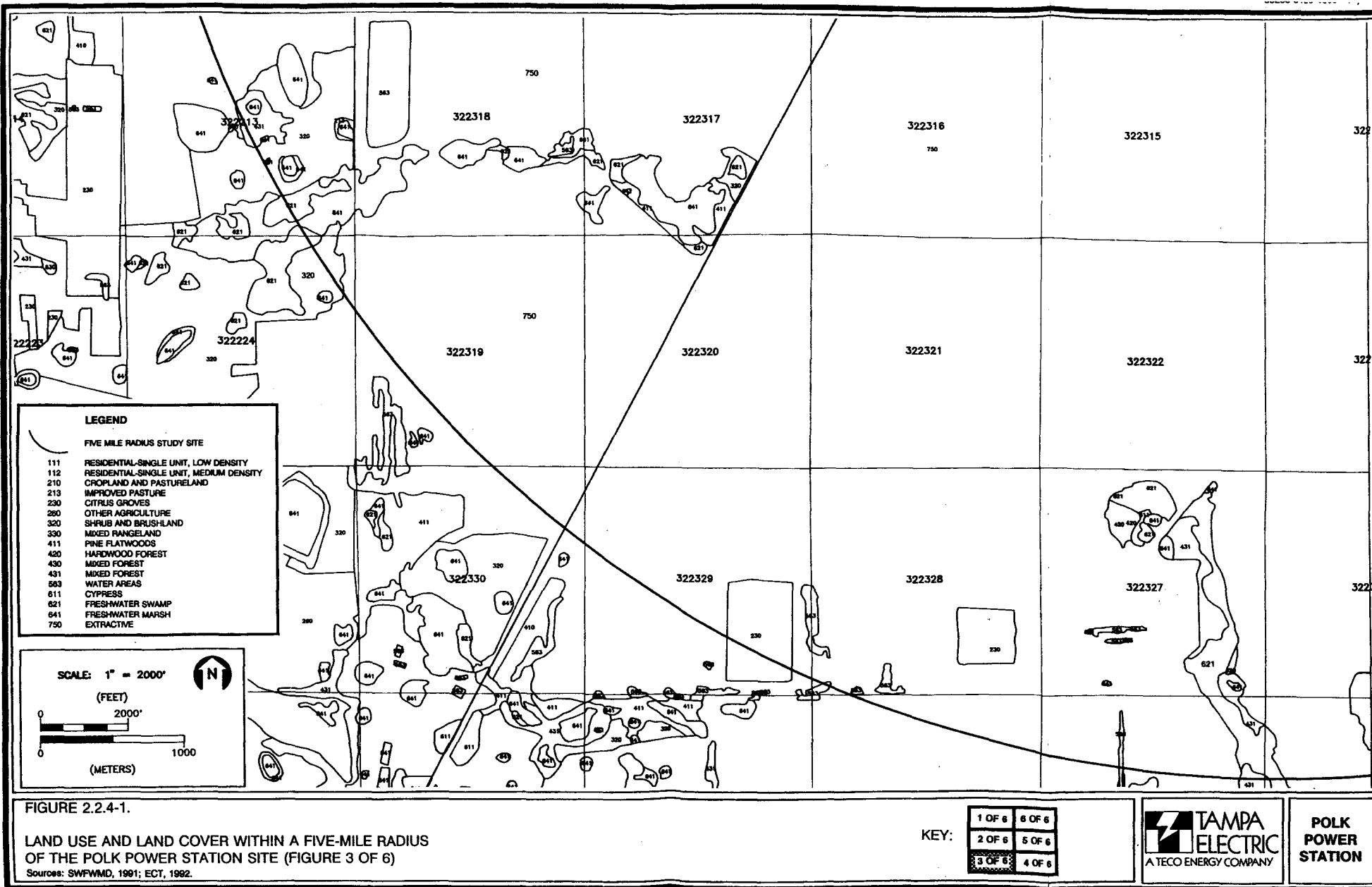
Sources: SWFWMD, 1991; ECT, 1992.

KEY:

1 OF 6	6 OF 6
2 OF 6	5 OF 6
3 OF 6	4 OF 6



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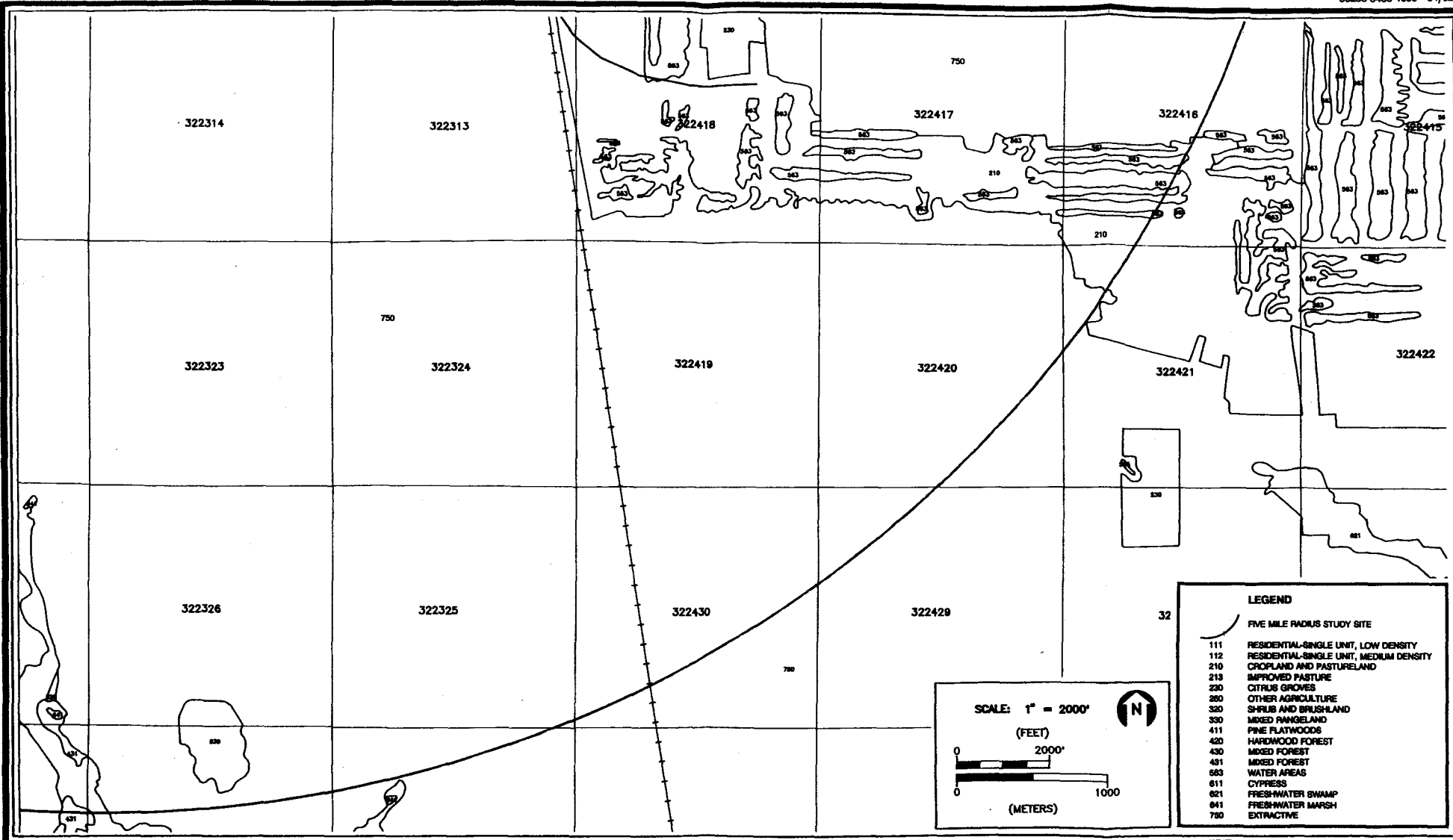


FIGURE 2.2.4-1.
LAND USE AND LAND COVER WITHIN A FIVE-MILE RADIUS
OF THE POLK POWER STATION SITE (FIGURE 4 OF 6)
Sources: SWFWMD, 1991; ECT, 1992.

KEY:

1 OF 6	6 OF 6
2 OF 6	5 OF 6
3 OF 6	4 OF 6

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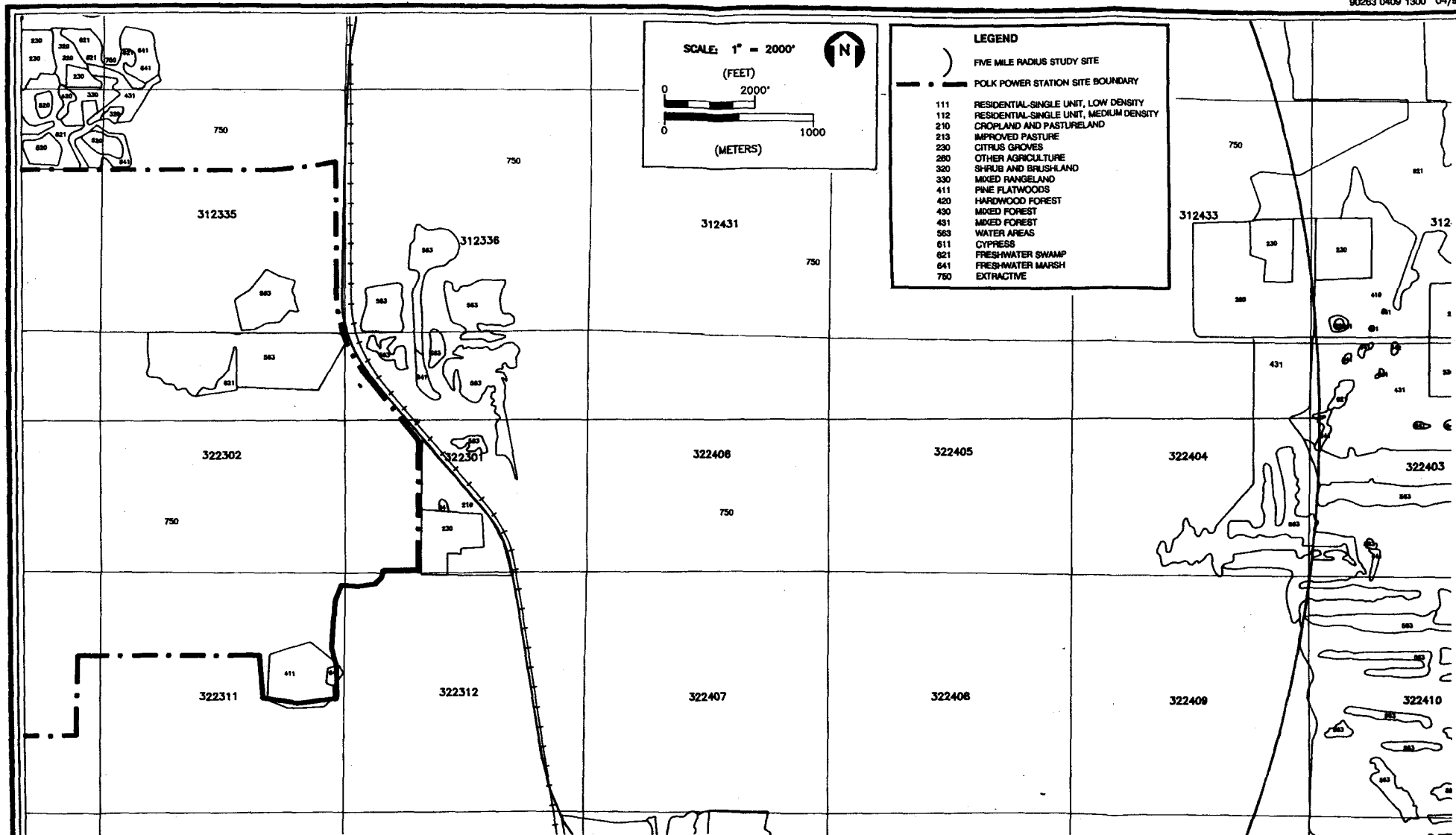


FIGURE 2.2.4-1.

LAND USE AND LAND COVER WITHIN A FIVE-MILE RADIUS
OF THE POLK POWER STATION SITE (FIGURE 5 OF 6)

Sources: SWFWMD, 1991; ECT, 1992.

KEY:

1 OF 6	6 OF 6
2 OF 6	5 OF 6
3 OF 6	4 OF 6



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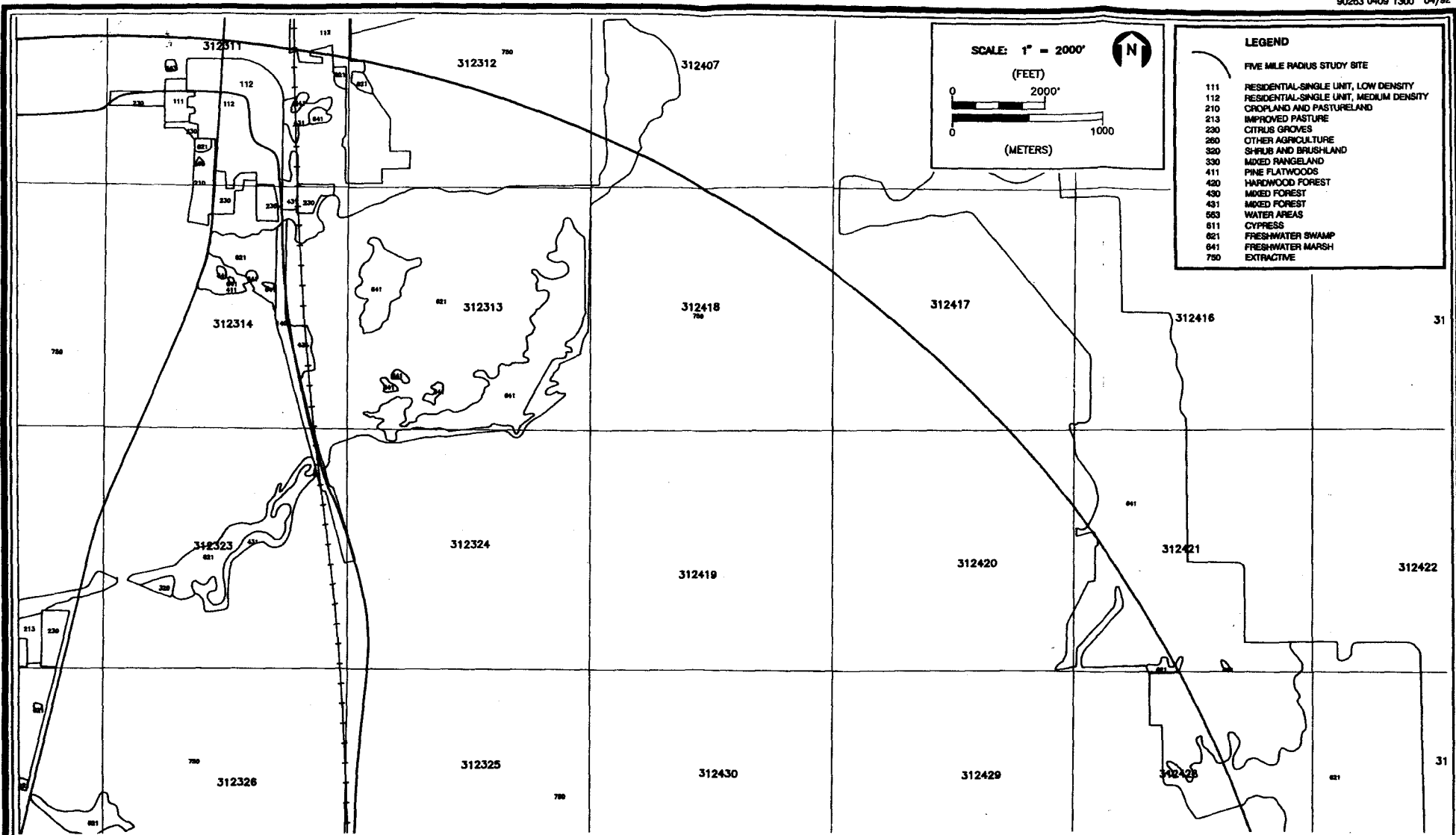


FIGURE 2.2.4-1.

LAND USE AND LAND COVER WITHIN A FIVE-MILE RADIUS
OF THE POLK POWER STATION SITE (FIGURE 6 OF 6)

Sources: SWFWMD, 1991; ECT, 1992.

KEY:

1 OF 6	5 OF 6
2 OF 6	6 OF 6
3 OF 6	4 OF 6

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System (FLUCFS). However, for consistency with other land use and land cover maps, the FLUCFS coding system was converted to the Florida Land Use and Cover Classification System (FLUCCS), to Level II and III detail, where available. The conversion and original SWFWMD data was reviewed and revised as appropriate to reflect current conditions.

As previously discussed, the predominant land form within the Polk Power Station site and adjacent 5-mile study area is 750, extractive. This land use is associated with the extraction of phosphate ore and includes mined areas, spoil banks, sand tailings areas, settling ponds, and reclaimed areas. Some of the mined-out areas that have been reclaimed are mapped as 750, but are being used as improved pasture.

Within the boundaries of the Polk Power Station, additional land use and land cover types include the following: 210, cropland and pastureland; 213, improved pasture; 260, other agriculture; 320, shrub and brushland; 411, pine flatwoods; 431, mixed forest; 563, other water areas; and 621, freshwater swamp. A more detailed description of onsite vegetation and land cover is contained in Section 2.3.5.

These land use and land cover types are also found within the 5-mile radius study area. In addition to the types previously discussed, the following land use and cover types are also located within the 5-mile radius study area: 111, residential, single-unit, low-density (less than two dwelling units per acre); 112, residential, single-unit, medium density (two to six dwelling units per acre); 230, citrus groves; and 641, freshwater marsh.

Within the 5-mile radius study area, there are several beneficiation facilities associated with phosphate mining operations which include: the IMC Fertilizer Haynsworth mine located in portions of Sections 28 and 29 of Township 21 South, Range 23 East; the Mobil Chemical Company Big Four Mine located in Section 25 of Township 31 South, Range 22 East; and the Agrico Payne Creek Mine located in Section 29 of Township 32 South, Range 24 East. These facilities are considered

part of the extractive (750) land use, and consequently, the actual areas have not been delineated separately.

Several land uses adjacent to the Polk Power Station site are known to exist based on the review of aerial photographs and field evaluations, but were not identified on SWFWMD maps. These areas include: a single-family residence (111) located east of the site in Section 1 of Township 32 South, Range 23 East within a parcel where a hazardous waste incinerator is proposed; a low-density residential (111) area located southeast of the site along Mills Road in Section 18 of Township 32 South, Range 24 East; low-density residential (111) areas located adjacent to the west of the site north of SR 674 in Section 12 of Township 32 South, Range 22 East; the Alafia Bible Camp, a religious/recreational facility (162/179) located along Bethlehem Road in Section 5 of Township 32 South, Range 23 East; and the Bethlehem Primitive Baptist Church (162) and Cemetery (167) located at the western edge of Bethlehem Road in Section 1 of Township 32 South, Range 22 East.

As previously described, the only areas containing urban (i.e., residential, commercial, and/or institutional) development within the 5-mile study area are residential areas along Albritton, Bethlehem, and Mills Roads, and mixed uses in Bradley Junction. While Bradley Junction is predominantly a residential area mapped as 112, residential, single-unit, medium-density uses (two to six dwelling units per acre), a few scattered commercial uses (i.e., convenience store and gas stations), a few institutional uses (i.e., post office, fire station, and churches), and a park (Bradley Junction Recreational Park) are contained in this unincorporated community.

The proposed northern transmission line corridor falls completely within the 5-mile study area; however, existing land use and land cover characteristics for the northern transmission line corridor are separately described in Section 6.1.2.2.

2.2.4.3 Proposed Development

The Polk Power Station will be compatible with industrial and utility projects proposed for the immediate region surrounding the Polk Power Station site. Two other electric generating facilities are proposed to be located in the immediate region surrounding the Polk Power Station. The Hardee Power Station is currently under construction on the Polk/Hardee County line, approximately 4 miles south of the Polk Power Station site. Florida Power Corporation also plans to build a 3,000-MW power plant approximately 5 miles east of the site.

2.2.5 EASEMENTS, TITLE, AGENCY WORKS

The Polk Power Station will be constructed on property that Tampa Electric Company intends to acquire prior to the commencement of construction.

2.2.6 REGIONAL SCENIC, CULTURAL, AND NATURAL LANDMARKS

The aesthetic character of lands within the boundaries of and adjacent to the Polk Power Station site are largely influenced by present and past mining operations. Because these lands have been previously disturbed by mining operations, there are virtually no areas of aesthetic or visual importance and significance. Additionally, no federal, state, regional, or local scenic, cultural, or natural landmarks are contained within the 5-mile study area surrounding the Polk Power Station site.

2.2.7 ARCHAEOLOGICAL AND HISTORIC SITES

The presence and potential presence of artifacts and/or structures which are of a cultural or historical value must be identified prior to the construction of the Polk Power Station. Correspondence from the Florida Division of Historical Resources (FDHR) stated that one prehistoric site had been previously recorded in the project area. This artifact is not eligible for listing on the National Register of Historic Places, nor is considered significant at a regional or local level. Therefore, no adverse impacts to significant cultural resources are proposed.

FDHR requested that a cultural resources assessment be conducted in Section 4 of Township 32 South, Range 23 East only (FDHR, 1991). A cultural resources assessment was conducted in 1991 in accordance with Chapter 403 and 167, F.S. and FDHR guidelines (see Appendix 11.5.3). No archaeological or historic sites and no historical structures were discovered or recorded as part of this assessment. It also indicated that no cultural resources eligible for nomination to the National Register of Historic Places will be impacted by the Polk Power Station project. FDHR concurred with the findings of the cultural resource assessment, and a copy of this confirmation letter is located in Appendix 11.5.1.

2.2.8 SOCIOECONOMICS AND PUBLIC SERVICES

The following discussion addresses the various infrastructure and growth management issues affected by the Polk Power Station site.

2.2.8.1 Social and Economic Characteristics

Employment and Income

The region's economic health can be largely determined by the level of unemployment. As shown in Table 2.2.8-1, Hillsborough and Manatee Counties have maintained unemployment rates below national and state levels in 1988, 1989, 1990, and 1991. Both Hardee and Polk Counties, conversely, have experienced unemployment rates at significantly higher levels than those of the nation and State of Florida, with high average annual unemployment rates in 1991 of 10.5 percent in Hardee County and 10.1 percent in Polk County (BEBR, 1991).

Although the average for the state was slightly higher than the national average, the 1988 and 1989 total per capita incomes in all four counties in the study region were below both state and national figures. For 1989, the state average per capita income was \$17,739 compared to \$17,555 nationally, while the averages were \$16,640 in Manatee County, \$16,292 for Hillsborough County, \$14,455 for Polk County, and \$13,542 for Hardee County, (BEBR, 1991).

Average Wage by Sector

Annual average employment and wage data for Hillsborough and Polk Counties in 1990 is shown in Table 2.2.8-2, illustrating significantly higher annual average employment and slightly higher average annual wages for Hillsborough County compared to Polk County. For Polk County in 1990, the highest average annual wage according to general service sector was also recorded for federal government employees, followed by state government, local government, and the private sector. The two highest average annual wages according to specific sector were services, transportation, communication, and public utilities employees of the federal government. The third highest average annual wage reported in Polk County for

Table 2.2.8-1. Percent Unemployment of Total Labor Force

	1988	1989	1990	1991
United States	5.4	5.2	5.4	6.7
Florida	5.0	5.6	5.9	7.3
Hardee County	7.7	8.7	10.9	10.5
Hillsborough County	4.5	4.9	4.8	6.0
Manatee County	4.3	4.6	4.6	5.8
Polk County	8.0	8.5	9.7	10.1

Sources: BEBR, 1991.
FDLES, 1992.
ECT, 1992.

Table 2.2.8-2. 1990 Average Annual Employment and Wages, Polk and Hillsborough Counties

Industry	Polk County		Hillsborough County	
	Average Annual Employment	Average* Annual Wage (\$)	Average Annual Employment	Average* Annual Wage (\$)
Total, all industries	157,062	19,399	440,584	21,120
Subtotal, private industry	134,074	19,106	378,681	20,587
Agriculture, forestry, and fishing	8,700	13,987	11,363	10,302
Mining	4,095	29,961	51	20,977
Construction	8,287	20,300	22,881	22,631
Manufacturing	22,352	23,740	40,059	23,148
Transportation, communication, and public utilities	7,032	23,128	25,412	28,789
Wholesale trade	7,935	23,120	33,794	29,742
Retail trade	34,337	13,467	80,683	12,694
Finance, insurance, and real estate	7,861	21,493	34,928	25,228
Services	33,420	19,159	139,424	20,005
Subtotal, federal government	1,482	28,124	10,892	30,578
Transportation, communication, and public utilities	1,019	30,674	4,194	32,193
Retail trade	0	0	448	10,550
Finance, insurance, and real estate	8	18,350	267	38,867
Services	1	35,162	3,013	30,032
Public administration	455	22,508	2,970	31,129
Subtotal, state government	3,904	22,360	13,611	21,582
Agriculture, forestry, and fishing	44	17,334	11	18,857
Construction	551	25,286	513	25,023
Services	242	24,401	8,059	21,201
Public administration	3,068	21,738	5,029	21,842
Subtotal, local government	17,602	20,238	37,346	23,581
Transportation, communication, and public utilities	0	0	656	26,619
Retail trade	9	10,304	74	12,075
Finance, insurance, and real estate	61	15,175	229	18,969
Services	10,859	19,310	22,585	23,050
Public administration	6,673	21,808	13,802	24,443

Note: Subtotals may not equal totals due to ES-202 Program disclosure editing and/or rounding.

*Total annual wages divided by annual average employment, rounded to nearest whole dollar.

Sources: FDLES, ES-202 Program, 1990.
ECT, 1992.

1990 was the mining sector of private industry [Florida Department of Labor and Employment Security (FDLES), 1991].

In Hillsborough County, the 1990 highest reported wage by general service sector was for federal government employees, followed by local government, state government, and private industry. Accordingly, the three highest annual average wages by specific sector were recorded within the federal government, and include in descending order: finance, insurance, and real estate; transportation, communications, and public utilities; and public administration. The highest private sector average annual wage reported in Hillsborough County for 1990 was in the wholesale trade sector (FDLES, 1991).

Employment Projections

Baseline year (1989) and projected (2000) employment figures by Standard Industrial Classification (SIC) code as prepared by FDLES, Bureau of Labor Market Information for Polk and Hillsborough Counties are shown on Table 2.2.8-3. For Polk County, an industry-wide increase of 45,674 employment positions at a 24.38-percent change is estimated to occur between 1989 and 2000, while employment increases in Hillsborough County are estimated at 155,107 positions at a 31.85-percent change. In Polk County, the two highest projected increases, both in terms of total positions and percent change, are services and wholesale and retail trade. The third highest projected increase in Polk County employment positions is in the manufacturing sector, while the third highest projected increase according to percent change is expected in the transportation and public utilities sector. In Hillsborough County, the three sectors with the highest projected increases, both in terms of total positions and percentage change are: services; wholesale and retail trade; and finance, insurance, and real estate (BEER, 1991).

The discussion of employment projections was omitted for Hardee and Manatee Counties because data for these counties was combined with other counties, and was not available individually for these two counties.

Table 2.2.8-3. Baseline and Projected Employment by SIC Code, Polk and Hillsborough Counties

SIC Code	Occupation	Polk County				Hillsborough County			
		1989 Annual Average Employment	2000 Projected Employment	Change in Employment	Percent Change	1989 Annual Average Employment	2000 Projected Employment	Change in Employment	Percent Change
000000	Total, all industries	187,378	233,052	45,674	24.38	487,023	642,130	155,107	31.85
100000	Agriculture, forestry, and fishing, total	15,904	19,959	4,055	25.50	15,472	17,735	2,263	14.63
200000	Mining, total	4,067	4,221	154	3.79	94	100	6	6.38
300000	Construction, total	8,989	10,602	1,613	17.94	25,762	30,613	4,851	18.83
400000	Manufacturing, total	23,004	27,909	4,905	21.32	40,483	48,065	7,582	18.73
500000	Transportation and public utilities	7,998	10,077	2,079	25.99	29,537	36,706	7,169	24.27
600000	Wholesale and retail trade, total	43,143	55,481	12,338	28.60	115,851	153,407	37,556	32.42
700000	Finance, insurance, and real estate, total	8,841	10,440	1,599	18.09	34,140	44,766	10,626	31.12
800000	Services, total	47,044	60,514	13,470	28.63	153,669	221,908	68,239	44.41
900000	Government, total	10,445	12,733	2,288	21.91	26,253	33,030	6,777	25.81
808800	Self-employed and unpaid family	17,943	21,116	3,173	17.68	45,762	55,800	10,038	21.94

Sources: FDLES, Division of Labor, Employment, and Training, Bureau of Labor Market Information, OES Matrix Industry Employment Estimates, 1991.
ECT, 1992.

Source of Income

The generalized 1989 source of income (labor versus proprietorship) for the four-county region is shown on Table 2.2.8-4. In Polk County, approximately 85.5 percent of total 1989 earnings were attributable to labor income (wage and salary disbursements combined with other labor income), with the remaining 14.5 percent derived from proprietorship. In Hillsborough County, the 1989 proportion was approximately 91.3 percent labor to 8.7 percent proprietorship, with the Hardee proportion approximately 66.6 percent labor to 33.4 percent proprietorship, and the Manatee proportion was approximately 83.1 percent labor to 16.9 percent proprietorship (BEBR, 1991).

Regional Economy

The general characteristics of the regional economy can be examined by reviewing local government revenue and expenditure per capita, distribution of the workforce, and distribution of land uses.

The relationship between revenue and expenditure per capita is an indicator of the cost of providing services and the economic stability of a local government. For 1989, Polk County reported \$484.80 per capita for expenditures, compared to \$498.40 per capita income from revenues, equating to a net surplus of \$13.60 per capita in revenues. Hardee County also experienced a net surplus in per capita expenditures to revenues of \$51.30. Both Hillsborough and Manatee Counties had net deficits in per capita revenues to expenditures with deficits of \$64.60 and \$34.60, respectively. Expenditures per capita were \$484.80 for Polk County, \$947.40 for Hillsborough County, \$968.10 for Hardee County, and \$1,099.00 in Manatee County, which suggests the costs of providing services and infrastructure improvements is lowest in Polk County. The total revenue per capita figures were \$498.40 for Polk County, \$882.80 for Hillsborough County, \$1,019.40 for Hardee County, and \$1,064.40 in Manatee County (BEBR, 1991).

Table 2.2.8-4. 1989 Source of Personal Income: Total Earnings on a Place-of-Work Basis by Major Type of Income

County	Total Earnings (\$)	Wage and Salary Disbursements (\$)	Other Labor Income (\$)	Proprietor's Income		
				Total (\$)	Farm (\$)	Nonfarm*
						(\$)
Hardee	152,899	93,898	8,000	51,001	33,931	17,070
Hillsborough	11,161,518	9,358,268	833,259	969,991	145,172	824,819
Manatee	1,675,766	1,271,945	120,087	283,734	89,760	193,974
Polk	3,907,791	3,053,983	287,426	566,382	161,910	404,472

*Excludes limited partners.

Sources: BEBR, 1991.
ECT, 1992.

In terms of the distribution of the workforce in the four counties, Polk, Hillsborough, and Manatee Counties had the highest employment in the service sector, followed by retail and manufacturing, as the top three bases of employment. Hardee County had the agricultural sector as highest, followed then by service and retail sectors (BEBR, 1991).

All four counties have different distributions of land uses based on value of land according to land use. Land uses in Hardee County were primarily agricultural (45.5 percent), followed by residential (30.6 percent), and industrial (7.4 percent). Manatee, Hillsborough, and Polk Counties had residential uses as the highest percentage of land allocation, at 64.4, 59.8, and 53.9 percent, respectively. Hillsborough County had commercial uses as next highest, at 17.9 percent, with miscellaneous third highest, at 12.1 percent. Similarly, Manatee County had commercial as next highest at 14.6 percent, with miscellaneous uses third highest at 9.7 percent of the total land uses. This relationship was reversed in Polk County, with a close distribution of 15.9 percent miscellaneous and 15.8 percent commercial. The miscellaneous category includes utilities, mining, recreational, government, and other lands not categorized as residential, commercial, industrial, agricultural, or institutional (BEBR, 1991).

Housing

Information describing 1990 housing stock as based on census data for the four-county study area is shown on Table 2.2.8-5, which identifies 677,151 total housing units, 98,859 total vacant units, and 34,651 vacant seasonal or recreational units within the four-county region. This number of available units is large enough to easily accommodate the minimal additional demand anticipated for employees of the Polk Power Station (see Sections 4.6.7 and 5.9).

Hillsborough County had a significantly higher number of total 1990 housing units, at 367,740, or approximately 54 percent of the four-county total. Polk County had the second highest number of total housing units at 186,225, approximately half as many as in Hillsborough County, and approximately 28 percent of the four-county

Table 2.2.8-5. 1990 Housing Stock

County	Total Units	Total Vacant Units	Vacant Seasonal or Recreational Units*	Vacancy Rate, Home- owner† (%)	Vacancy Rate, Rental‡ (%)	Occupied Homeowner Units**	Occupied Rental Units**
Hardee	7,941	1,550	664	1.6	15.5	4,844	1,547
Hillsborough	367,740	42,868	6,188	3.6	13.5	204,966	119,906
Manatee	115,245	24,185	14,669	3.7	11.8	64,574	26,486
Polk	186,225	30,256	13,130	3.3	12.6	109,885	46,084
Total/ Average	677,151	98,859	34,651	3.05††	13.35††	384,269	194,023

* Vacant units intended for use only in certain seasons, for recreational or other occasional use throughout the year.

† Percentage relationship of vacant units for sale to total homeowners inventory, or for rent to total rental inventory.

** Usual place of residence of the person or group of persons living in the unit at the time of census enumeration.

†† Arithmetic average of the four counties.

Sources: BEBR, 1991.
ECT, 1992.

total. Manatee County had the third highest number of total housing units, at 115,245, approximately 17 percent; Hardee County contains a total of 7,941 housing units, approximately 1 percent of the four-county total.

In terms of total vacant units, Hillsborough County contained the highest number (42,868 units) and greatest proportion, at approximately 43 percent of the four-county total. For these four counties, the next highest number of total vacant units was reported in Polk County (30,256 units, approximately 30 percent of the total), followed by Manatee (24,185 units, approximately 24 percent) and Hardee (1,550 units, approximately 3 percent). The highest number of vacant seasonal units was reported in Manatee County, followed by Polk, Hillsborough, and Hardee Counties.

The highest homeowner vacancy rate of the four counties was identified in Manatee County (3.7 percent), followed by Hillsborough (3.6 percent), and Polk (3.3 percent), with Hardee County having a relatively low homeowner vacancy rate of 1.6 percent. These homeowner vacancy rates suggest that adequate housing stock exists to provide for any minimal housing demands associated with the Polk Power Station operational workforce (see Section 5.9).

The highest 1990 rental vacancy rate within the four-county study area was reported in Hardee County (15.5 percent), followed by Hillsborough (13.5 percent), Polk (12.6 percent), and Manatee (11.8 percent). These rental vacancy rates indicate sufficient supply of rental housing available to adequately support those temporary housing demands associated with the Polk Power Station construction workforce (see Section 4.6).

County-wide building permit activity for 1991 as recorded by BEBR is shown in Table 2.2.8-6, illustrating that a significantly higher number of construction permits were issued in Hillsborough County compared to other counties in the four-county study area. A total of 3,164 new single-family homes were permitted in Hillsborough County, representing approximately 51 percent of the four-county total. Of the

Table 2.2.8-6. 1991 Building Permit Activity

County	Total Value (x \$1,000) (\$)	Value of All Housekeeping Residential Units (x \$1,000) (\$)	Number of Single-Family Homes	Number of Housing Units in Multifamily Structures	Average Unit Cost, Combined Single-Family and Multifamily* (\$)	Value of Non-Housekeeping Residential (x \$1,000) (\$)	Value of Non-Residential (x \$1,000) (\$)
Hardee	12,573	3,328	51	0	65,225	0	6,889
Hillsborough	622,086	318,308	3,164	1,243	72,228	2,308	182,221
Manatee	157,195	83,280	1,012	801	45,935	0	6,194
Polk	234,159	141,812	1,988	598	54,838	873	6,194
Total/average	1,026,013	136,682†	6,215	2,642	59,557†	3,181	201,498

*Rounded to the nearest whole dollar.

†Arithmetic average of four counties.

Sources: BEBR, Building Permit Activity in Florida, Preliminary Annual 1991, Volume XXXVII, No. 13, February, 1992.
ECT, 1992.

remaining three counties, Polk County issued the second highest single-family building permits, at 1,988 units, or approximately 32 percent of the study area total, followed by Manatee County (1,012 units at approximately 16 percent), with Hardee County reporting 51 single-family residential permits, at approximately 1 percent of the four-county total.

The average housing unit cost for combined single-family and multifamily buildings averaged \$59,557 for the four-county study area. Hillsborough County had recorded the highest housing unit cost at \$72,228, followed by Hardee at \$65,255, Polk at \$54,838, and Manatee at \$45,935 (BEBR, 1992). The per unit housing costs for Hardee County described in Table 2.2.8-6 are disproportionately high in comparison to other counties because only single-family and not multifamily residences are accounted for. Since the value of multifamily structures is generally lower than their single-family counterparts, a higher proportion of multifamily units would have been expected to result in a lower average per unit housing cost. For example, in Manatee County, almost half of the permitted residences were in multifamily units, accounting for the low average housing cost of \$45,938.

The distribution of new homes permitted for construction in 1991 as reported by BEBR is shown in Table 2.2.8-7, which depicts the trend of a higher proportion of new home construction in unincorporated areas, rather than within municipalities. This trend is accounted for by the relatively large size of unincorporated areas compared to municipalities, and to some extent, by growth occurring in unincorporated areas such as Brandon in Hillsborough County. For the municipalities, the largest cities had the largest proportion of new home construction permits. The cities with the largest number of single-family building permits include the following as listed in descending order: Tampa, Lakeland, Plant City, Bradenton, and Winter Haven.

The four closest municipalities to the Polk Power Station, Bowling Green, Fort Meade, Mulberry, and Bartow, had a combined total of 27 single-family new home construction permits in 1991. The majority, or 19 of these 27 residences, were

Table 2.2.8-7. Distribution of New Single-Family Home Building Permits

County/City	Number of Single-Family Home Building Permits	Percentage of County Total
<u>Hardee County Total</u>	51	100
Bowling Green	2	3.9
Wauchula	8	15.7
Zolfo Springs	7	13.7
Unincorporated area	34	66.7
<u>Hillsborough County Total</u>	3,164	100
Plant City	163	5.2
Tampa	459	14.5
Temple Terrace	19	0.6
Unincorporated area	2,523	79.7
<u>Manatee County Total</u>	1,012	100
Anna Maria	25	2.5
Bradenton	139	13.7
Bradenton Beach	2	0.1
Homes Beach	32	3.2
Longboat Key	22	2.2
Palmetto	32	3.2
Unincorporated area	760	75.1
<u>Polk County Total</u>	1,988	100
Auburndale	31	1.6
Bartow	19	1.0
Davenport	8	0.4
Dundee	3	0.2
Eagle Lake	2	0.1
Fort Meade	6	0.3
Frostproof	12	0.6
Haines City	27	1.3
Lake Alfred	6	0.3
Lake Hamilton	2	0.1
Lakeland	200	10.1
Lake Wales	30	1.5
Mulberry	0	0.0
Polk City	21	1.0
Winter Haven	98	4.9
Unincorporated area	1,523	76.6

Sources: BEBR Building Permit Activity in Florida, Preliminary Annual 1991, Volume XXXVII, No. 13, February, 1992.
ECT, 1992.

permitted in Bartow, with six permits issued in Fort Meade, two permits recorded in Bowling Green, and none in Mulberry (BEBR, 1992). This low level of building activity confirms that these areas are not high-growth residential areas and are experiencing no significant residential development pressures.

2.2.8.2 Public Services and Utilities

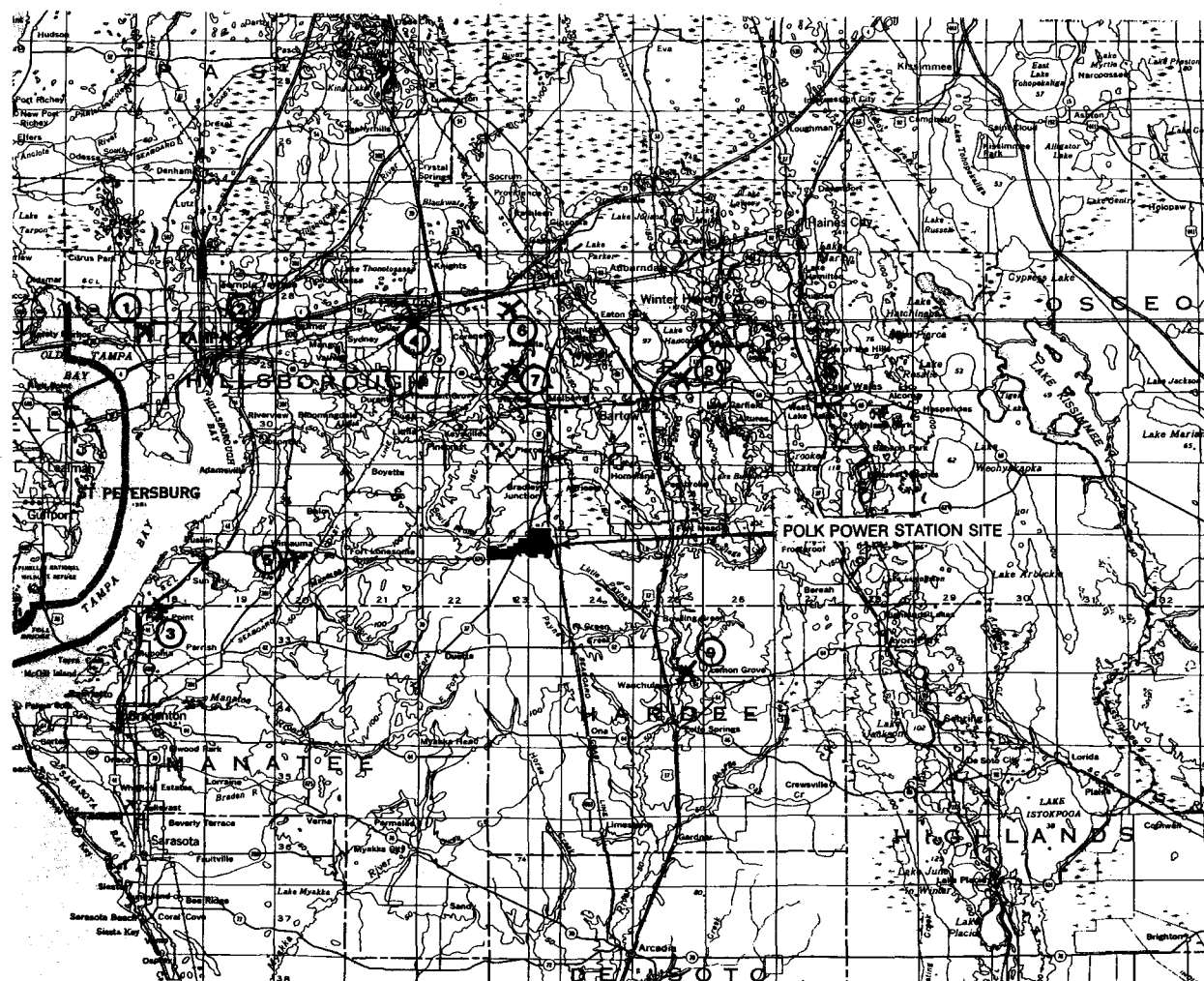
Transportation Facilities

Transportation facilities servicing the Polk Power Station include roadways and rail. No public or private airport facilities are located within a 5-mile radius of the Polk Power Station site. Regional transportation facilities are shown on Figure 2.2.8-1.

Major roadways within a 5-mile radius of the Polk Power Station include SR 37, SR 674, and CR 630. Those within a 10-mile radius include CR 640, CR 39, and SR 62, while major roadways outside of a 10-mile radius include SR 60, U.S. Highway 17, U.S. Highway 98, Interstate 4, and Interstate 75.

The Polk Power Station is provided with direct rail access by the CSX Railroad via an existing north-south rail line adjacent to the east along Fort Green Road. Additional regional CSX rail lines traverse to the northwest from Bradley Junction through unincorporated Keyville in Hillsborough County through unincorporated Brandon west to Tampa, and east from Brandon to northeast through Lakeland and Winter Haven.

As previously stated, no public or private aviation facilities are located within a 5-mile radius of the Polk Power Station. The nearest private airports to the Polk Power Station power block include the Circle K Airport, approximately 14.5 miles to the north, and the Anderson Airport, approximately 18 miles to the west along SR 674 in Hillsborough County. The closest public airports to the Polk Power Station power block area include: the Wauchula Airport approximately 17.5 miles to the southeast, Lakeland Municipal Airport approximately 18 miles to the north, and



LEGEND



POLK POWER STATION SITE

- ① TAMPA INTERNATIONAL AIRPORT
- ② VANDENBURG AIRPORT
- ③ MANATEE COUNTY AIRPORT
- ④ PLANT CITY MUNICIPAL AIRPORT
- ⑤ ANDERSON AIRPORT (PRIVATE)
- ⑥ LAKELAND MUNICIPAL AIRPORT
- ⑦ CIRCLE K AIRPORT (PRIVATE)
- ⑧ BARTOW MUNICIPAL AIRPORT
- ⑨ WAUCHULA MUNICIPAL AIRPORT

SCALE: 1 : 633,600
 SCALE: 1" = 10 MILES
 (MILES)
 0 10
 0 10 20
 (KILOMETERS)



FIGURE 2.2.8-1.
 TRANSPORTATION FACILITIES

Source: USGS, 1978; ECT, 1992.

**TAMPA
 ELECTRIC**
 A TECO ENERGY COMPANY

**POLK
 POWER
 STATION**

Bartow Municipal Airport approximately 19.5 miles to the northeast. Tampa International Airport lies more than 37 miles to the west-northwest.

Traffic Volumes

The Polk Power Station site is bounded by SR 37 to the west, CR 630 to the north, SR 674/Wimauma Road to the south, and partially by Fort Green Road to the east. SR 37 is a two-lane highway classified as a Minor Arterial which currently functions at level of service (LOS) B from the Manatee County line to CR 640, based on 1990 traffic counts of 2,951 average annual daily trips (AADT) and 320 peak hour, peak direction trips. From CR 640 to Cameron Street in Mulberry, SR 37 currently functions at LOS C with 1990 volumes of 6,649 AADT and 710 peak hour, peak direction trips. SR 674 is also a two-lane highway classified as a Minor Arterial currently functioning at LOS A from the Hillsborough County line to SR 37 with a 1990 AADT of 1,232 and 130 peak hour, peak direction trips. CR 630 from SR 37 to U.S. Highway 98 is a two-lane highway functionally classified as a Major Collector currently functioning at LOS A with a 1990 AADT of 2,294 with 227 peak hour, peak direction trips. Fort Green Road/CR 663 is a two-lane highway classified as a Minor Collector currently functioning at LOS A, with a 1990 AADT of 519 and 51 peak hour peak direction trips. The county minimum LOS standard for rural arterial and collector roads is LOS D.

Educational Facilities

Public school information for Hillsborough and Polk Counties is shown in Table 2.2.8-8, which indicates that Hillsborough County has almost twice as many pre-kindergarten to 12th grade students enrolled for the 1989-1990 school year, and correspondingly more pre-kindergarten to 12th grade schools. In Hillsborough County, 62.1 percent of high school graduates and 50.5 percent of Polk County high school graduates enrolled in some higher form of education (i.e., vocational school, junior college, state college). Though Hillsborough County collected more total revenues per full-time equivalent (FTE) student than Polk County, both counties had comparable expenditures per FTE student, school tax millage rates, and percentage

Table 2.2.8-8. Public Education Information

	Polk County	Hillsborough County
<u>1989-1990 School Year Data</u>		
Total PK-12 public school enrollment ¹	64,256	120,364
High school graduates continuing education ²	1,641 (50.5%)	3,885 (62.1%)
FTE teacher-to-FTE student ratio ³		
Elementary	1:20.37	1:20.85
Secondary	1:17.61	1:19.41
Percentage of total staff that are full-time teachers ³	51.47%	48.78%
Total all revenues (\$1,000) ³	\$265,226	\$583,706
Revenue/FTE student	\$3,999	\$4,534
Total expenditures, all funds (\$1,000) ³	\$268,233	\$561,030
Expenditure/FTE student	\$3,761	\$3,828
Debt service (\$1,000)	\$3,187	\$19,932
Operating tax millage	6.217	6.347
<u>1991-1992 School Year Data⁴</u>		
Total public schools		
Elementary	61	102
Middle junior	17	26
Other secondary	12	14
Total pre-kindergarten through 12 th grade	90	142
Adult	3	17
Vocational	3	3
Other	37	21

Sources: ¹ State of Florida, Department of Education, MIS Statistical Brief, Series 90-10B, 1990.

² State of Florida, Department of Education, MIS Statistical Brief, Series 90-09B, 1990.

³ BEBR, 1991, Florida Statistical Abstract, 1991.

⁴ State of Florida, Department of Education, 1991-1992 Florida Public Schools MIS Data Sheet, 1991.

of total staff that are teachers. Hillsborough County has a significantly greater debt service than Polk County, caused by the planned construction of five new schools for the 1991-1992 school year and two additional schools in 1992-1993 (Hillsborough County Board of Education, 1991).

Table 2.2.8-9 consists of a listing of the nearest Hillsborough and Polk County schools to the Polk Power Station, for the 1991-1992 school year. The nearest Polk County schools are in Mulberry and Fort Meade, while the nearest public schools in Hillsborough County are in Lithia and Plant City. No public schools are located in unincorporated Bradley Junction; school-age children in Bradley Junction attend Mulberry schools (Polk County Board of Education, 1992).

Medical Facilities

The nearest hospitals to the Polk Power Station are Bartow Memorial and Polk General, both located in Bartow approximately 13 miles to the northeast. Bartow Memorial is a private facility, while Polk General is a public hospital established primarily for indigent care. Both hospitals are equipped with emergency rooms, but neither are equipped with a trauma center. Persons requiring emergency trauma center services would be sent to Lakeland Regional Hospital located approximately 17 miles to the north, or would be air lifted to Tampa General Hospital, which is an approximately 20-minute helicopter flight from the Polk Power Station (Polk County Division of Public Safety, 1992).

Polk County has eight hospitals totaling 1,785 general hospital beds at a ratio of 434 general hospital beds per 100,000 population. Hillsborough County has 19 hospitals totaling 3,366 general hospital beds, averaging 400 general hospital beds per 100,000 population. The State of Florida ratio of adequate hospital services is 406 general hospital beds per 100,000 population (BEHR, 1991).

The emergency medical services (EMS) facilities that would respond to the Polk Power Station are located at the Fort Meade Fire Station. These facilities include

Table 2.2.8-9. Nearest Polk and Hillsborough County Public Schools to the Polk Power Station, 1991-1992 School Year

POLK COUNTY

Mulberry (approximately 11 miles north)

Grades K-3
Kingford Elementary School
1400 Dean Street
Mulberry

Grades 4-6
Purcell Elementary School
305 Northeast 1st Avenue
Mulberry

Grades 7-8
Mulberry Middle School
500 Southeast 9th Avenue
Mulberry

Grades 9-12
Mulberry Senior High School
Northeast 4th Circle
Mulberry

Fort Meade (approximately 11 miles east)

Grades Pre K-3
Lewis Elementary School
115 South Oak Avenue
Fort Meade

Grades 4-5
Riverside Elementary School
1002 Northeast 6th Street
Fort Meade

Grades 6-7
Fort Meade Middle School
610 South Charleston Avenue
Fort Meade

Grades 8-12
Fort Meade Junior-Senior High School
700 Edgewood Drive
Fort Meade

HILLSBOROUGH COUNTY

Lithia (approximately 13 miles northwest)

Grades K-6
Pinecrest Elementary School
7950 Lithia Pinecrest Road
Lithia

Plant City (approximately 19 miles northwest)

Grades 7-9
Turkey Creek Middle School
5005 South Turkey Creek Road
Plant City

Grades 10-12
Plant City High School
One Raider Place
Plant City

Sources: Hillsborough County School Board, 1992.
Polk County School Board, 1992.
ECT, 1992.

advanced life support. The Fort Meade Fire Station EMS response time is estimated to be 20 to 30 minutes (Polk County Division of Public Safety, 1992).

Fire Protection

The nearest fire station to the Polk Power Station within Polk County is the Bradley Station, located approximately 4.4 miles to the north, in Bradley Junction. This station is manned by two full-time firefighters on duty from 8 a.m. to 5 p.m., 5 days per week, and 8 to 12 volunteer firefighters. This facility is a primary response unit and is equipped with a pumper truck [approximately 750 gallons per minute (gpm)], tanker truck, and rescue truck. Estimated response times range from 8 to 12 minutes for responses by full-time firefighters and 12 to 20 minutes when using volunteer firefighters. The next nearest facility is the Fort Meade Station, which is a city rather than county facility manned by 15 to 20 volunteers, at an estimated response time of 20 to 25 minutes. This station is equipped with three full-size pumper trucks (greater than 1,000 gpm capacity) and a tanker truck. Haz-Mat capabilities or an aerial truck would respond from the Bartow Air Base Station (Polk County Fire Marshall, 1992).

Fire protection services in Hillsborough County are divided into four regional quadrants. The Polk Power Station falls within the southwest quadrant, and firefighting efforts would be coordinated through the Southwestern Battalion Officer. There are a total of 28 county fire stations, of which 10 stations are manned 24 hours, 10 are manned by career firefighters during the daytime, with the remainder using volunteer firefighters. There are approximately 10 additional city-operated fire stations in Polk County (Polk County Fire Marshall, 1992).

For most responses, Polk County would exhaust their firefighting resources before requiring assistance from another county, such as Hillsborough. If assistance is necessary from Hillsborough County, it is likely to include Haz-Mat or aerial truck assistance from Hillsborough County's Brandon Station (Polk County Fire Marshall, 1992). In the event that additional firefighting capabilities would be necessary, the nearest Hillsborough County station is the Southeastern Station located on Lithia

Pinecrest Road west of CR 39 on Browning Road. This facility is manned 24 hours by three full-time volunteers, with an estimated response time of 20 to 25 minutes. The next nearest fire station is the Wimauma Station, located on 7th Avenue in Wimauma. This facility is manned by three permanent firefighters over 24-hour periods. The Hillsborough County Fire Department has 32 facilities with 330 career firefighters and 220 volunteers (Hillsborough County Fire Department, 1992).

Police Protection

The Polk Power Station lies in unincorporated Polk County, and would receive police services from the Polk County Sheriff's Department. Deputies patrolling this area are based out of the West Regional Substation, located at 2105 East Lakewood Drive in south Lakeland. A total of approximately 109 sworn officers are located at the West Regional Substation. Responses are prioritized according to urgency, with an average estimated response time of 10 to 15 minutes for a routine response, with a considerably shorter time expected for high-priority emergencies. Because the Polk Power Station lies in unincorporated Polk County and is more than 10 miles from the nearest municipality, responses by city police departments under most all circumstances are not expected (Polk County Sheriff's Department, 1992).

A total of six sheriff's stations are contained in Polk County, with a total of 383 sworn officers, 590 automobiles, and 242 patrol units (Polk County Sheriff's Department, 1991).

Hillsborough County has a total of seven sheriff's stations, and 838 sworn officers. The nearest Hillsborough County district station to the Polk Power Station is located in Brandon (Hillsborough County Sheriff's Department, 1991.)

Potable Water, Sanitary Sewer, and Solid Waste

The Polk Power Station site is located in rural Polk County, an area not provided with public potable water supply or sanitary sewerage service. Because this rural area is not provided with municipal service, relevant system capacities are not

applicable in this area. The applicant will be its own provider for most utilities required by the project and its employees. Electricity, potable water, and sanitary sewage treatment/disposal services will be provided by onsite facilities appropriately designed to meet these expected service demands. Domestic, construction, and certain industrial solid waste disposal services will be provided by contracted services with an approved, licensed contractor serving the region.

Three landfills are currently operating in Polk County which have a total available capacity of 1,350 tons per day (tpd). The North Central Landfill is located nearest the Polk Power Station site and has a capacity of 1,000 tpd. The solid wastes generated from the Polk Power Station is expected to consume less than 0.1 percent of the available capacity of the North Central Landfill. The useful life of these landfills is projected to the year 2010; however, Polk County has proposed a solid waste processing plant which, if constructed, could extend the useful life of these landfills to the year 2030.

Recreation and Open Space

No recreational areas, open space, or public lands are located adjacent to, or in the immediate vicinity of the Polk Power Station site. The nearest recreational facility to the Polk Power Station is the Bradley Junction Recreational Park, located at the extreme northern perimeter of the 5-mile study area, within Section 11 of Township 31 South, Range 23 East. This 1.5-acre neighborhood park is located on Pine Street between Whidden and 1st Streets and contains a baseball/softball field, basketball court, and small playground. This facility has no restrooms, showers, concessions, shelters, or electric service, and is not manned by a county attendant

Electricity

Electricity service within the four-county region is provided by public utilities, electric cooperatives, and local municipal electric departments as based on discussions with representatives of these entities. Within Polk County, electricity is primarily provided by Tampa Electric Company, Florida Power Corporation (FPC), and Lakeland

Electric and Water. The City of Fort Meade and City of Bartow provide local service. The Seminole Electric Cooperative, Inc., also generates power which is distributed by sub-regional electric cooperatives including the Withlacoochee River Electric Cooperative in extreme northwestern Polk County, and the Peace River Electric Cooperative (PRECO). Within Hillsborough County, electric service is provided by Tampa Electric Company, Florida Power & Light Company, and PRECO. Electric service in Manatee County is provided by Florida Power & Light Company and PRECO, while FPC, PRECO, and the City of Wauchula service Hardee County.

Natural Gas

The four-county region is provided with wholesale natural gas service by the Florida Gas Transmission Company (FGT), who in turn distributes gas to local or sub-regional retailers. These retailers include People's Gas (Polk, Hillsborough, and Manatee Counties), Central Florida Gas (Haines City-Winter Haven area), and Plant City Natural Gas. No natural gas pipelines are contained in Hardee County (FGT, 1992).

Concurrency Management

The Polk County concurrency/growth management requirements include the issuance of a Certificate of Concurrency in accordance with the Concurrency Management Ordinance of Polk County, adopted in June 1992. Since the Polk Power Station will provide its own potable water and sanitary sewerage services, a Certificate of Concurrency will not be required or issued for these services. Similarly, because the Polk Power Station has no residential element, it is exempted from the parks and recreation concurrency provisions of this ordinance.

Based on adequate existing and future capacity of Polk County landfills, appropriate site drainage design and engineering, and existing transportation volumes and proposed improvements, the Polk Power Station will fulfill requirements of the Concurrency Management Ordinance of Polk County.

2.3 BIOPHYSICAL ENVIRONMENT

2.3.1 GEOHYDROLOGY

2.3.1.1 Geological Description of Site Area

Regional Stratigraphy

The Polk Power Station site and surrounding region contain surficial layers of unconsolidated sand and clay underlain by a thick sequence of sedimentary rocks. A summary of the hydrogeologic framework for the central Florida phosphate district of west-central Florida is presented in Table 2.3.1-1 and illustrated on Figure 2.3.1-1.

The deepest formation encountered is the Paleocene Cedar Keys Formation which overlies strata greater than 2,000 ft deep. Above these units is the Eocene Series which includes the Oldsmar Formation, Avon Park Limestone, and Ocala Group. The Avon Park Limestone is the lower of two highly productive units of the upper Floridan aquifer. The Ocala Group crops out in the area of the Green Swamp of northern Polk County and increases in depth toward the south.

The Suwannee Limestone of Oligocene age overlies the Ocala Group. The Suwannee Limestone ranges in thickness from approximately 80 ft to more than 250 ft. In Polk County, the Suwannee Limestone pinches out to the north and east. The Suwannee Limestone is the top of two highly productive units of the upper Floridan aquifer, and is overlain by strata comprising the Hawthorn Group.

The Hawthorn Group consists of the Arcadia Formation and the Peace River Formation, in ascending order. The Arcadia Formation contains, in ascending order, the Nocatee and Tampa Members plus an unnamed member. The Arcadia Formation consists of dolomite, sand, clay, and silty, phosphatic limestone. The Peace River Formation is comprised of clayey phosphatic sand beds (Scott, 1986). The thickness of the Hawthorn Group ranges from very thin to approximately 300 ft.

The Tamiami Formation, Caloosahatchee Marl, and Fort Thompson Formation generally occur west and south near the Gulf Coast. Near the Tampa Electric Company

Table 2.3.1-1. Hydrogeological Framework of West-Central Florida

System	Series	Stratigraphic Unit		General Lithology	Major Lithologic Unit	Hydrogeological Unit
Quaternary	Holocene and Pliestocene	Undifferentiated Surficial Deposits		Predominantly fine quartz sand; shell interbedded clay, marl, peat, dolostone, sandstone, and phosphorite.	Sand	Surficial Aquifer System
		Fort Thompson Formation		Shelly quartz sand, unfossiliferous quartz sand, and thin limestone beds.		
		Caloosahatchee Formation		Shelly quartz sand. Thin, shelly limestone beds, and marl.		
Tertiary	Pliocene	Tamiemi Formation		Sandy limestone, clayey and pebbly sand; clay, marl, shell, phosphatic.	Clastic	Confining Unit
	Miocene	H A G W R T O H U P O P R N	Peace River Formation ¹	Clayey, phosphatic, sandy beds; silty and sandy phosphatic clay beds, and clayey phosphatic quartz sand.	Carbonate and Clastic	Aquifer
			Arcadia Formation ²	Dolomite and, clay, and limestone, silty, phosphatic.		Confining Unit
	Oligocene	Suwannee Limestone		Limestone, sandy limestone, fossiliferous	Carbonate	Floridan
	Eocene	Ocala Group		Limestone, chalky, foraminiferal, dolomitic, near bottom.		Aquifer System
		Avon Park Formation		Limestone and hard brown dolomite; intergranular evaporite in lower part in some areas.		Upper Floridan Aquifer
		Oldsmar Formation		Dolomite and limestone, with intergranular gypsum in most areas.		Middle Confining Unit
	Paleocene	Cedar Keys Formation		Dolomite and limestone with beds of anhydrite.	Carbonate with evaporites	Lower Floridan Aquifer
						Sub-Floridan Confining Unit

¹ Peace River Formation includes Bone Valley Member and undifferentiated deposits.² Arcadia Formation includes undifferentiated deposits, Tampa Member, and Nocatee Member.

Sources: Modified from Ryder, 1985 (Table 1) and Johnson, 1989.

GEOLOGIC AGE	FORMATION		LITHOLOGIC SECTION	MINING TERM	MINERALOGY/ GEOLOGY	WATER BEARING PROPERTIES	
RECENT	UNNAMED		TOPSOIL	OVERBURDEN	ORGANICS AND SANDS	SURFICIAL AQUIFER SYSTEM	
PLEISTOCENE	TERRACES		SAND		SAND		
MIOCENE	UPPER MIDDLE LOWER	HAWTHORN GROUP	PEACE RIVER FORMATION	BONE VALLEY MEMBER	LEACHED ZONE	ALUMINUM PHOSPHATES SAND CLAYS	INTERMEDIATE AQUIFER SYSTEM
				ORE ZONE	MATRIX	IRON PHOSPHATES CALCIUM PHOSPHATES SAND CLAY	
			UNDIFFERENTIATED PEACE RIVER FORMATION	CLAY	BED CLAY	CALCIUM PHOSPHATES CLAY	
				DOLOMITE AND CLAYS	BED ROCK	DOLOMITE SAND CLAY CALCIUM PHOSPHATES	
			UNDIFFERENTIATED ARCADIA FORMATION	CLAY AND DOLOMITE		CLAY DOLOMITE SAND	
				TAMPA MEMBER		LIMESTONE	
NOCATEE MEMBER	CLAY						
OLIGOCENE	SUWANNEE LIMESTONE		LIMESTONE		LIMESTONE	FLORIDAN AQUIFER SYSTEM	

FIGURE 2.3.1-1.

HYDROGEOLOGIC FRAMEWORK OF FLORIDA PHOSPHATE DISTRICT

Source: Yon, 1983; Scott, 1986; Campbell, 1986.



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Polk Power Station, these formations are discontinuous and the Bone Valley member dominates. The Bone Valley member of the Peace River Formation ranges from 20 to 60 ft in thickness and is the primary ore zone for phosphate pebble mining.

The most recent deposits are undifferentiated sands and terrace deposits which may range in thickness from 0 to 70 ft.

The location of geologic cross-sections by the Florida Geologic Survey (FGS) are illustrated in Figure 2.3.1-2. The geologic cross-sections depicted in Figures 2.3.1-3 and 2.3.1-4 were constructed from the available well logs in the general region (Campbell, 1986).

Lithology

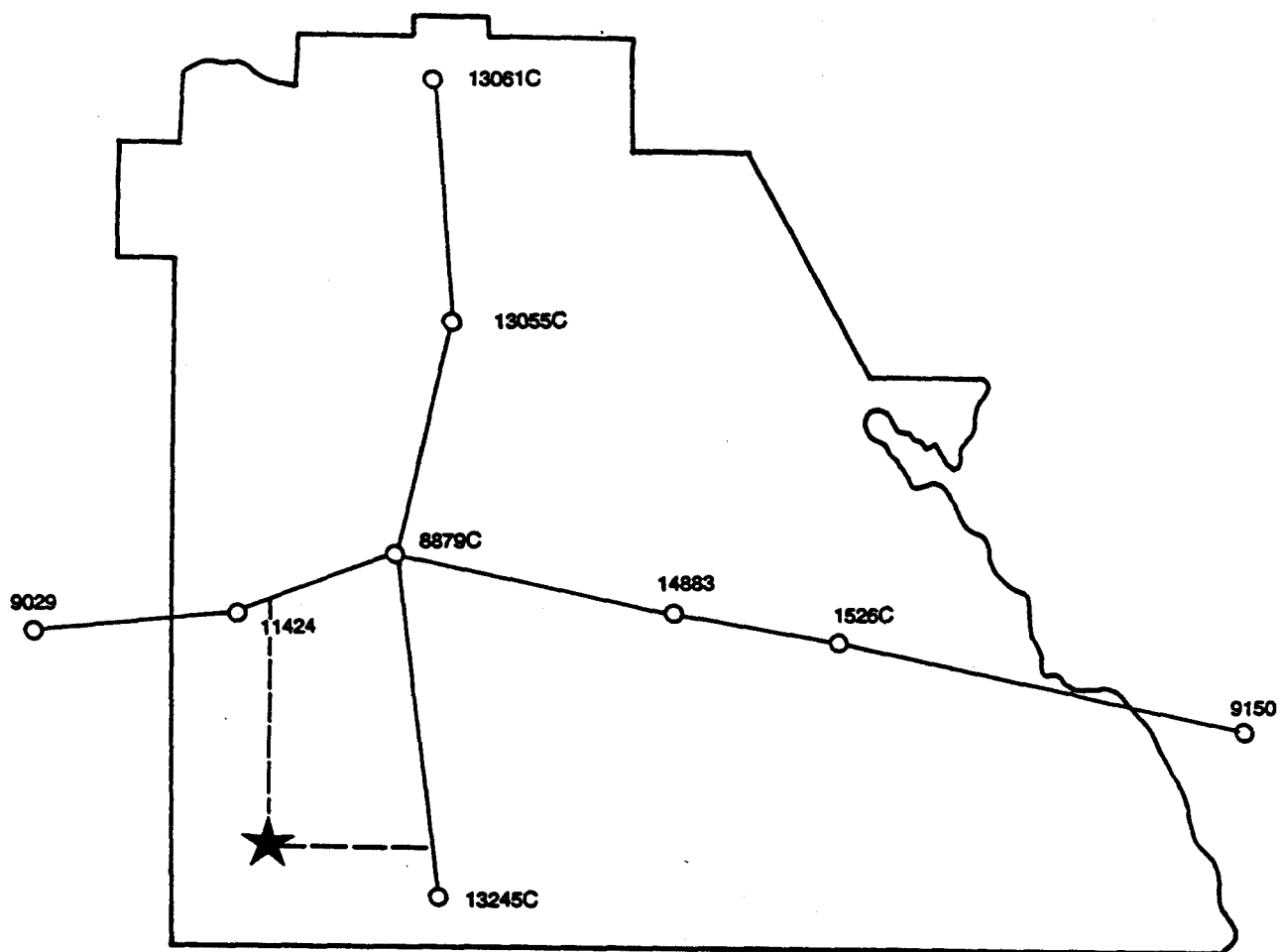
Generalized descriptions (Campbell, 1986 and Stewart, 1966, except as noted) of the formations in the site area are summarized here in ascending order.

Oldsmar Formation--Limestones and dolomites with evaporites, soft to hard, chalky zones, occasional fine honeycomb, abundant nodules, and nests of nodules of gypsum altered from anhydrite.

Avon Park Formation--Limestone, chalky, nodular, oolitic, fragmental, intergranular anhydrite and gypsum, very fossiliferous, cream, white, to dark brown; commonly dolomite zones in middle park, dense to finely crystalline, yellow to grayish brown. Lower dolomite unit massive, dense to finely crystalline or sucrosic, some coarsely crystalline, pale-yellow and brown to dark brown and gray, mottled (Wilson, 1977).

Ocala Group--Limestone, chalky, nodular, granular, fragmental, some oolitic, generally very fossiliferous, cream, white, some buff; occasional dolomite in lower part, dense and cherty, white, cream to dark brown and gray.

Suwannee Limestone--Limestone, nodular, granular, chalky, some fragmental, some oolitic, usually very fossiliferous, cream to white, occasionally some clear quartz grains.

LEGEND

★ POLK POWER STATION SITE

----- PROJECTION LINE

NOT TO SCALE

FIGURE 2.3.1-2.

REGIONAL GEOLOGIC CROSS-SECTION
LOCATION MAP

Source: Campbell, 1986.

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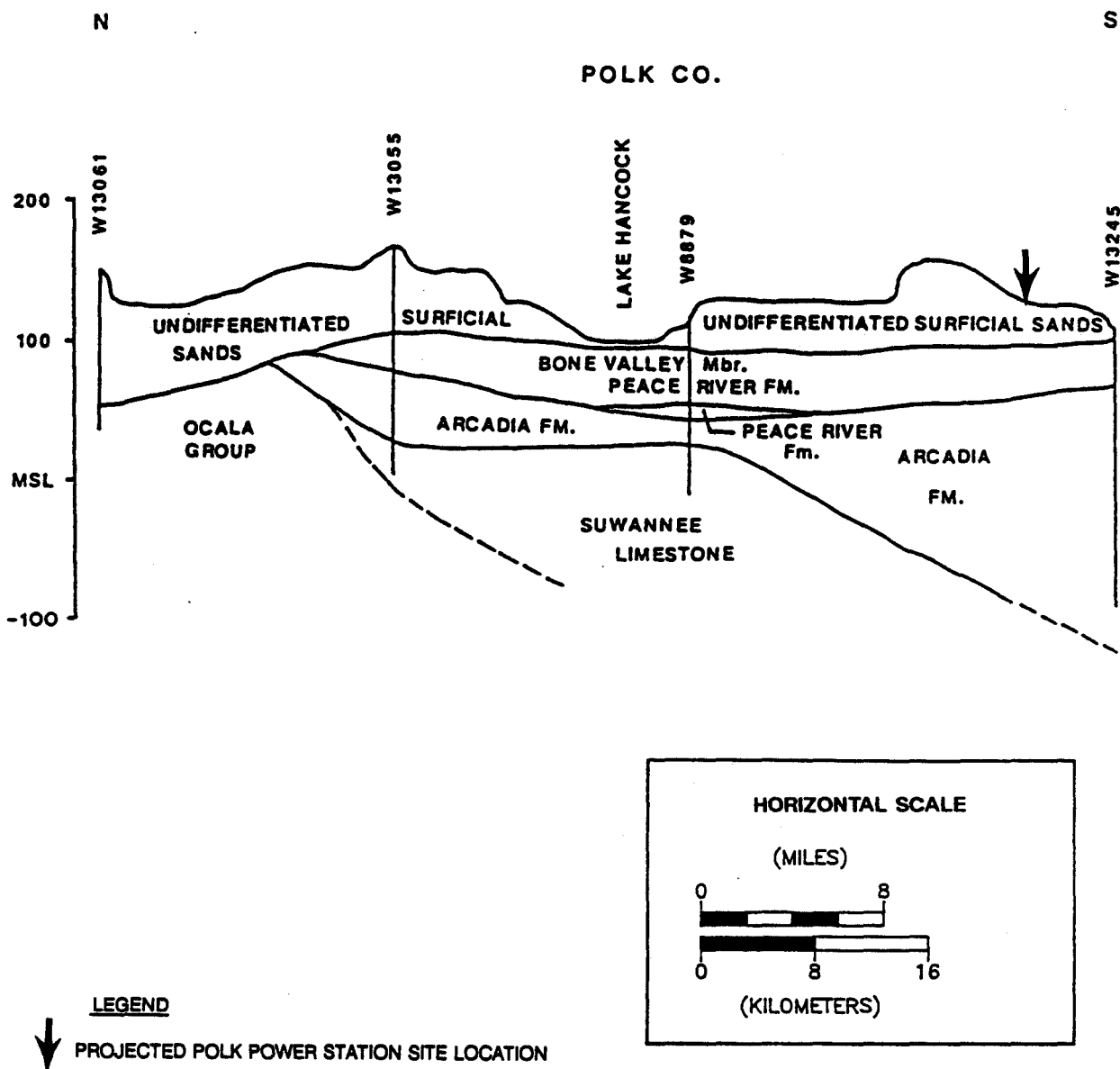


FIGURE 2.3.1-3.

NORTH-SOUTH GEOLOGIC CROSS-SECTION

Source: Campbell, 1986.



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W
HILLSBOROUGH CO. | POLK CO.

POLK CO. | OSCEOLA CO. E

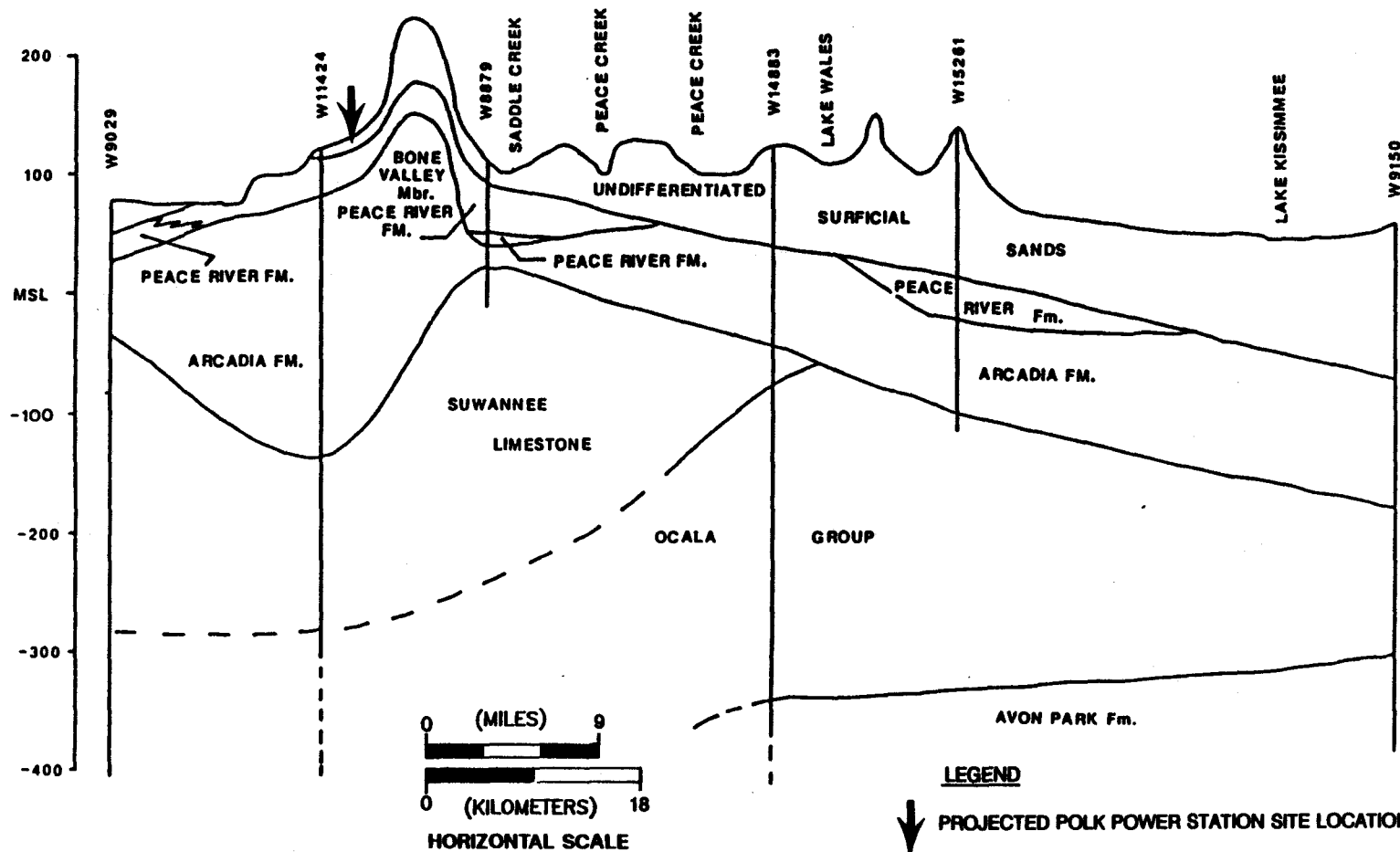


FIGURE 2.3.1-4.

WEST-EAST GEOLOGIC CROSS-SECTION

Source: Campbell, 1986.



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Hawthorn Group-Arcadia Formation--Nocatee member: sand, fine-coarse grained, clean to silty, limey, grayish green; and clay, silty, sandy, marly, gray to pale green, and hard, waxy, dark green to black, marly; minor limestone. **Tampa member:** limestone, massive or thick-bedded, hard, dense, cherty, fossiliferous, phosphatic, white to gray and brown; minor thin bedded sand and clay. Where underlying sand and clay unit is absent, equivalent beds are limestone, predominantly sandy, fossiliferous, gray, cherty; in places marly, soft, pebbly. **Undifferentiated member (Hawthorn Carbonate unit):** predominantly marl, dolomite and limestone; soft, chalky, fine-grained to sandy or pebbly; abundant brown or black phosphorite grains or pebbles; minor thin-bedded sand and clay. Generally the uppermost limestone in the section is less clastic than the underlying sand and clay unit, phosphatic throughout.

Hawthorn Group-Peace River Formation--Undifferentiated member: interbedded sands, clays, and dolomite with varying phosphate content. **Bone Valley member:** clayey sand and sandy clay, fine-grained, calcareous to noncalcareous; abundant phosphorite nodules up to pebble size, white to gray in upper part, amber or black in lower part; includes beds of clean phosphatic sand and sand and gravel.

Undifferentiated Surficial Deposits--Sand, clayey, very fine- to medium-grained, predominantly fine-grained; white to brown; trace of phosphate in lower part, minor thin beds of limestone and bluish gray clayey sand and clay.

Site Area Stratigraphy

Stratigraphic data was collected from a wire-line core at Monitor Station GW-1 (Figure 2.3.1-5) to prepare a general stratigraphic section and column (Figure 2.3.1-6) for the site. Monitor Station GW-1 is located in the northeast quarter of Section 9 of Township 32 South, Range 23 East, east of SR 37. Data from the wireline core and other borings conducted onsite were used to evaluate the site area stratigraphy. The undifferentiated surficial sand deposits ranged in thickness from 15 to 28 ft. For the Hawthorn Group, the Peace River Formation ranged in thickness from 16 to 40 ft and the Arcadia Formation was approximately 225 ft thick. The Suwannee

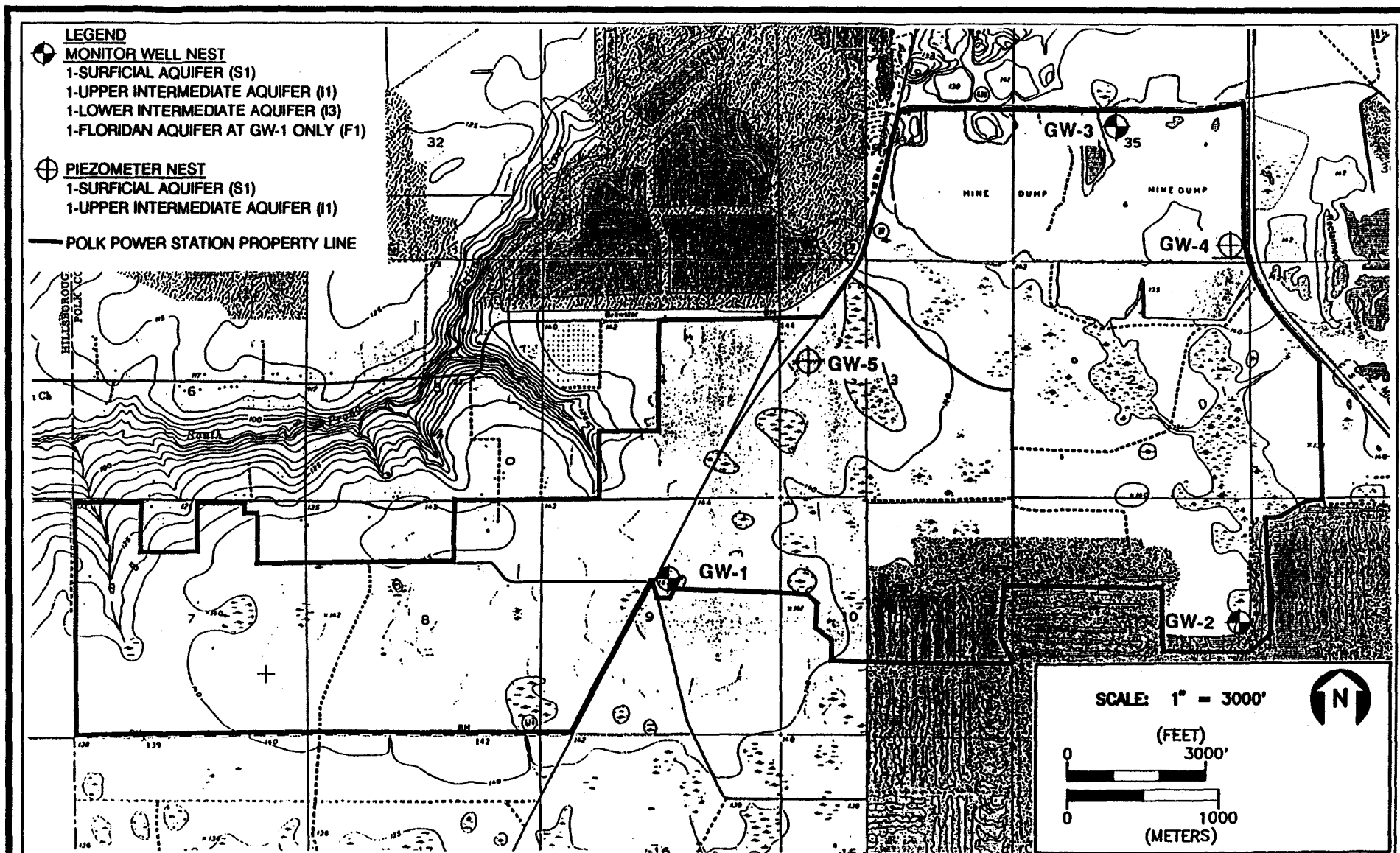


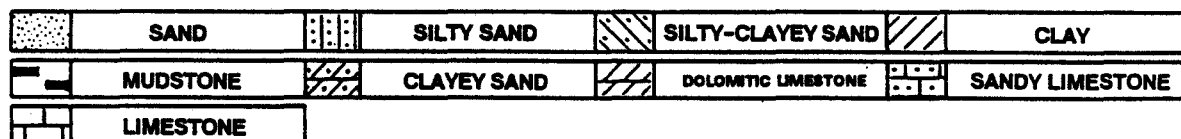
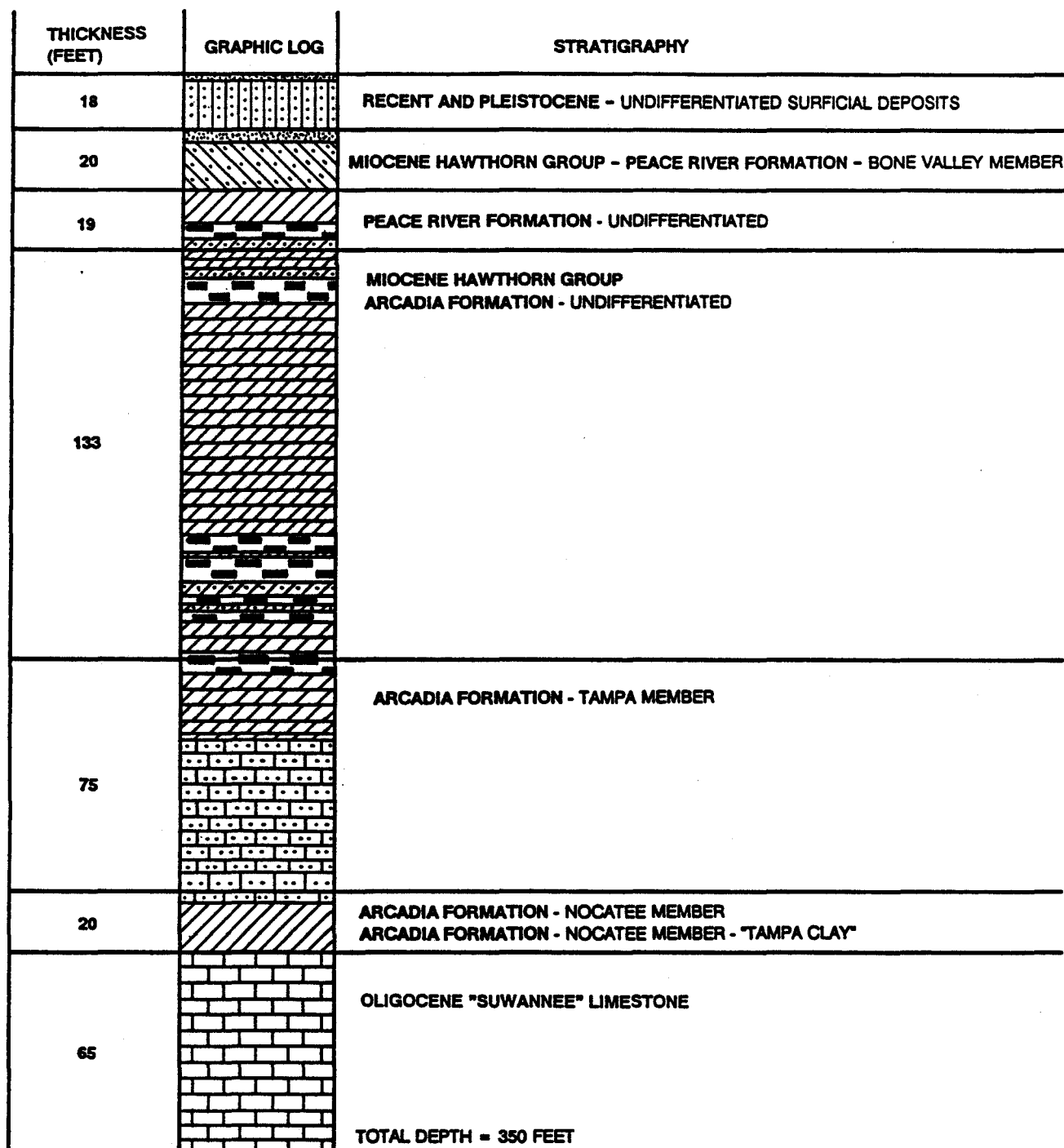
FIGURE 2.3.1-5.

GROUNDWATER MONITORING STATION LOCATION MAP

Source: USGS, Duette NE, FL, 1972; Baird, FL, 1987; ECT, 1992.

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NOTE: LITHOLOGY AND STRATIGRAPHY FROM NQ WIRELINE CORE AT GW-1 FLORIDA AQUIFER WELL

NOT TO SCALE

FIGURE 2.3.1-6.

STRATIGRAPHIC COLUMN FROM NQ WIRELINE
CORE AT GW-1

Source: ECT, 1992.

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Limestone was encountered at a depth of approximately 285 ft. This unit was not fully penetrated during this investigation. The carbonate sequence including the Suwannee Limestone, Ocala Group, Avon Park Formation, and Oldsmar Limestone extends to depths ranging from 1,500 to 1,800 ft.

Site Area Structure

Three features influenced the depositional environments and geologic setting of southwest central Florida (Figure 2.3.1-7). These features are the Peninsular Arch, Ocala Uplift, and South Florida Basin.

The main axis of the Peninsular Arch is located east of the site area, trends generally north-northwestward, and is estimated to be 275 miles long. The trend of the arch is approximately south 35 degrees (°) east, and extends from south-central Georgia to slightly northeast of Lake Okeechobee (Applin and Applin, 1965). The arch is thought to be an anticlinal fold of late Paleozoic and early Mesozoic time which caused differential subsidence of the overlying strata (Faulkner, 1970).

The Ocala Platform, or Ocala Uplift, is an additional geologic feature which parallels the Peninsular Uplift to the southwest. The Ocala Platform trends approximately north 25° west and covers an elliptical area approximately 230 miles long and 70 miles wide (Vernon, 1951). This feature extends from the vicinity of Dunellin to Otter Springs in Levy County and affects the Eocene and younger stratigraphic units. The Ocala Platform is not a true uplift, but rather an anomalous buildup of carbonates (Winston, 1976). A southern extension of this platform is the Central Florida Platform which underlies much of the Central Florida Phosphate District (Hall, 1983). The Tampa Electric Company Polk Power Station is located near the approximate center of the Central Florida Platform.

A third structural feature is the South Florida Basin. This basin is a broad, relatively flat, synclinal feature that trends approximately south 45° west and extends nearly

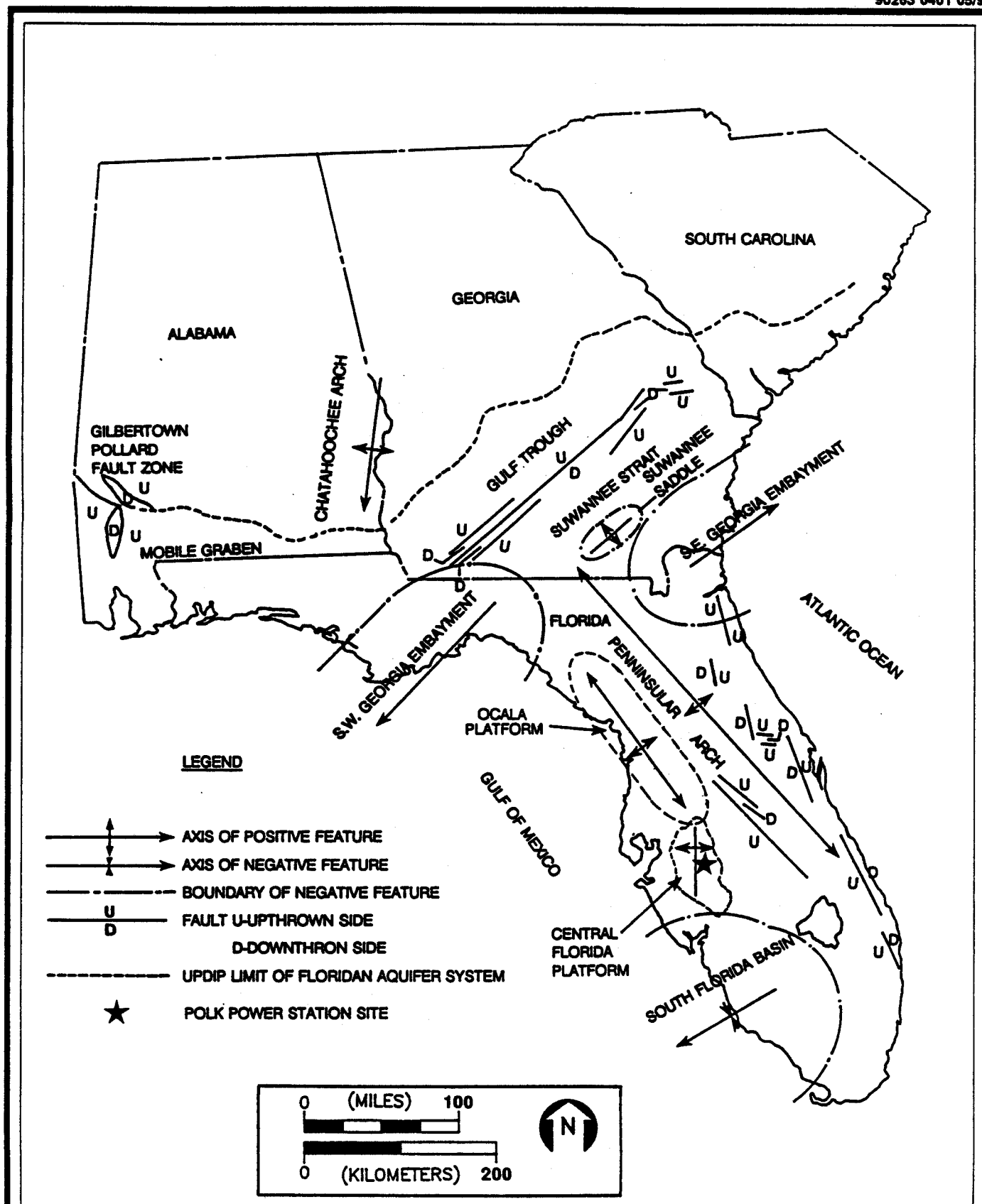


FIGURE 2.3.1-7.

STRUCTURAL AND GEOLOGIC FEATURES OF FLORIDA

Source: Modified Miller, 1986 and Hall, 1983.

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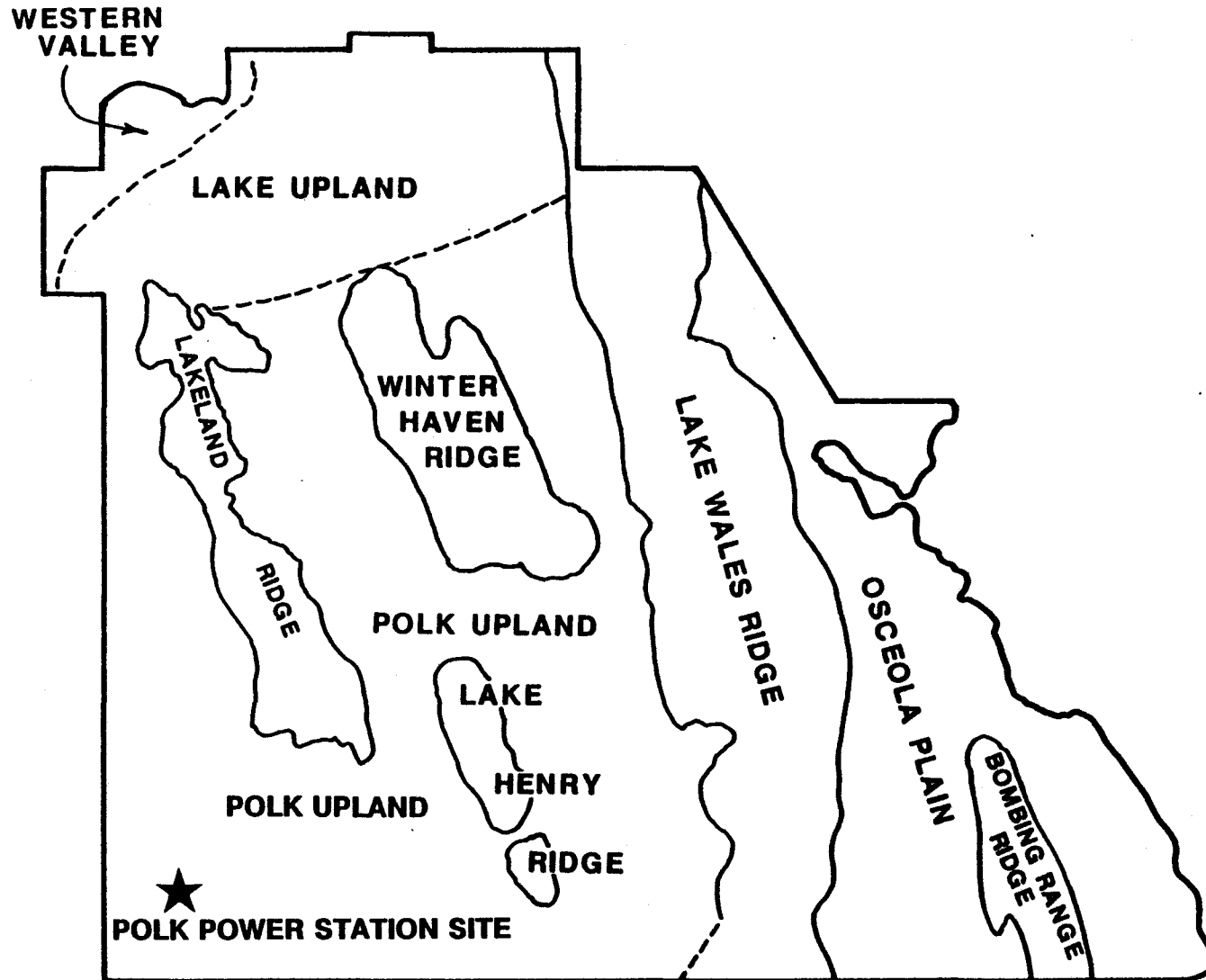
200 miles across the Florida peninsula. The maximum depositional thickening occurred during the Jurassic and Lower Cretaceous periods in the South Florida Basin.

No faulting has been identified within the immediate vicinity of the Tampa Electric Company Polk Power Station site.

Site Area Physiography

The site area falls in the geomorphic province known as the Polk Upland (White, 1970). The majority of the Tampa Electric Company Polk Power Station site occurs on the Okefenokee Terrace (Sunderland Terrace) with an altitude range of +100 to +170 ft-msl, and a shoreline altitude at +170 ft-msl. The Polk Upland is bounded by the DeSoto Plain on the south and the Lake Henry or Lake Wales Ridge on the east (Campbell, 1986) (Figure 2.3.1-8). The topography of the Polk Upland is flat and underlain by a veneer of sands. Only geomorphic features associated with remnants of ancient shorelines mark the land form as it slopes gently toward the south (Campbell, 1986).

Prior to the recent mining activities, the land surface elevations ranged from approximately 130 to 200 ft-msl. The low elevation occurs at the southeast corner of the project site. Mine tailings mounds (from the early 1900s) in the northeast portion of the site range between approximately 170 to 200 ft-NGVD adjacent to Fort Green Road. The land surface elevation along SR 37 ranges from approximately 145 to 150 ft-NGVD. West of SR 37 the site elevation ranges from approximately 150 to 110 ft-NGVD. Prior to recent mining, the land surface was relatively flat with shallow slopes. The two exceptions are the old mine tailings mounds (northeast corner) and adjacent to the South Prong Alafia River (west-northwest corner). Several circular depressions are visible on soils and topographic maps and areal photographs. These features may predate mining activities and will be further discussed in Section 2.3.2.2.



Generalized Physiographic Map of Polk County, after White (1970).

NOT TO SCALE

FIGURE 2.3.1-8.

GENERALIZED PHYSIOGRAPHIC MAP OF POLK COUNTY

Source: Modified Campbell, 1986; ECT, 1992.



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2.3.1.2 Detailed Site Lithologic Description

Phosphate mining activities have disturbed much of the power plant site. The presence of the Bone Valley member with its pebble-sized phosphate grains dominates the detailed surficial geohydrology. The phosphate mining activities remove the overburden (Figure 2.3.1-1) and place this material in adjacent mine cut bottoms. The phosphate ore, *matrix*, is removed, and soils are piled adjacent to mine cuts resulting in deep ponds of standing water surrounded by spoil piles. At the Polk Power Station, the mining activities impacted or removed soils to a depth between 30 to 40 ft. The central area of the Polk Power Station site has not been mined and is the intended location for the power plant facility.

An exploratory drilling program was conducted to characterize the hydrogeologic units and subsurface conditions under the site. The subsurface investigation included:

1. Eight standard penetration test (SPT) borings illustrated on Figure 2.3.1-9 (identified as GW-1, GW-3, GW-4, GW-5, SPT-1N, SPT-2M, SPT-3SD, SPT-4ND, and SPT-5S) and drilled to depths varying from 12 to 60 ft;
2. Three cone penetration test (CPT) borings illustrated on Figure 2.3.1-9 (identified as SPT-2M, SPT-3SD, and SPT-4ND) and drilled to depths varying from 32 to 42 ft;
3. Three monitor wells [4-inch diameter, polyvinyl chloride (PVC)] and two piezometers (2-inch diameter, PVC) drilled, completed, and developed into the surficial aquifer (designated S1). These wells/piezometers ranged from 13 to 23 ft in depth. The well site locations are illustrated on Figure 2.3.1-5 and are identified as GW1-S1, GW2-S1, GW3-S1, GW4-S1, and GW5-S1;
4. Three monitor wells (4-inch diameter, PVC) and two piezometers (2-inch diameter, PVC) drilled, completed, and developed into the upper intermediate aquifer (designated I1). These wells/piezometers ranged from 90 to 106 ft in depth. The well site locations are illustrated on Figure 2.3.1-5 and are identified as GW1-I1, GW2-I1, GW3-I1, GW4-I1, and GW5-I1;

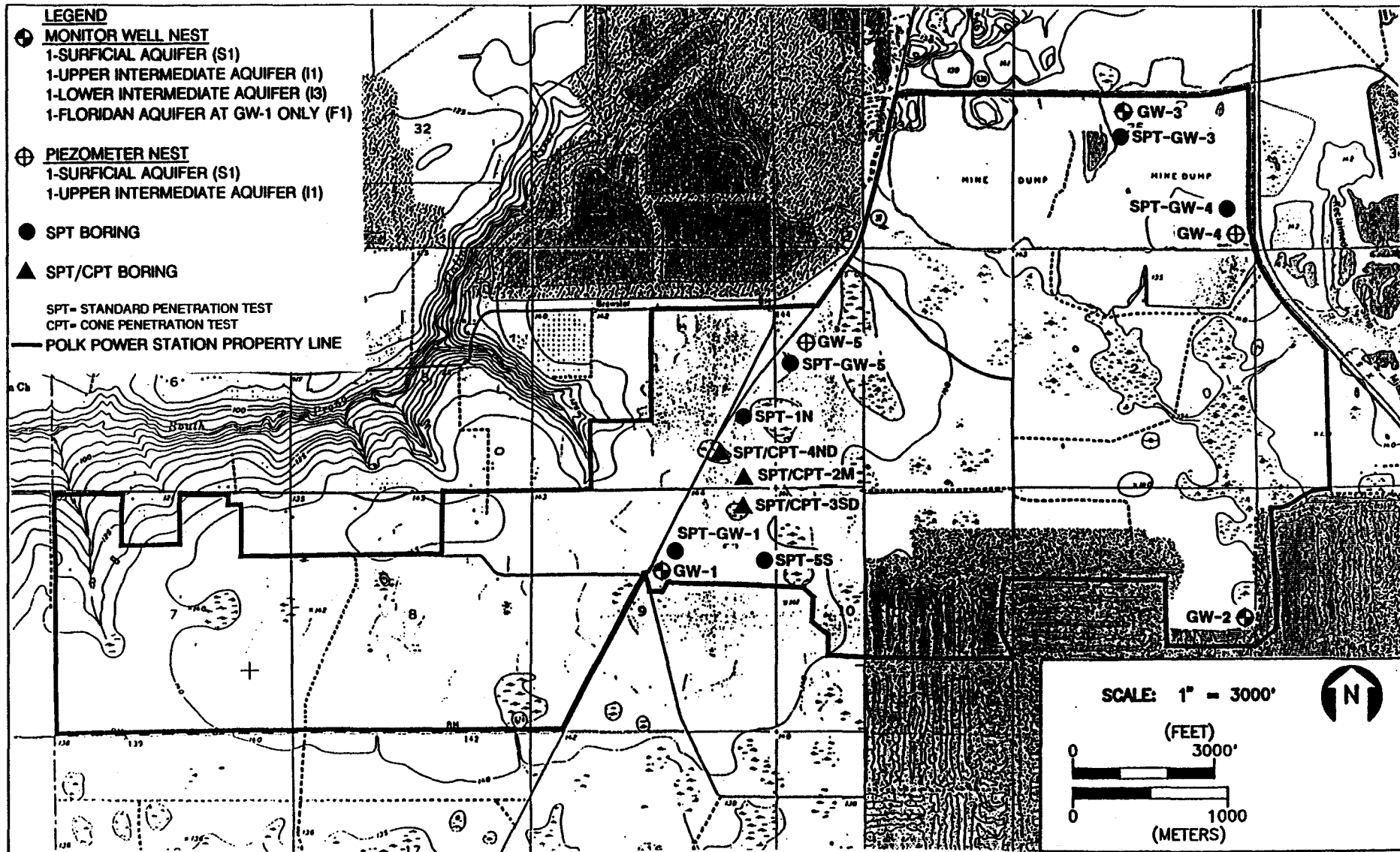


FIGURE 2.3.1-9.

STANDARD AND CONE PENETRATION TEST BORING LOCATION MAP

Sources: USGS Quad. Duette NE., Fl. 1972; Baird, Fl. 1987; ECT, 1992.

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5. Three monitor wells (4-inch diameter, PVC) drilled, completed, and developed into the lower intermediate aquifer, Tampa member of the Arcadia Formation (designated I3). These wells ranged from 235 to 242 ft in depth. The well site locations are illustrated on Figure 2.3.1-5 and are identified as GW1-I3, GW2-I3, and GW3-I3; and
6. One monitor well (4-inch diameter, PVC) drilled, completed, and developed into the upper Floridan aquifer (designated F1). This well was drilled to a depth of 338 ft. The well site location is illustrated on Figure 2.3.1-5 and is identified as GW1-F1.

The logs for these borings and the construction details for the monitor wells and piezometers are provided in Appendix 11.7.1.

Split-spoon, Shelby tube, and wash samples were obtained. The laboratory soil testing program consisted of soil classification, grain-size analysis, natural moisture content, percent fines, liquid limits, plasticity index, vertical permeability, dry density, porosity, and cation exchange capacity. Soil classifications were determined in accordance with the unified method [American Society for Testing and Materials (ASTM) D2487] for all split-spoon samples.

A soil classification chart is provided as Figure 2.3.1-10. A soil profile location map and a soil profile for the upper 60 ft of soil are shown as Figures 2.3.1-11 and 2.3.1-12, respectively. The stratigraphic column presented in Figure 2.3.1-6 is representative of the geologic units encountered at depth at the Tampa Electric Company Polk Power Station site.

The undifferentiated sand unit is being removed by mining activities and replaced with tailing sands over much of the site. The sands are gray to brown, fine- to medium-grained, with a varying amount of silt and/or clay present. The natural moisture content of the soil averages 26 percent from tests, and the percent fines ranged from 4 to 73 percent in 11 tests. Eleven permeability tests ranged from a low

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests^A

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^A				Soil Classification	
				Group Symbol	Group Name ^B
Coarse-Grained Soils More than 50 % retained on No. 200 sieve	Gravels More than 50 % of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5 % fines ^C	$Cu \geq 4$ and $1 \leq Cc \leq 3^E$	GW	Well-graded gravel ^F
			$Cu < 4$ and/or $1 > Cc > 3^E$	GP	Poorly graded gravel ^F
		Gravels with Fines More than 12 % fines ^C	Fines classify as ML or MH	GM	Silty gravel ^{F,G,H}
			Fines classify as CL or CH	GC	Clayey gravel ^{F,G,H}
	Sands 50 % or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5 % fines ^D	$Cu \geq 6$ and $1 \leq Cc \leq 3^E$	SW	Well-graded sand
			$Cu < 6$ and/or $1 > Cc > 3^E$	SP	Poorly graded sand ^I
		Sands with Fines More than 12 % fines ^D	Fines classify as ML or MH	SM	Silty sand ^{G,H,I}
			Fines classify as CL or CH	SC	Clayey sand ^{G,H,I}
Fine-Grained Soils 50 % or more passes the No. 200 sieve	Silt and Clays Liquid limit less than 50	inorganic	$PI > 7$ and plots on or above "A" line ^J	CL	Lean clay ^{K,L,M}
			$PI < 4$ or plots below "A" line ^J	ML	Silt ^{K,L,M}
		organic	Liquid limit – oven dried Liquid limit – not dried < 0.75	OL	Organic clay ^{K,L,M,N} Organic silt ^{K,L,M,O}
	Silt and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line	CH	Fat clay ^{K,L,M}
			PI plots below "A" line	MH	Elastic silt ^{K,L,M}
		organic	Liquid limit – oven dried Liquid limit – not dried < 0.75	OH	Organic clay ^{K,L,M,P} Organic silt ^{K,L,M,O}
Highly organic soils	Primarily organic matter, dark in color, and organic odor			PT	Peat

^A Based on the material passing the 3-in. (75-mm) sieve.

^B If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

^C Gravels with 5 to 12 % fines require dual symbols:

GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay

^D Sands with 5 to 12 % fines require dual symbols:

SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay

$$E \quad Cu = D_{60}/D_{10} \quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

^E If soil contains ≥ 15 % sand, add "with sand" to group name.

^G If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

^H If fines are organic, add "with organic fines" to group name.

^I If soil contains ≥ 15 % gravel, add "with gravel" to group name.

^J If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay.

^K If soil contains 15 to 29 % plus No. 200, add "with sand" or "with gravel," whichever is predominant.

^L If soil contains ≥ 30 % plus No. 200, predominantly sand, add "sandy" to group name.

^M If soil contains ≥ 30 % plus No. 200, predominantly gravel, add "gravelly" to group name.

^N $PI \geq 4$ and plots on or above "A" line.

^O $PI < 4$ or plots below "A" line.

^P PI plots on or above "A" line.

^Q PI plots below "A" line.

^A Based on the material passing the 3-in. (75-mm) sieve.

^B If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

^C Gravels with 5 to 12 % fines require dual symbols:

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SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
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^H If fines are organic, add "with organic fines" to group name.

^I If soil contains ≥ 15 % gravel, add "with gravel" to group name.

^J If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay.

^K If soil contains 15 to 29 % plus No. 200, add "with sand" or "with gravel," whichever is predominant.

^L If soil contains ≥ 30 % plus No. 200, predominantly sand, add "sandy" to group name.

^M If soil contains ≥ 30 % plus No. 200, predominantly gravel, add "gravelly" to group name.

^N $PI \geq 4$ and plots on or above "A" line.

^O $PI < 4$ or plots below "A" line.

^P PI plots on or above "A" line.

^Q PI plots below "A" line.

FIGURE 2.3.1-10.

UNIFIED SOIL CLASSIFICATION CHART SYSTEM

Source: ASTM, 1990.



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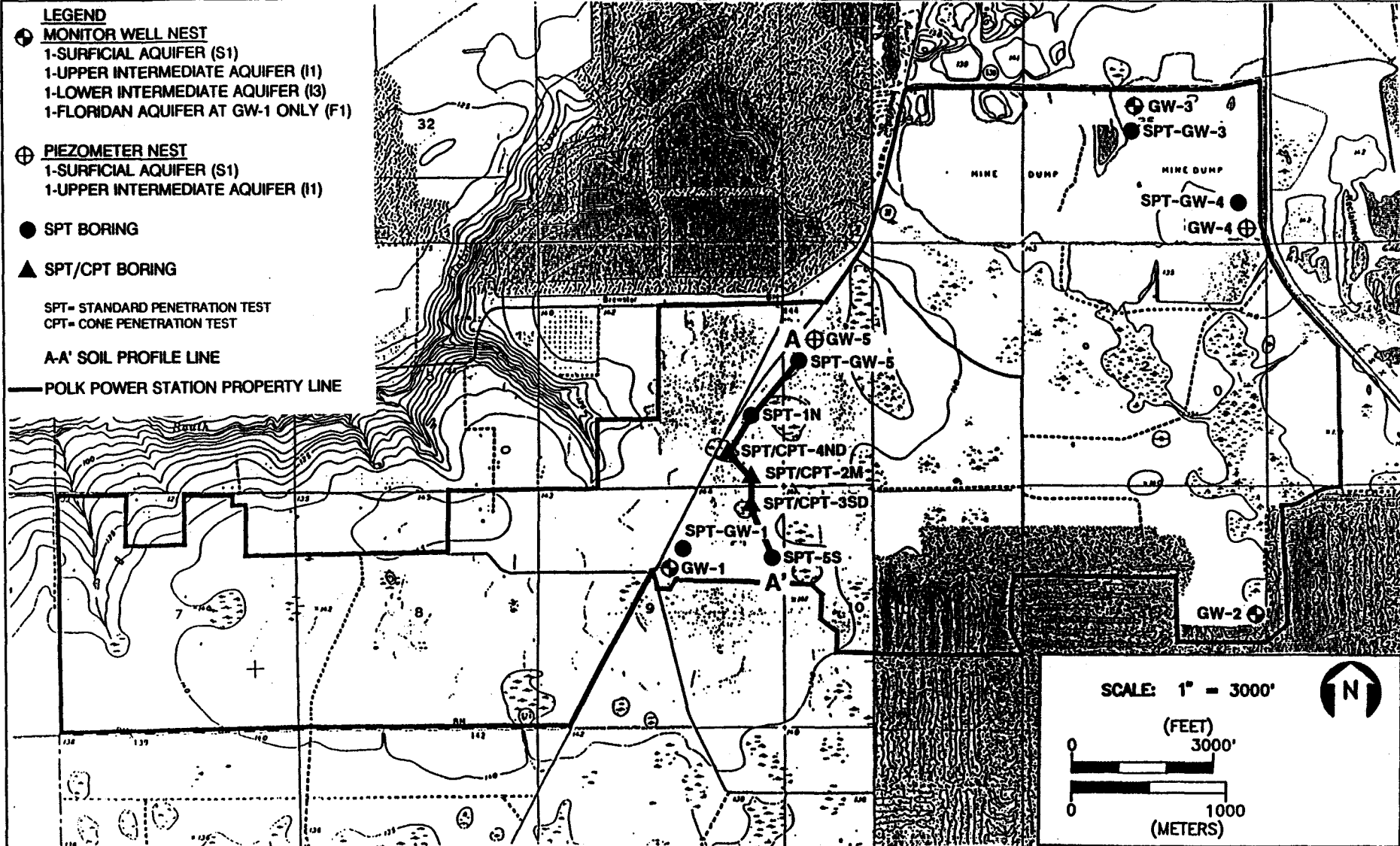


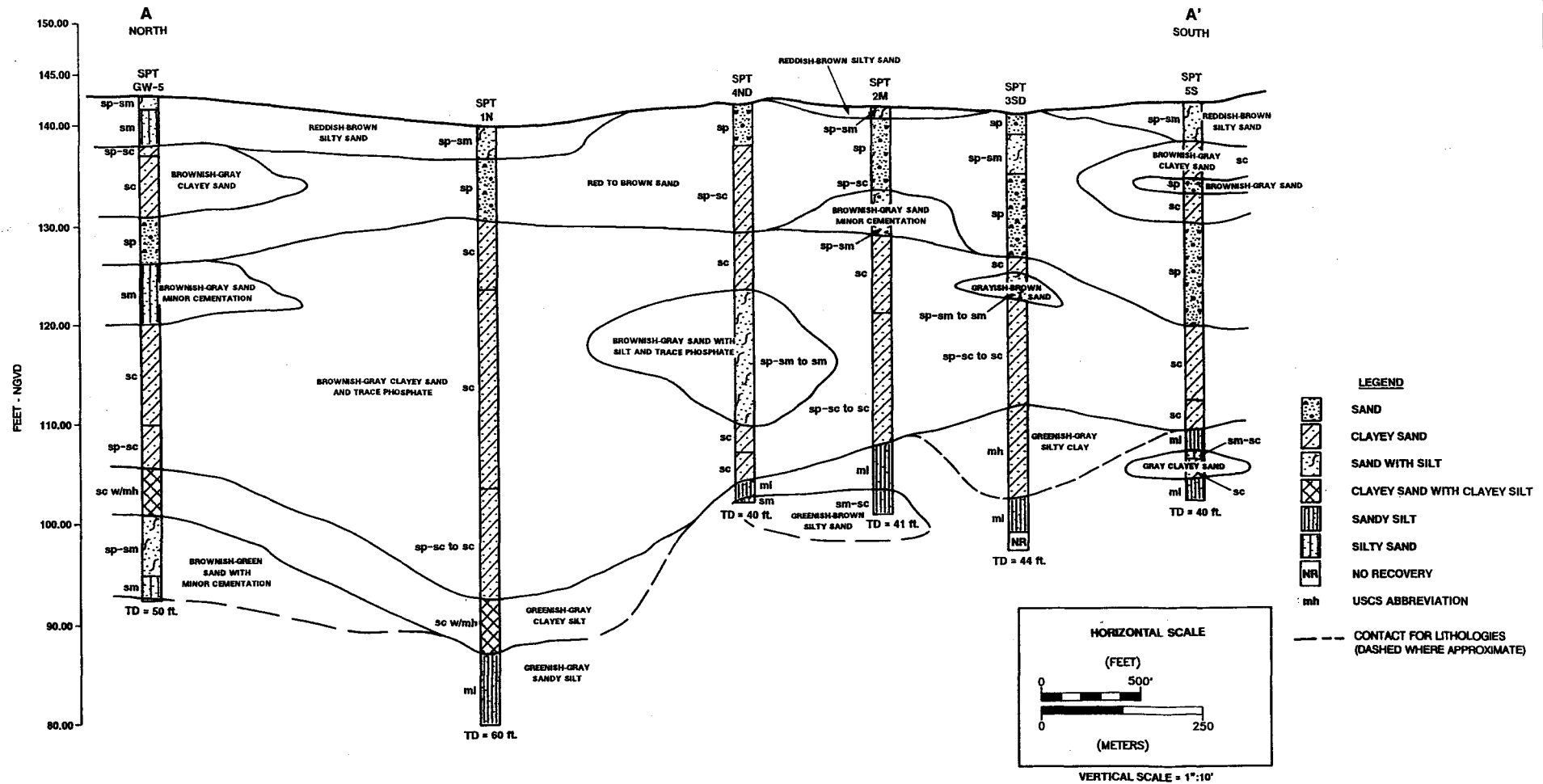
FIGURE 2.3.1-11.

SOIL PROFILE LOCATION MAP

Source: USGS, Duetle NE, FL, 1972; Baird, FL, 1987; ECT, 1992.



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NOTE: EXCEPT AT WELL LOCATIONS, GROUND SURFACE AND STRATIGRAPHY ARE INFERRED.

FIGURE 2.3.1-12.
SOIL PROFILE A-A'

Source: ECT, 1992.

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of 3.2×10^{-8} centimeters per second (cm/sec) to 5.1×10^{-4} cm/sec. The results of the laboratory testing for these soil samples are summarized in Table 2.3.1-2, and the laboratory report (with grain-size analyses curves) are provided in Appendix 11.7.2.

At depths ranging from 50 to 60 ft, calcareous mudstone or carbonate strata were encountered with interbedded lenses of sand and clay. These calcareous or carbonate units were consolidated, well compacted, and moderately hard to hard. Thus, extensive soil testing was not conducted on the consolidated, carbonate units. Soil laboratory tests were conducted on a calcareous sandy clay sample (80 to 81 ft deep) and a hard clay to soft claystone sample (270 ft deep) at monitor station GW-1. The results of the laboratory testing for these samples are summarized in Table 2.3.1-2 and the laboratory report is provided in Appendix 11.7.2.

2.3.1.3 Geologic Maps

Soil types have been mapped by the U.S. Department of Agriculture in cooperation with the Polk County Soil Conservation Services (SCS) (1990a).

The Tampa Electric Company Polk Power Station plant site is situated primarily on Smyrna-Myakka, Arents-Water, and Ona soil types (Figure 2.3.1-13). Seventeen other soil types occur across the site, but cover significantly less area.

The Smyrna-Myakka soil complex consists primarily of fine sands which cover broad areas of flatwoods. These soils are somewhat poorly drained with slopes that are smooth to concave at 0 to 2 percent. The water table within these soils is typically 0 to 1 foot below land surface (ft bls) for 1 to 4 months in most years. The Smyrna soils have an organic matter content of 1 to 5 percent, and the Myakka soils have an organic matter content of 2 to 5 percent (SCS, 1990a). This soil complex has only a slight erosional risk.

The Arents-Water complex is a soil type resulting from mining activities. The Arents consists of piles (various slopes) of soil material and overburden that originally

Table 2.3.1-2. Soil Laboratory Test Results

Boring Number	Sample Number	Depth Sampled (ft)	Natural Moisture (%)	Percent Fines (%)	Liquid Limits	Plasticity Index	Vertical Permeability (cm/sec)	Dry Density (pcf)	Porosity (%)	CEC (meq Ba/100 g soil)
Unconsolidated Surficial Soils										
SPT-1N	US 1	16 to 18	19.0	17.0			3.8×10^{-5}	110.7	33.7	
SPT-2M	US 1	18.5 to 20.5	16.8	13.0	24	10	2.3×10^{-5}	105.4	28.4	
SPT-3SD	US 1	17 to 18.5	18.9	11.0			2.8×10^{-5}	104.8	31.7	
SPT-3SD	US 2	27 to 29	18.8	16.0	26	10	6.3×10^{-6}	108.9	32.8	
SPT-4ND	US 2	36 to 38	44.8	23.0	89	47	1.1×10^{-5}	74.9	53.8	
SPT-4ND	US 1	12 to 14	26.7	73.0			3.2×10^{-8}	100.2	42.9	
SPT-5S	US 2	36 to 38	33.4	25.0	97	63	6.2×10^{-7}	86.4	46.2	
SPT-5S	US 1	16 to 18	20.1	7.0			3.3×10^{-4}	103.3	33.3	
GW-5	US 1	16.5 to 18.5	27.0	12.0			4.3×10^{-7}	90.9	39.3	
GW-4	US 1	12 to 14	19.7	7.0			2.4×10^{-5}	102.0	32.2	
GW-4	MT-1	38 to 40	52.3					69.3	58.1	7.11
GW-3	US PI1	49 to 51	20.4					110.0	36.0	
GW-3	US 1	12 to 14	25.8	5.0			1.2×10^{-3}	99.4	41.1	
GW-2										
GW-1	US 1	10 to 12	22.5	4.0			5.1×10^{-3}	114.4	40.3	
GW-1	US MT-1	36 to 38	27.1	73.0			6.4×10^{-7}	99.1	43.0	3.04
Average			26.2	22.0	59	32.5	5.2×10^{-4}	98.6	39.5	
Maximum			52.3	73.0	97	63	5.1×10^{-3}	114.4	58.1	
Minimum			16.8	4.0	24	10	3.2×10^{-8}	69.3	28.4	
GW1-II	*	~ 270	18.6	38.0			3.0×10^{-7}	108.3	32.3	0.27
	US 1	80 to 81	30.6					96.0	47.1	

Note: GW1-F1 and GW1-II are not part of surficial soils.
 Boring locations are illustrated in Figure 2.3.1-9.
 CEC = cation exchange capacity.
 meq = milliequivalents.
 pcf = pounds per cubic foot.

N = north SPT boring.
 M = middle SPT boring.
 SD = south depression boring.
 ND = north depression boring.
 S = south SPT boring.

*Mineral barrel sample.

Sources: Ardaman & Associates, 1991.
 ECT, 1992.

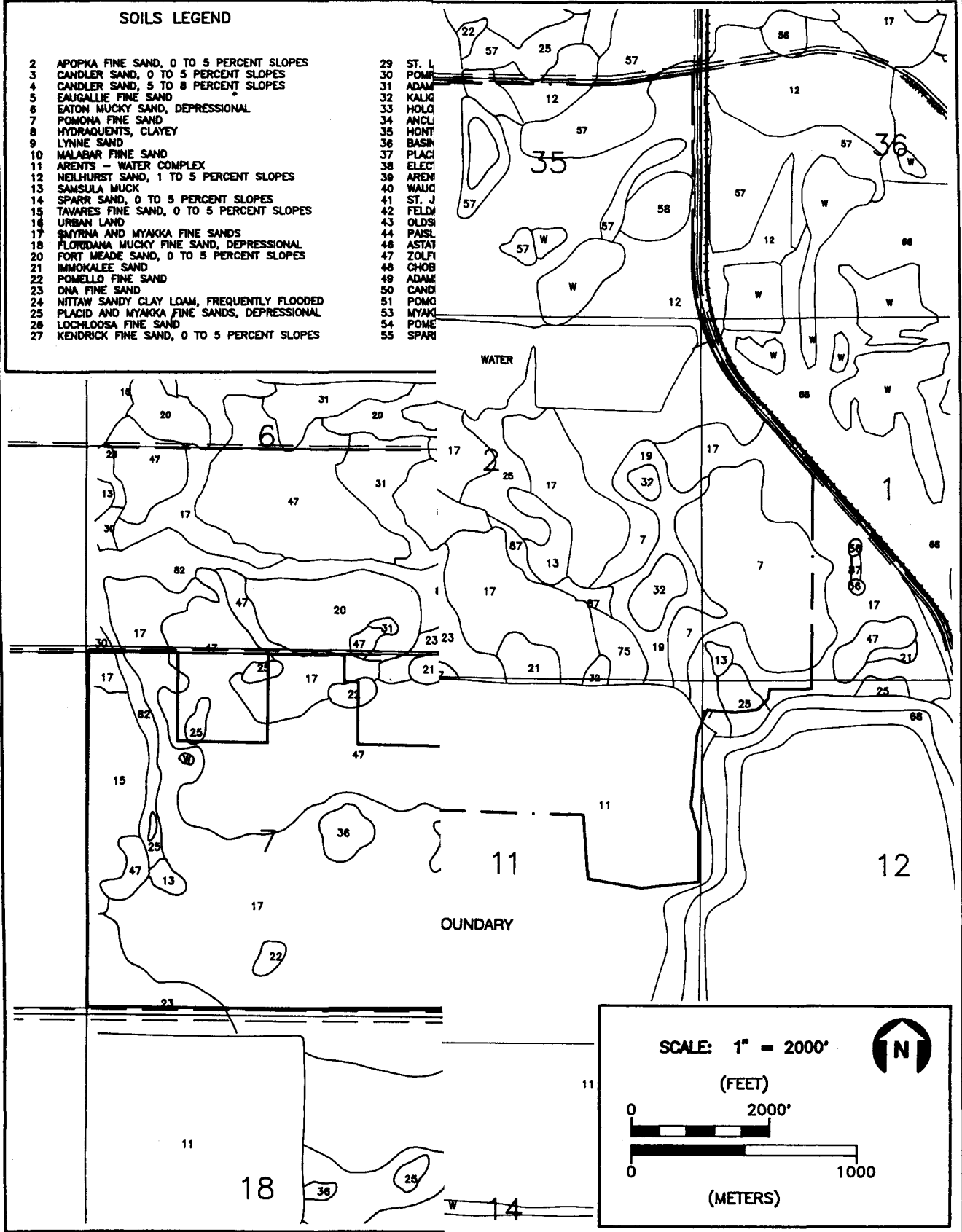


FIGURE 2.3.1-13.

SCS SOIL TYPE MAP - PREMINING CON

Source: ECT, 1992.



POLK
POWER
STATION

overlaid the phosphate matrix. The water part of this classification forms after the ore has been mined.

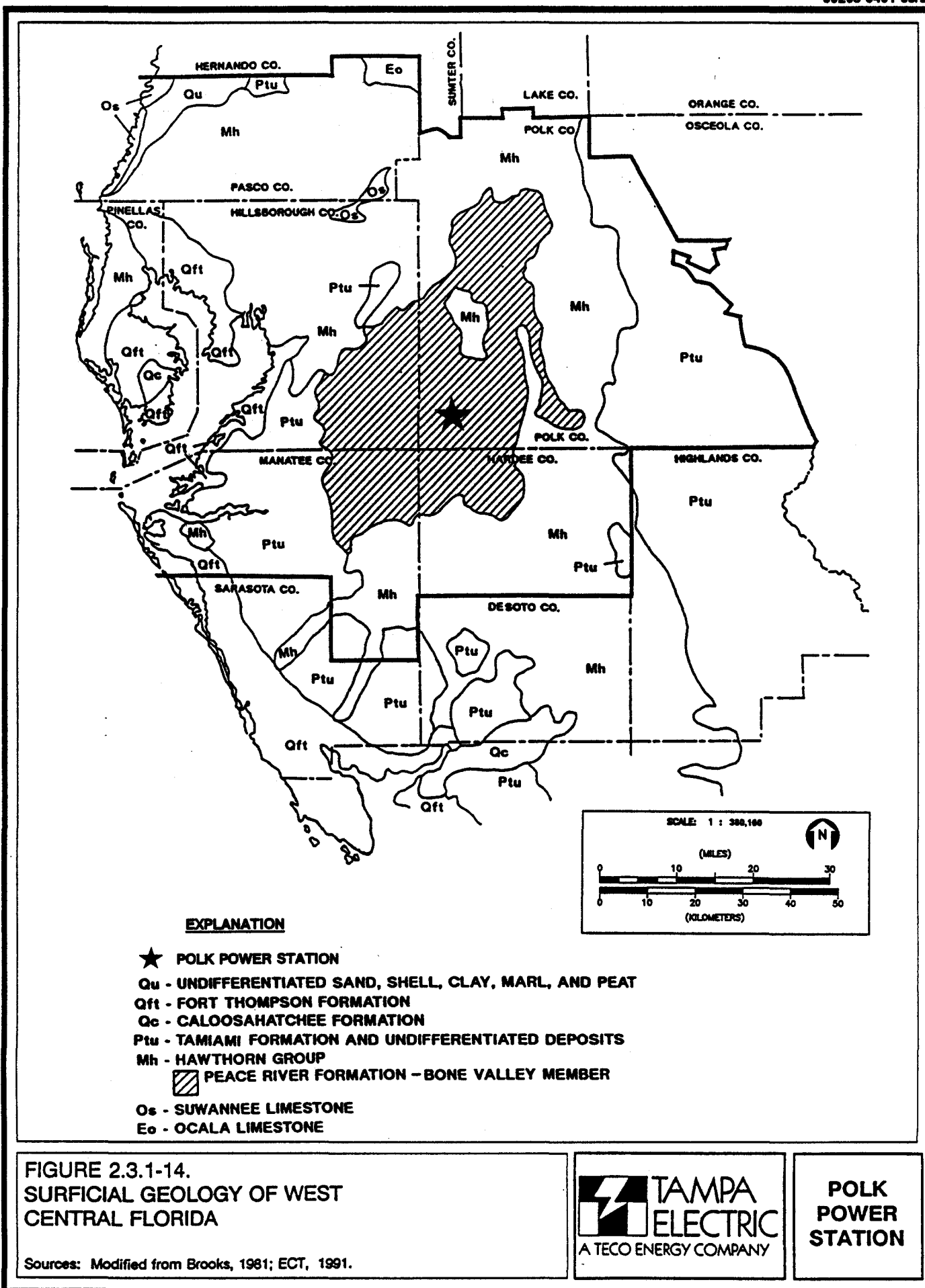
The Ona fine sands are also found in broad areas of flatwoods. The Ona soils are somewhat poorly drained with shallow slopes of 0 to 2 percent. The water table within this soil unit is typically 0 to 1 ft bls for 1 to 4 months in most years. The Ona sand has only a slight erosional risk.

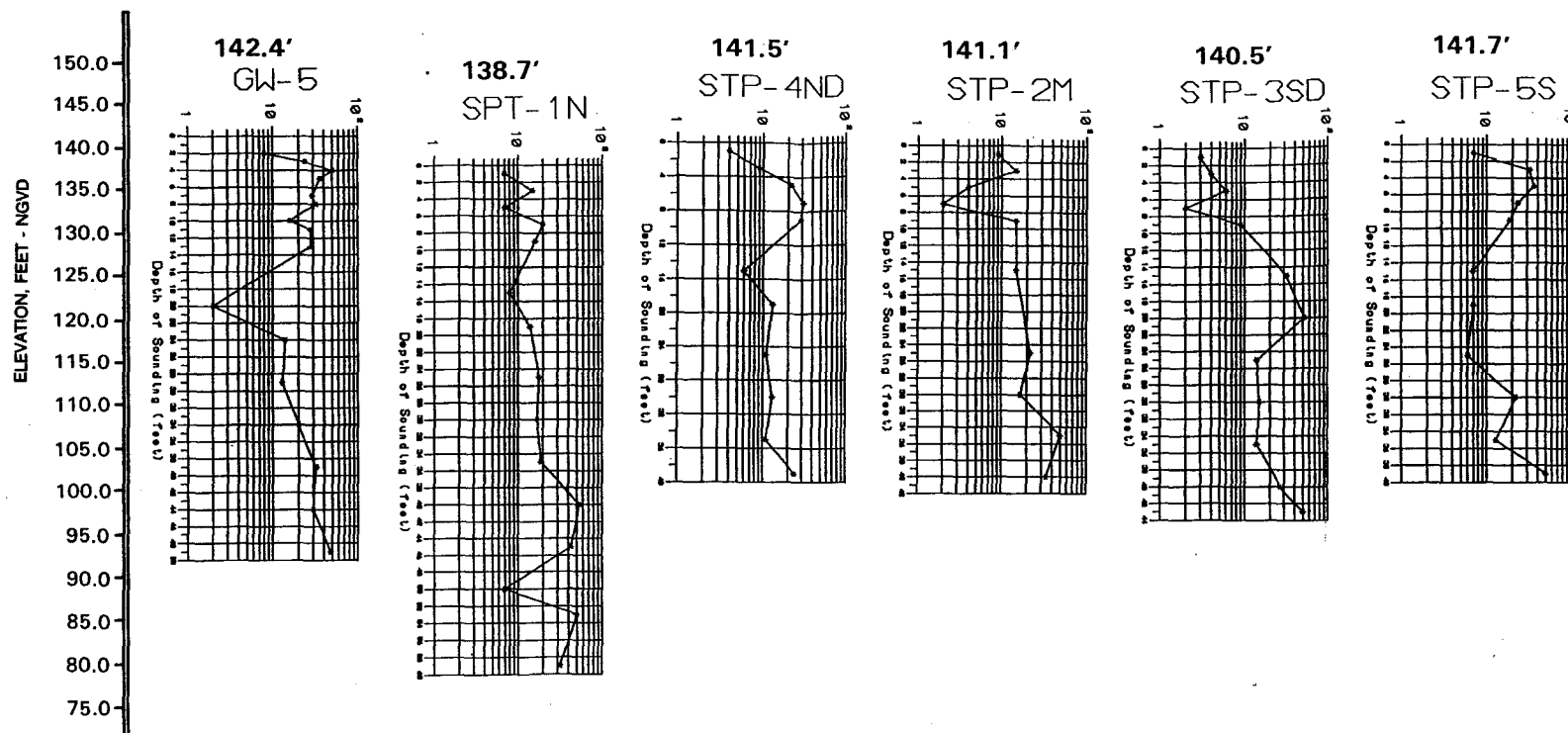
The geology for Polk County and west-central Florida have been mapped by Campbell (1986) and Brook (1981), respectively. Figure 2.3.1-14 illustrates the surficial geology for west-central Florida. As illustrated, the Bone Valley member of the Peace River Formation is the predominant surficial geologic unit in the study area.

Distinguishing the undifferentiated surficial sands from the Bone Valley member is based on a change in the clay content. The mine cuts, pits, and ditches from recent mining may penetrate most of the surficial sands and Bone Valley member. The first confining unit generally encountered would be the calcareous clay/mudstone or calcareous cemented strata of the Hawthorn Group.

2.3.1.4 Bearing Strength

Eight SPT and three CPT borings were drilled near the power plant site in areas undisturbed by recent mining activities (Figure 2.3.1-11). The SPT test borings were performed in accordance with ASTM D1586 standards, which determine the bearing strength of the unconsolidated soils. An SPT *N* value profile for borings identified in Figure 2.3.1-11 is illustrated in Figure 2.3.1-15. Figure 2.3.1-15 illustrates profiles, *N* values horizontally, and sample depth vertically for each boring in the soil profile A-A'. The larger *N* values indicate more compaction and consolidation of the soils, while smaller values indicate less compaction and less consolidation. The unconsolidated soils had blow counts ranging from zero blows per foot (GW-4, mine tailings) to more than 50 blows per foot. The strength of the carbonate units in the Hawthorn





NOTES: HORIZONTAL AXIS REPRESENTS "N" VALUE
 VERTICAL AXIS REPRESENTS DEPTH OF SAMPLE
 142.4' ELEVATION OF BORING LOCATION

FIGURE 2.3.1-15.

SPT "N" VALUE* PROFILE FOR SOIL PROFILE A-A'

Source: ECT, 1992



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Group generally were greater than 50 blows per foot. Thus, these units are considered well compacted.

The power plant structures have rigid settlement requirements but apply a relatively light load. Due to the compressible surficial deposits, foundations for the main plant structures will be supported on either driven displacement piles (with pre-drilling) or auger cast piles. Either pile type will be placed into competent carbonate strata within the Hawthorn Group.

For smaller structures with less stringent settlement requirement and smaller loads, shallow spread footings will be used. Tank structures are to be placed on ring beam footings.

At the time of these baseline studies, the central power block area of the site was inaccessible by a drill rig due to previous and existing mining activities. To supplement the baseline data previously presented, additional geotechnical and drilling programs are scheduled for the central area. This data, along with the geotechnical data obtained from the numerous clay settling ponds near the site, will be evaluated for final foundation designs.

2.3.2 SUBSURFACE HYDROLOGY

The groundwater aquifer systems in Polk County include, in descending order, the surficial aquifer (usually unconfined), intermediate aquifer (usually semi-confined to confined), and the Floridan aquifer (usually confined). The confining units of the intermediate aquifer system separate the aquifers from one another, including the upper and lower intermediate aquifers. In southwest Polk County, the surficial aquifer and upper intermediate are hydraulically interconnected as are the lower intermediate and Floridan aquifers. However, the two upper aquifers are not in good hydraulic connection to the two lower aquifers.

2.3.2.1 Subsurface Hydrological Data for the Site

Shallow Aquifer

The surficial aquifer is composed of the undifferentiated sands and clays, plus the upper sandy section of the Bone Valley member of the Peace River Formation. The precipitation at the site is approximately 53 inches per year. The amount of recharge entering the surficial aquifer is affected by runoff and evapotranspiration. Runoff and evapotranspiration may account for more than 90 percent of the precipitation received. The surficial aquifer is typically in hydraulic communication with the streams and lakes within southwestern Polk County.

A network of five PVC observation wells (three 4-inch diameter monitor wells and two 2-inch diameter piezometers) were used to monitor the groundwater levels within the surficial aquifer (Figure 2.3.1-5). These wells had either 10- or 15-ft screens that were placed to intercept the water table (see Appendix 11.7.1 for well construction details). Groundwater levels across the site ranged from approximately 130 to 144 ft-NGVD. The water table fluctuation has been approximately 4 to 6 ft from the end of the dry season to the end of the wet season. The hydrograph presented in Figure 2.3.2-1 shows the time-dependent surficial aquifer water level fluctuations from the five observation wells. Figure 2.3.2-2 shows the groundwater contours for the surficial aquifer on May 20, 1991. In addition to the groundwater contours, Figure 2.3.2-2 illustrates the approximate location of a groundwater divide. The

2.3.2-2

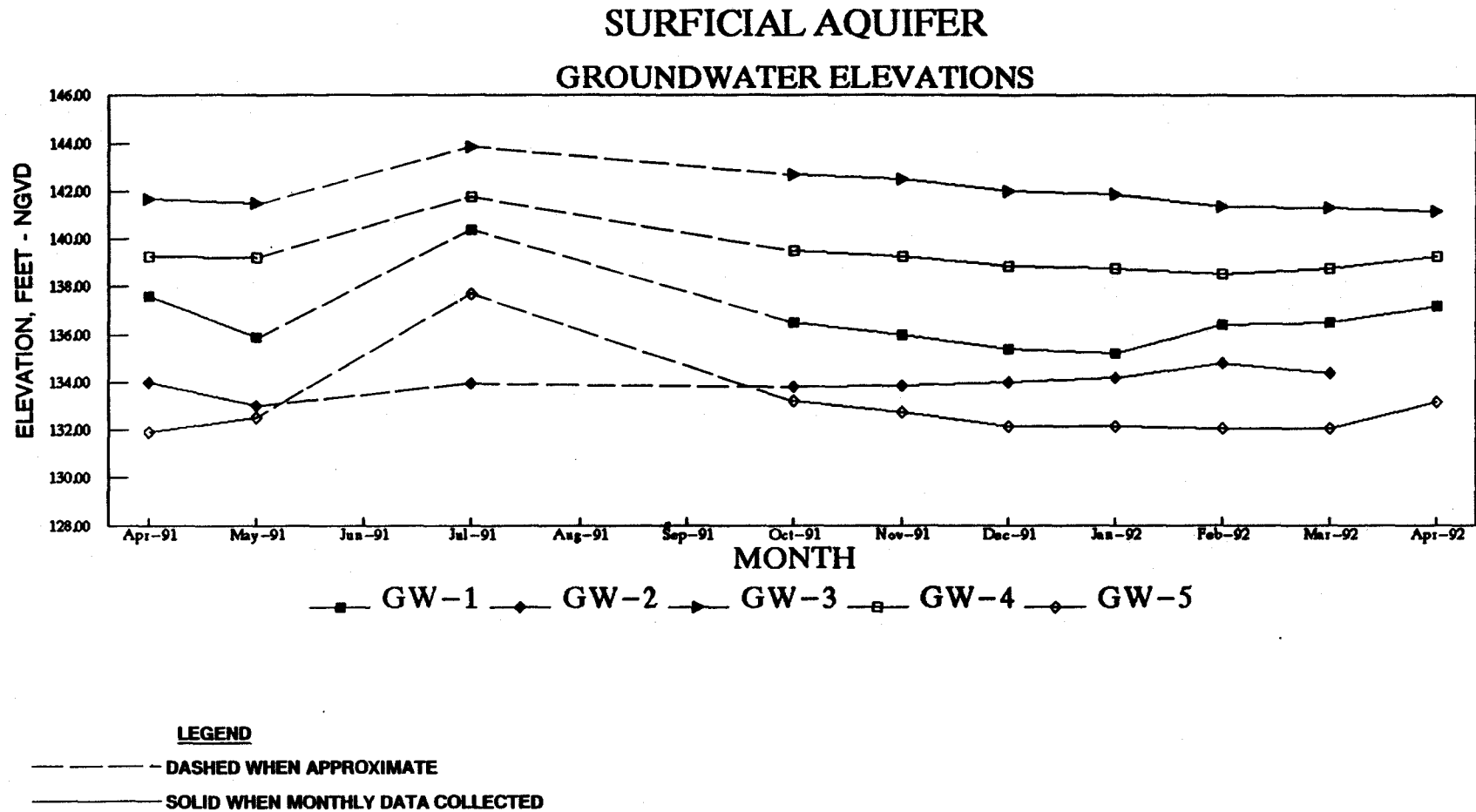


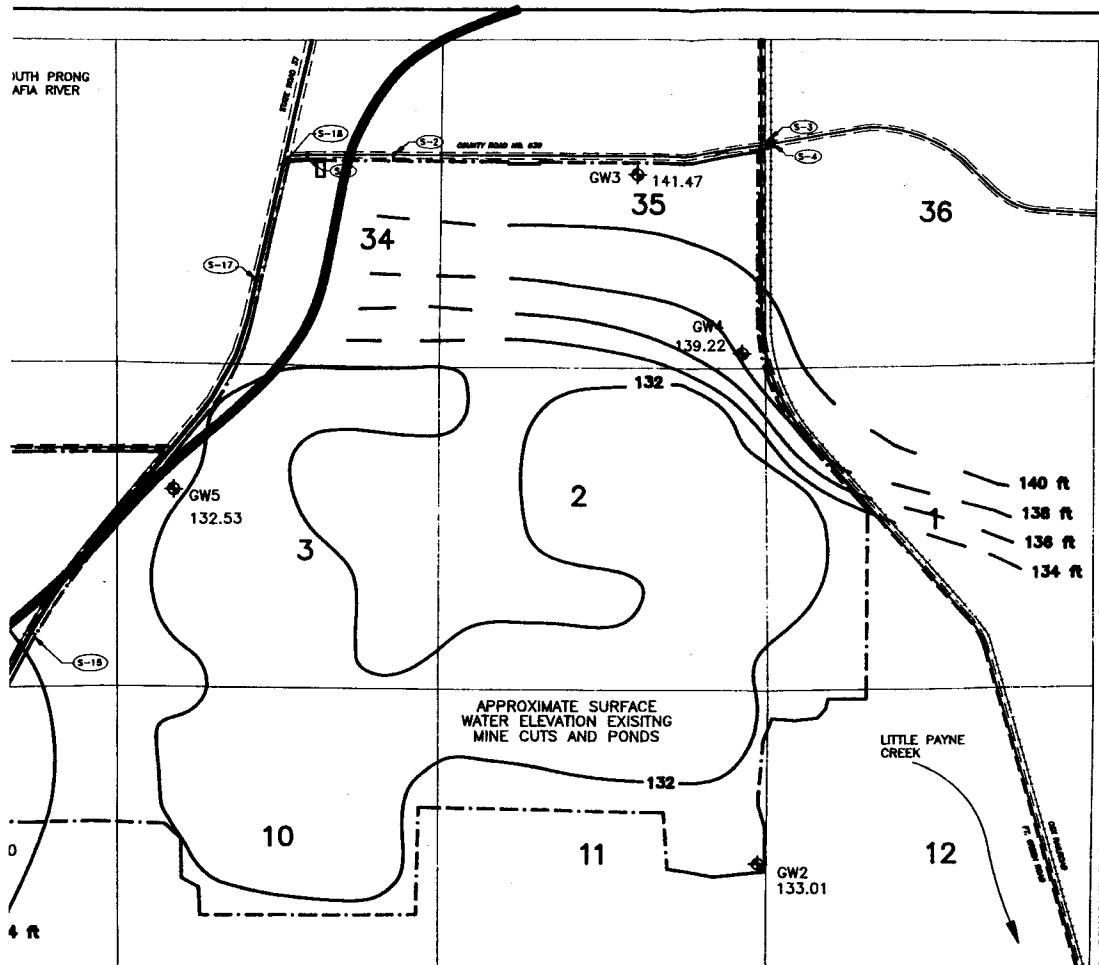
FIGURE 2.3.2-1.

HYDROGRAPH FOR SURFICIAL AQUIFER

Source: ECT, 1992.

**TAMPA
ELECTRIC**
A TECO ENERGY COMPANY

**POLK
POWER
STATION**



LEGEND

- GW5 132.53 GW ELEVATION FT - NGVD
- GW CONTOUR DASHED WHERE APPROXIMATE (CONTOUR ELEVATION 2 FT)
- APPROXIMATE LOCATION OF GROUNDWATER DIVIDE

SCALE: 1" = 2000'

(FEET)

0 2000'

(METERS)

0 1000

groundwater divide location is controlled by the surface water drainage basins. Groundwater north of the divide flows to the South Prong Alafia River. Groundwater south of the divide flows to the Little Payne Creek. Table 2.3.2-1 summarizes the groundwater level measurements for all observation wells and aquifers monitored. Permeability tests (short duration pump and recovery tests) were conducted on all 4-inch diameter monitor wells within the surficial and intermediate aquifer systems (Table 2.3.2-2). The hydraulic conductivity data for the surficial aquifer ranged from 5 to 11 feet per day (ft/day) and are summarized in Table 2.3.2-2.

Groundwater flow in the surficial aquifer are toward two surface water features and form a groundwater divide near SR 37 (Figure 2.3.2-2). Groundwater east and south of the divide flows toward the Little Payne Creek (south and southeast). Hydraulic gradients within the surficial aquifer ranged from approximately 0.0007 to 0.007 feet per foot (ft/ft). The linear groundwater flow velocities for the surficial aquifer may range from approximately 0.001 to 1.0 ft/day .

Average aquifer characteristics from ten surficial aquifer tests within a 15-mile radius of the site were obtained from SWFWMD (SWFWMD, 1988) and summarized in Table 2.3.2-3. For the surficial aquifer, average values of transmissivity and specific yield are 1,223 square feet per day (ft²/day) and 0.11 or 11 percent, respectively. The ratio of horizontal to vertical hydraulic conductivities may range from approximately 1 to 2 orders of magnitude (10 to 100).

The groundwater quality of the surficial (water table) aquifer is classified as G-II and is dependent on the chemical constituents within the rainfall and surface activities. Based on the ambient groundwater quality monitoring program by SWFWMD (SWFWMD, 1988), several regional trends are presented for background quality:

- Total dissolved solids (TDS), <250 milligrams per liter (mg/L);
- Total hardness, <25 mg/L;
- Chlorides, <25 mg/L; and
- Sulfates, <25 mg/L.

Table 2.3.2-1. Tampa Electric Company Polk Power Station Summary of Groundwater Levels

Aquifer	Station	Well Nest	Reference Elevation (ft-NGVD)	Groundwater Elevations (ft-NGVD)					
				11-Apr-91	20-May-91	10-Jul-91	31-Oct-91	19-Nov-91	31-Dec-91
Surficial	GW1	S1	145.70	137.60	135.90	140.39	136.50	135.96	135.38
	GW2	S1	138.79	134.00	133.01	133.96	133.81	133.85	134.01
	GW3	S1	154.84	141.69	141.47	143.84	142.68	142.50	142.00
	GW4	S1	147.06	139.28	139.22	141.76	139.50	139.26	138.86
	GW5	S1	145.07	131.92	132.53	137.68	133.23	132.77	132.17
Upper Intermediate	GW1	I1	145.00	126.50	126.72	127.92	128.10	127.56	126.32
	GW2	I1	138.83	134.41	134.08	134.80	133.97	134.87	135.03
	GW3	I1	152.45	133.13	133.07	134.27	134.11	133.43	130.75
	GW4	I1	146.06	130.76	130.68	131.64	132.76	132.46	131.90
	GW5	I1	145.73	126.18	126.79	128.46	129.59	129.23	129.03
Lower Intermediate	GW1	I3	145.45	49.25	48.21	58.57	62.19	57.89	53.11
	GW2	I3	139.29	49.61	49.70	58.79	62.71	58.41	53.35
	GW3	I3	151.08	54.36	57.12	61.73	68.04	65.34	60.66
Floridan	GW1	F1	146.03	41.93	40.58	51.79	53.13	49.03	44.81

Aquifer	Station	Well Nest	Reference Elevation (ft-NGVD)	Groundwater Elevations (ft-NGVD)			
				14-Jan-92	26-Feb-92	26-Mar-92	28-Apr-92
Surficial	GW1	S1	145.70	135.21	136.38	136.50	137.20
	GW2	S1	138.79	134.19	134.79	134.37	Not Taken
	GW3	S1	154.84	141.83	141.34	141.28	141.16
	GW4	S1	147.06	138.74	138.52	138.76	139.28
	GW5	S1	145.07	132.15	132.05	132.05	133.15
Upper Intermediate	GW1	I1	145.00	126.07	124.98	124.64	124.00
	GW2	I1	138.83	135.18	136.01	136.05	Not Taken
	GW3	I1	152.45	130.42	129.65	130.89	131.29
	GW4	I1	146.06	131.86	131.66	131.58	131.44
	GW5	I1	145.73	128.99	128.25	128.25	128.39
Lower Intermediate	GW1	I3	145.45	51.41	51.77	52.33	55.11
	GW2	I3	139.29	51.91	52.23	52.87	Not Taken
	GW3	I3	151.08	60.37	59.42	59.84	60.66
Floridan	GW1	F1	146.03	42.99	43.99	44.35	46.91

Source: ECT, 1992.

Table 2.3.2-2. Summary of Hydraulic Conductivity Results

Monitor Well	Q (gpm)	Q (ft ³ /m)	Change in Head - dh (ft)	Change in Time - dh (minutes)	T (ft ² /min)	T (ft ² /day)	b (ft)	K (ft/day)	Method of Analysis
GW-1 S1-R			6.43	0.0 to 6.5		238.0	34.0	7.0	Bouwer and Rice
II-D	2.70	0.36	6.07	0.2 to 2.0	1.1×10^{-2}	15.7			Jacob St. Line
II-R	2.70	0.36	6.33	1.0 to 10.0	1.0×10^{-2}	15.0			Jacob St. Line
I3-D	*								
I3-R	*								
GW-2 S1-R			3.99	0.0 to 7.0		189.0	35.0	5.4	Bouwer and Rice
II-D	4.30	0.57	61.50	2.0 to 20.0	1.7×10^{-3}	2.5			Jacob St. Line
II-R	4.30	0.57	39.00	5.0 to 50.0	2.7×10^{-3}	3.9			Jacob St. Line
I3-D	*								
I3-R	*								
GW-3 S1-R			3.99	0.0 to 7.0		328.6	31.0	10.6	Bouwer and Rice
II-D	3.00	0.40	35.80	2.0 to 20.0	2.1×10^{-3}	3.0			Jacob St. Line
II-R	3.00	0.40	24.00	20.0 to 200.0	3.1×10^{-3}	4.4			Jacob St. Line
I3-D	3.30	0.44	31.20	2.0 to 20.0	2.6×10^{-3}	3.7			Jacob St. Line
I3-R	3.30	0.44	26.90	4.0 to 40.0	3×10^{-3}	4.3			Jacob St. Line

Note: ft³/m = cubic feet per meter.
ft²/min = square feet per minute.

S1 = surficial aquifer.

II = upper intermediate aquifer.

I3 = lower intermediate aquifer.

R = recovery test.

D = drawdown test.

*Erratic data due to electronic interference obtained, unable to analyze.

Source: ECT, 1992.

Table 2.3.2-3. Aquifer Characteristic Test Data (15-mile radius)

Aquifer	Minimum	Maximum	Average
<u>Surficial (10 tests)</u>			
Transmissivity (ft ² /day)	254	2,393	1,223
Specific yield (ND)	5×10^{-3}	0.20	0.11
<u>Intermediate (9 tests)</u>			
Transmissivity (ft ² /day)	160	3,837	808
Storage coefficient (ND)	4.0×10^{-5}	3×10^{-4}	1.3×10^{-4}
Leakance (ft ³ /day/ft ³)	8.0×10^{-7}	3×10^{-4}	1.5×10^{-4}
<u>Floridan (10 tests)</u>			
Transmissivity (ft ² /day)	103,610	735,294	292,850
Storage coefficient (ND)	4.0×10^{-4}	3×10^{-3}	1×10^{-3}
Leakance (ft ³ /day/ft ³)	1.0×10^{-5}	3×10^{-4}	2.1×10^{-4}

Note: ND = non-dimensional.

Source: SWFWMD, 1988.

Additional background groundwater quality data for Polk County was obtained from the FDER groundwater quality monitoring program. The data for the surficial aquifer is summarized in Table 2.3.2-4. Site-specific groundwater quality from the surficial aquifer was measured from a sampling event in May 1991. The groundwater quality for the surficial aquifer is summarized in Table 2.3.2-5, and the laboratory analyses are included in Appendix 11.7.3. With the exceptions of total iron (GW-1, GW-2, and GW-3) and gross alpha with Radium 226 and 228 (GW-2 and GW-3), primary and secondary drinking water standards were met.

Radiation within the groundwater is a result of weathering of uranium-bearing phosphatic soils and rock. The radionuclides of general concern include Radium 226, Radon 222, and Polonium 210. While other radioactive isotopes may exist, they are not considered to be hazardous. The presence of the phosphatic soils and rock can cause gross alpha activities to exceed state and Federal drinking water standards. These high activity levels are generally the result of natural releases from phosphatic material and are not considered to be a direct result of mining activities (Upchurch, 1986). However, mining activities may act to redistribute or disturb the radioactive materials. Numerous studies have been conducted regarding uranium and its daughter products in groundwater systems and potential relationship to mining/industrial activities. One study by Kaufmann and Bliss (1977) compared radium in groundwater from the mining district and the coastal areas. The study reported that the elevated radium in the coastal areas was not related to the industrial or mining activities, but was rather a natural condition for the geologic setting.

Analytical results from the May 1991 sampling event indicate that the radionuclide emissions exceeding primary drinking water standards were detected from the surficial aquifer at Stations GW-2 and GW-3 and the intermediate aquifer at Station GW-1 (Table 2.3.2-6). These samples were not filtered prior to analysis and had total solids concentrations greater than 250 mg/L. It is believed that the elevated radionuclide emissions are related to the amount of solids present within the groundwater samples.

Table 2.3.2-4. FDER Surficial Aquifer Groundwater Quality Monitoring Program--
Polk County

Surficial Aquifer Parameters	Groundwater		Average Value	Standard Deviation	Range	
	Units	Quality Standard*			Minimum	Maximum
<u>In situ Measurements</u>						
pH	SU		6.0292	0.941	4.700	8.600
<u>Classical</u>						
Arsenic	mg/L	0.05	0.0004	0.001	0.000	0.003
Arsenic (dissolved)	µg/L	--	0.0000	0.000	0.000	0.000
Chloride	mg/L	250	14.0484	10.135	4.000	38.000
Fluoride	mg/L	2.0	0.1819	0.180	0.000	0.576
Nitrate	mg/L	10.0	0.6204	1.220	0.000	3.610
Selenium	mg/L	0.01	0.0000	0.000	0.000	0.000
Selenium (dissolved)	µg/L	--	2.5000	3.075	0.000	7.500
Sodium	mg/L	160	7.3760	5.591	2.000	27.000
Sulfate	mg/L	250	38.2300	48.896	0.000	148.000
TDS	mg/L	500	182.1250	121.180	23.000	454.000
<u>Other Metals</u>						
Barium	mg/L	1.0	0.0041	0.012	0.000	0.380
Barium (dissolved)	µg/L	--	0.0000	0.000	0.000	0.000
Cadmium	mg/L	0.010	0.0036	0.005	0.000	0.014
Cadmium (dissolved)	µg/L	--	1.0000	2.236	0.000	5.000
Chromium (total)	mg/L	0.05	0.0057	0.012	0.000	0.032
Chromium (dissolved)	µg/L	--	0.0000	0.000	0.000	0.000
Copper	mg/L	1.0	0.0076	0.012	0.000	0.032
Copper (dissolved)	µg/L	--	0.0000	0.000	0.000	0.000
Iron	mg/L	0.3	3.9685	5.195	0.030	19.300
Iron (dissolved)	µg/L	--	0.6107	0.910	0.000	2.910
Lead	mg/L	0.05	0.0661	0.113	0.000	0.369
Manganese	mg/L	0.05	0.1368	0.182	0.001	0.438
Manganese (dissolved)	µg/L	--	27.7500	26.735	0.000	72.000
Mercury	mg/L	0.002	0.0003	0.001	0.000	0.003
Silver	mg/L	0.05	0.0000	0.000	0.000	0.001
Zinc	mg/L	5.0	0.0388	0.077	0.000	0.295
Zinc (dissolved)	µg/L	--	4.0000	6.856	0.000	15.000

Table 2.3.2-4. FDER Surficial Aquifer Groundwater Quality Monitoring Program--
Polk County (Continued, Page 2 of 2)

Surficial Aquifer Parameters	Groundwater		Average Value	Standard Deviation	Range	
	Units	Quality Standard*			Minimum	Maximum
<u>Organics</u>						
Endrin	µg/L	0.2	0.0000	0.000	0.000	0.000
Methoxychlor	µg/L	100.0	0.0000	0.000	0.000	0.000
Toxaphene	µg/L	5.0	0.0000	0.000	0.000	0.000
2,4-D	µg/L	100	0.0000	0.000	0.000	0.000
2,4,5-TP, silvex	µg/L	10	0.0000	0.000	0.000	0.000
Benzene	µg/L	1.0	0.0238	0.109	0.000	0.500
Carbon tetrachloride	µg/L	3.0	0.0238	0.109	0.000	0.500
Ethylene dibromide	µg/L	0.02	0.0000	0.000	0.000	0.000
Tetrachloroethene	µg/L	3.0	0.0238	0.109	0.000	0.500
Trichloroethene	µg/L	3.0	0.0312	0.125	0.000	0.500
Vinyl chloride	µg/L	1.0	0.0238	0.109	0.000	0.500
1,2-Dichloroethane	µg/L	3.0	0.0238	0.109	0.000	0.500
1,1,1-Trichloroethane	µg/L	0.2	0.0312	0.125	0.000	0.500

Note: SU = standard units.
-- = no data available.

*Standards from Chapter 17-550, F.A.C.

Source: FDER, 1991.

Table 2.3.2-5. Groundwater Quality Summary for Surficial Aquifer

Parameter	Units	Groundwater Quality				Mean	Maximum	Minimum	Standard Deviation
		Standard	GW-1S-1	GW-2S-1	GW-3S-1				
pH (<i>in situ</i>)	su	6.5-8.5	7.0	5.4	8.1	6.8	8.1	5.4	1.1
Arsenic EPA 206.2	µg/L	50.0	<10.000	<10.000	<10.000	--	--	--	--
Barium	mg/L	1.0	<0.300	<0.300	<0.300	--	--	--	--
Cadmium	µg/L	0.010	1.6	<0.800	3.8	1.8	3.8	<MDL	1.6
Chromium	mg/L	0.05	<0.050	<0.050	<0.050	--	--	--	--
Lead EPA 239.2	µg/L	50.0	19	<5.000	14	11	19	<MDL	8
Mercury EPA 245.1	µg/L	0.2	<0.200	<0.200	<0.200	--	--	--	--
Nitrogen, nitrate	mg/L	10.0	<1.000	<1.000	<1.000	--	--	--	--
Silver	µg/L	50.0	<0.070	<0.070	<0.070	--	--	--	--
Chloride	mg/L	250.0	11	17	3.2	10.4	17	3.2	5.7
Color	Pt-Co	15	5	500	75	193	500	5	219
Copper	mg/L	1.0	<0.030	<0.030	<0.030	--	--	--	--
Fluoride, soluble	mg/L	4.0	0.1	0.26	1.6	0.65	1.6	0.1	0.67
Iron	mg/L	0.3	0.9	7.4	2.3	3.5	7.4	0.9	2.7
Manganese	mg/L	0.05	<0.050	<0.050	<0.050	--	--	--	--
Sodium	mg/L	160.0	10	12	3	8	12	3	4
Sulfate	mg/L	250	<5.000	<5.000	27	9	27	<MDL	13
Surfactants	mg/L	0.5	0.038	<0.020	<0.020	0.013	0.038	<MDL	0.018
TDS	mg/L	500	70	200	86	119	200	70	58
Endrin	µg/L	0.2	<0.080	<0.080	<0.080	--	--	--	--
Methoxychlor	µg/L	100.0	<100.000	<100.000	<100.000	--	--	--	--
Toxaphene	µg/L	5.0	<3.000	<3.000	<3.000	--	--	--	--
2,4-D	µg/L	100.0	<10.000	<10.000	<10.000	--	--	--	--
2,4,5-Trichlorophenol	µg/L	10.0	<1.000	<1.000	<1.000	--	--	--	--
Benzene	µg/L	1.0	<0.600	<1.200	<0.600	--	--	--	--
Carbon tetrachloride	µg/L	3.0	<0.500	<1.000	<0.500	--	--	--	--
1,2-Dibromoethane	µg/L	0.02	<0.020	<0.020	<0.020	--	--	--	--
Tetrachloroethylene	µg/L	3.0	<5.000	<5.000	<5.000	--	--	--	--
Trichloroethylene	µg/L	3.0	<5.000	<5.000	<5.000	--	--	--	--
Chloroform	µg/L	*	<0.400	<0.800	<0.400	--	--	--	--
Bromodichloromethane	µg/L	*	<0.600	<1.200	<0.600	--	--	--	--
Dibromochloromethane	µg/L	*	<1.000	<2.000	<1.000	--	--	--	--

2.3.2-11

Table 2.3.2-5. Groundwater Quality Summary for Surficial Aquifer (Continued, Page 2 of 2)

Parameter	Units	Groundwater Quality				Mean	Maximum	Minimum	Standard Deviation
		Standard	GW-1S-1	GW-2S-1	GW-3S-1				
Bromoform	µg/L	*	<2.000	<4.000	<2.000	--	--	--	--
Vinyl chloride	µg/L	1.0	<0.800	<1.600	<0.800	--	--	--	--
1,2-Dichloroethane	µg/L	3.0	<1.000	<2.000	<1.000	--	--	--	--
1,1,1-Trichloroethane	µg/L	200.0	<0.800	<1.600	<0.800	--	--	--	--
Turbidity	NTU	1	110	510	190	270	510	110	173
Gross alpha	pCi/L	15	13.5 ±6.8	44 ±6.6	16.6 ±6.4	24.7	44	13.5	13.7
Radium 226	pCi/L	†	2.2 ±0.5	8.9 ±1.0	8.5 ±1.0	6.5	8.9	2.2	3.1
Radium 228	pCi/L	†	1.4 ±1.2	<1.0	1.3 ±1.1	0.9	1.4	<MDL	0.6

Note: Pt-Co = platinum-cobalt units.
 NTU = nephelometric turbidity units.
 pCi/L = picoCuries per liter.
 MDL = method detection limit.

*Total trihalomethane water quality standard is 100 mg/L.

†Combined Radium 226 and 228 water quality standard is 5 pCi/L.

Source: ECT, 1992.

2.3.2-12

Table 2.3.2-6. Summary of Radionuclide Emission Results

Laboratory Report Date	Sample Location	Field Filtered or Unfiltered	Date Sampled	Gross Alpha (pCi/L)	Radium 226 (pCi/L)	Radium 228 (pCi/L)	Total Solids (mg/L)	TSS (mg/L)	TDS (mg/L)
07/19/91	GW1-S1	Unfiltered	05/21/91	13.5 ±6.8	2.2 ±0.5	1.4 ±1.2	94	24	70
	GW2-S1	Unfiltered	05/22/91	44 ±6.6	8.9 ±1	ND	264	64	200
	GW3-S1	Unfiltered	05/20/91	16.6 ±6.4	8.5 ±1	1.3 ±1	376	290	86
	GW1-I1	Unfiltered	05/21/91	4.8 ±6.9	6.2 ±0.9	1.4 ±3	362	42	320
	GW2-I1	Unfiltered	05/22/91	ND	0.6 ±0.3	ND	270	ND	270
	GW3-I1	Unfiltered	05/20/91	ND	ND	ND	295	55	240
	GW1-I3	Unfiltered	05/21/91	ND	0.7 ±0.3	3.4 ±3.2	296	16	280
	GW2-I3	Unfiltered	05/23/91	ND	1.2 ±0.4	ND	640	40	600
	GW3-I3	Unfiltered	05/20/91	ND	ND	ND	299	69	230
	GW1-F1	Unfiltered	05/22/91	ND	1 ±0.4	ND	253	33	220
	GW1-S1	Unfiltered	03/03/92	9.4 ±1.9	2 ±0.1	5 ±3.5	80	18	62
	GW2-S1	Unfiltered	03/03/92	119 ±11.3	5.9 ±0.1	ND ±1.3	280	58	222
	GW3-S1	Unfiltered	03/03/92	3.3 ±1.4	0.4 ±0.08	ND ±2.5	91	7	84
	GW1-S1	Filtered	03/03/92	6.6 ±1.7	19.7 ±0.3	0.6 ±2.9	47	ND	47
	GW2-S1	Filtered	03/03/92	59 ±6.5	2.1 ±0.08	1.6 ±2.6	140	ND	140
	GW3-S1	Filtered	03/03/92	ND ±0.9	0.9 ±0.09	2.2 ±2.9	91	ND	91
05/07/92	Sample 1		03/03/92	3.5 ±2.6	0.8 ±1.3	ND ±1.1	360	12	348
	Sample 2		03/03/92	2,990 ±517	15.4 ±3.4	0.3 ±1	49,000	70,000	*
	Sample 3		03/03/92	2.1 ±3.1	1.4 ±1.4	ND ±1	330	ND	330
	Sample 4		03/03/92	450 ±125	23.6 ±4	6.4 ±1.2	14,000	6,200	7,800
	Sample 5		03/03/92	1.1 ±2.4	2.2 ±1.8	ND ±1	300	ND	300
	Sample 6		03/03/92	191 ±37.6	12.7 ±3.4	0.8 ±1.1	2,800	1,800	1,000

Note: S1 = surficial aquifer.

I1 = upper intermediate aquifer.

I3 = lower intermediate aquifer.

F1 = Floridan aquifer.

ND = not detected at or above the method detection limits (see laboratory reports, Appendices 11.7.3 and 11.7.4).

Descriptions for Samples 1 through 6 are provided in Table 2.3.2-8.

*An erroneous TDS value has resulted from a high concentration of total solids and TSS. These concentrations exceed the normal concentration range for this analysis.

Source: ECT, 1992.

To verify the aforementioned theory, a second round of groundwater samples was collected from the surficial aquifer monitor wells in March 1992. Both unfiltered and field filtered groundwater samples were collected. The field filtration was completed by use of an inline 0.45-micron filter. The groundwater samples were analyzed for gross alpha, Radium 226, and Radium 228 emissions plus total solids and total suspended solids (TSS) concentrations (Table 2.3.2-6). By comparing the filtered versus unfiltered data and considering the error bands, there is typically a reduction in the radiation emission rate.

In addition to the filtered and unfiltered sample comparison, an engineering test was conducted and evaluated potential groundwater impacts related to excavating cooling reservoirs from existing mine cuts. The objectives and procedure for this engineering test are summarized in Tables 2.3.2-7 and 2.3.2-8. This test was conducted to support two theories: first, that elevated radionuclide emissions are related to the amount of solids present within the groundwater samples; and second, that the aquifer matrix (soil) will act to filter out solids and reduce the radionuclide emissions from the groundwater. The sample descriptions are summarized in Tables 2.3.2-7 and 2.3.2-8, while the sample results are presented in Table 2.3.2-6. The data supports both theories presented. The samples with less total solids typically have lower radioactive emissions, and a thin layer of aquifer material was able to reduce radioactive emissions.

Intermediate Aquifer

The intermediate aquifer system consists of portions of the Peace River and Arcadia Formations of the Hawthorn Group. At the Tampa Electric Company Polk Power Station site, this aquifer has two producing zones which are separated by confining units. The primary recharge to the upper intermediate aquifer is leakage from the surficial aquifer system. The amount of recharge received by the upper intermediate aquifer system ranges from zero to greater than 10 inches per year (SWFWMD, 1988). The rate of recharge into and through the intermediate aquifer is dependent on the potential head difference between the aquifers (or producing zones) and the

Table 2.3.2-7. Radionuclide Engineering Test Procedure Summary

Objective: Conduct an engineering test on a radionuclide sampling program to demonstrate and evaluate potential groundwater impacts related to developing the cooling reservoir within existing mine cuts.

Approach and Procedures: (modified Method 1312, Synthetic Precipitation Leaching Procedure)

Step 1: Personnel collected a representative sample of mine cut surface water at surface water station SW-7 (Sample 1, liquid), mine cut sediment (semi-solid, clayey sludge), and surficial aquifer material (solid, soil).

Step 2: A volume of the mine cut water (liquid) and the mine cut sediment (semi-liquid) was placed into the agitation apparatus. The weight ratio of liquid to semi-solid was approximately four parts liquid and one part semi-solid. The agitation had taken place for a period of 4 ± 0.25 hours. After agitation, sufficient quantity of agitated elutriate was obtained to analyze Samples 2 (unfiltered) and 3 (filtered) yielding acceptable detection levels.

Step 3: A volume of the surficial aquifer material (soil) was placed in the synthetic leaching extraction device. A thickness of approximately 2.5 inches of soil was placed between two support screens (top and bottom). A 0.7-micron filter was placed between the support screen and the liquid outlet valve. After placing the soil in the extraction device, the agitated elutriate was poured into the device.

Step 4: A sufficient quantity of extraction leachate (from agitated elutriate sample) was obtained to analyze Samples 4 (unfiltered) and 5 (filtered) yielding acceptable detection levels.

Step 5: An unfiltered control sample (Sample 6) was collected using the same technique as described in Step 3 using deionized water rather than the agitated elutriate.

Results: Comparing unfiltered to filtered water samples, the radionuclide emissions were lower for the filtered samples with less total solids and TSS. The agitated elutriate sample showed some reduction in gross alpha emission after passing through the aquifer material. The control sample (deionized water through the aquifer material) had elevated emission rates for gross alpha and Radium 226, likely resulting from the acquisition of fines from within the aquifer material. The data supports the position that the undisturbed aquifer will have a filtering affect on the groundwater and should prevent significant transport of the radionuclides from the reservoir area after construction.

Source: ECT, 1992.

Table 2.3.2-8. Radionuclide Engineering Test Sample Summary

Sample Number	Sample Description and Purpose
1	<u>Mine Cut Water</u> --A sample volume of the mine cut water from surface water station SW-7 (unfiltered) was collected and analyzed for total solids, TSS, gross alpha, Radium 226, and Radium 228.
2	<u>Elutriate</u> --A sample volume of agitated elutriate (unfiltered) was collected and analyzed for total solids, TSS, gross alpha, Radium 226, and Radium 228.
3	<u>Filtered Elutriate</u> --A sample volume of agitated elutriate was collected and analyzed after filtration through a 0.45-micron filter for total solids, TSS, gross alpha, Radium 226, and Radium 228.
4	<u>Extraction Leachate (Elutriate Filtered through Aquifer Material)</u> --A sample volume of extraction leachate (unfiltered) was collected and analyzed for total solids, TSS, gross alpha, Radium 226, and Radium 228.
5	<u>Filtered Extraction Leachate (Sample 4 Filtered)</u> --A sample volume of extraction leachate was collected and analyzed after filtration through a 0.45-micron filter for total solids, TSS, gross alpha, Radium 226, and Radium 228.
6	<u>Control Extraction Leachate (Deionized Water Filtered through Aquifer Material)</u> --A sample volume of a control extraction leachate (unfiltered) was collected and analyzed for total solids, TSS, gross alpha, Radium 226, and Radium 228.

Source: ECT, 1992.

thickness and conductivity of the confining units within the intermediate system. The intermediate aquifer is typically in hydraulic communication with the larger rivers in southwestern Polk County.

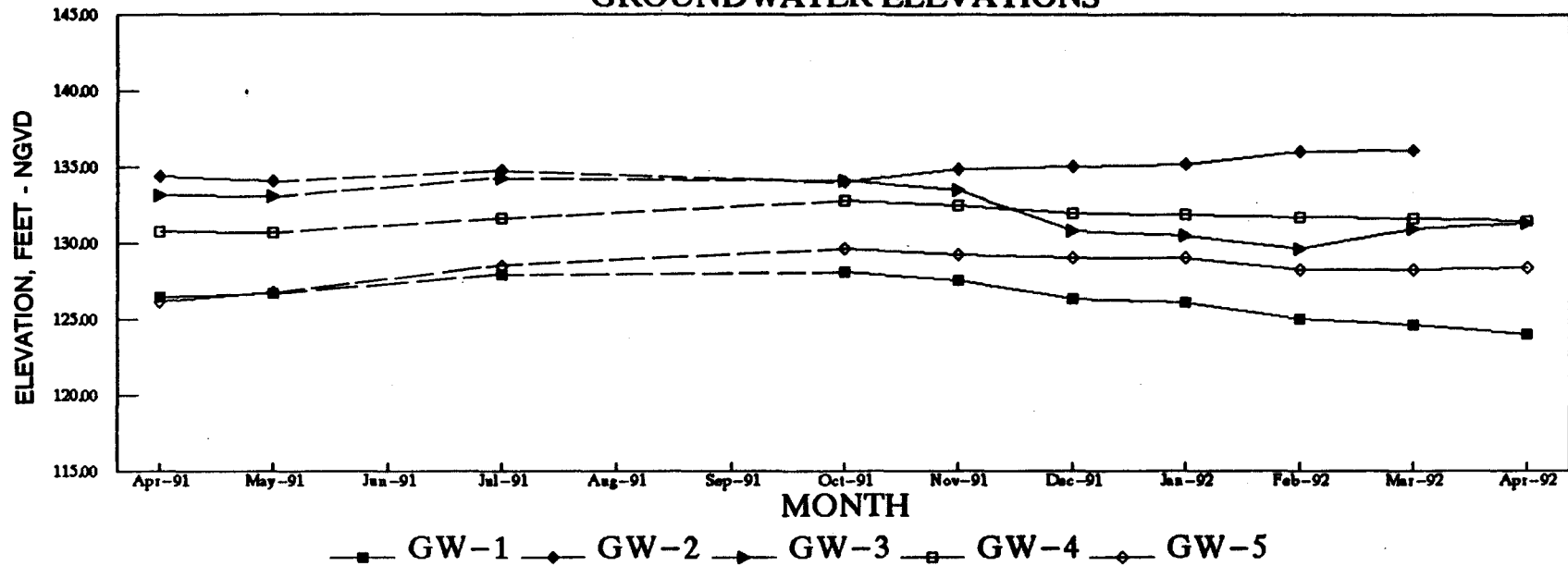
A network of five PVC observation wells (three 4-inch diameter monitor wells and two 2-inch diameter piezometers) were placed and used to monitor the groundwater levels within the upper intermediate aquifer (Figure 2.3.1-5). Three 4-inch diameter monitor wells were also placed into the lower intermediate aquifer system to monitor the groundwater levels. The wells completed into the upper intermediate and lower intermediate aquifers had 5- and 10-ft screens, respectively.

The screen depth intervals for the upper and lower intermediate aquifers were approximately between 90 and 105 ft bls and 235 to 240 ft bls, respectively (see Appendix 11.7.1 for well construction details).

The potentiometric surface of the upper intermediate aquifer across the Polk Power Station site ranged from approximately 126 to 135 ft-NGVD. The potentiometric surface has fluctuated approximately 2 to 4.5 ft from the end of the dry season to the end of the wet season. The potentiometric surface of the lower intermediate aquifer has ranged from approximately 48 to 68 ft-NGVD across the site. The potentiometric surface has fluctuated approximately 13 to 14 ft from the end of the dry season to the end of the wet season. Table 2.3.2-1 provides a summary of the groundwater level measurements taken on the upper and lower intermediate aquifers. The hydrographs illustrated in Figures 2.3.2-3 and 2.3.2-4 show the time-dependent fluctuations of the potentiometric surfaces for the intermediate aquifer systems.

The most recent published regional potentiometric surface maps (May and September 1990) of the upper intermediate aquifer indicate that the potentiometric surface ranges from 115 ft to 125 ft-msl for the dry season (Figure 2.3.2-5) and wet season (Figure 2.3.2-6), respectively. The groundwater flow direction for the intermediate aquifer system is radially outward from beneath the Tampa Electric Company Polk

UPPER INTERMEDIATE AQUIFER GROUNDWATER ELEVATIONS



LEGEND

- DASHED WHEN APPROXIMATE
- SOLID WHEN MONTHLY DATA COLLECTED

FIGURE 2.3.2-3.

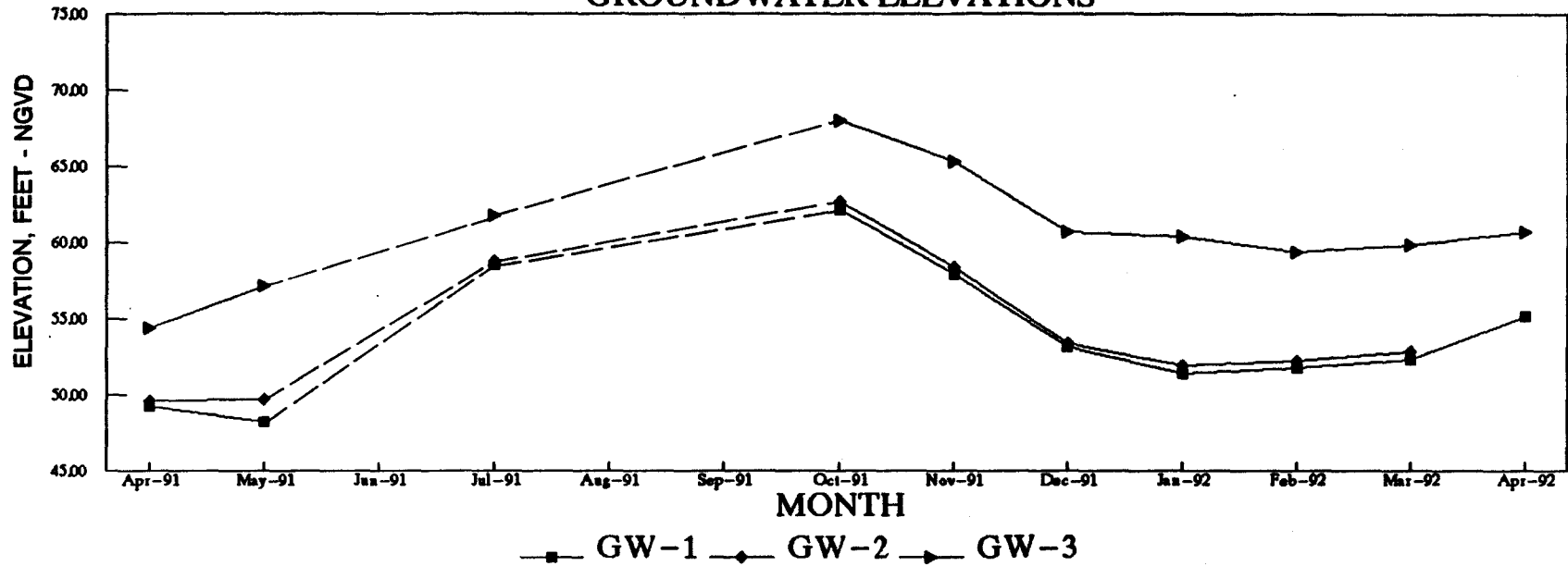
HYDROGRAPH FOR UPPER INTERMEDIATE AQUIFER

Source: ECT, 1992.



POLK
POWER
STATION

LOWER INTERMEDIATE AQUIFER GROUNDWATER ELEVATIONS



LEGEND

- DASHED WHEN APPROXIMATE
 ———— SOLID WHEN MONTHLY DATA COLLECTED

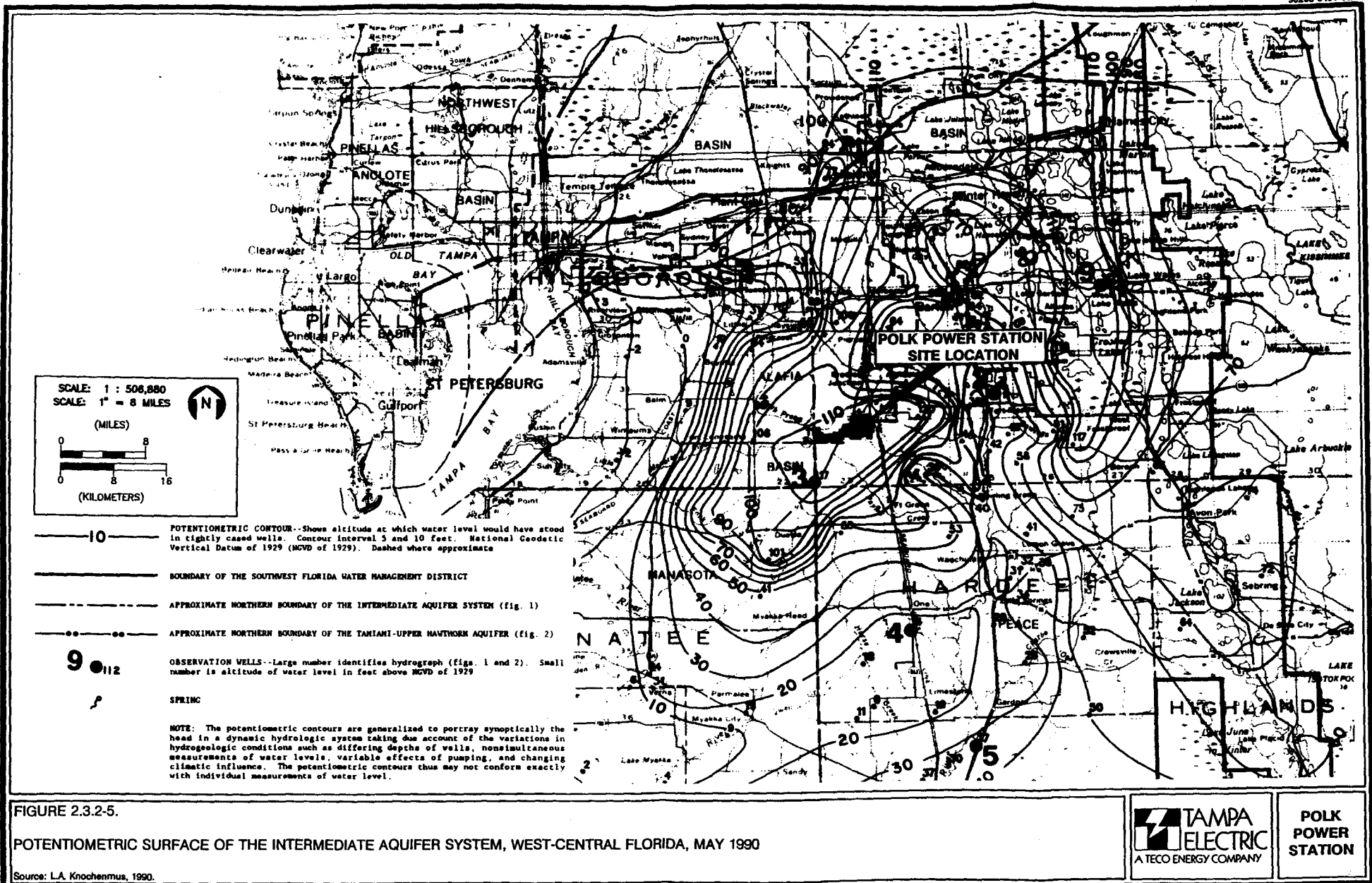
FIGURE 2.3.2-4.

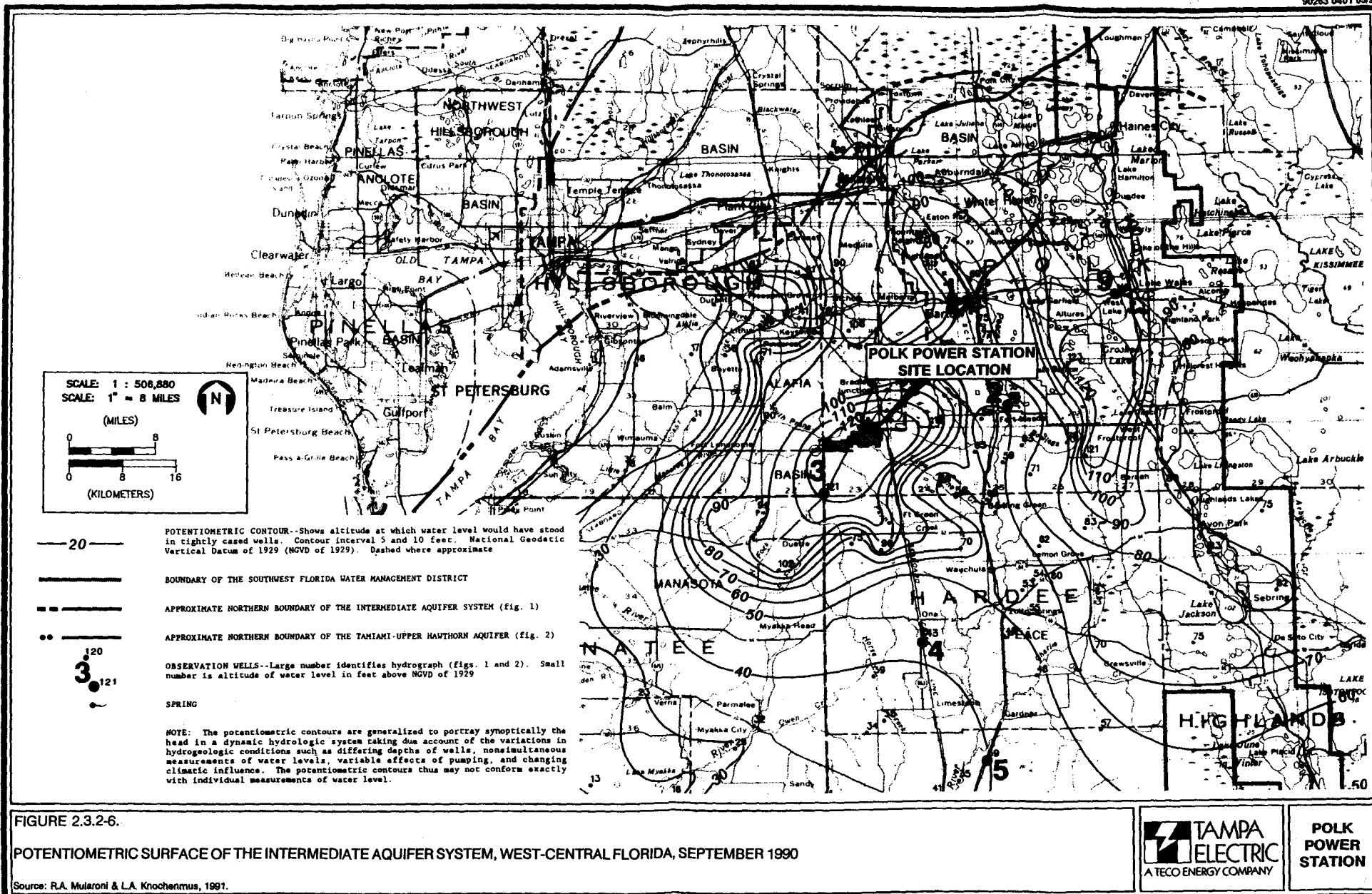
HYDROGRAPH FOR LOWER INTERMEDIATE AQUIFER

Source: ECT, 1992.



**POLK
POWER
STATION**





Power Station site. Permeability tests were conducted on the 4-inch monitor wells completed into the upper and lower intermediate aquifers. The resulting hydraulic conductivity data is summarized in Table 2.3.2-2.

Hydraulic gradients within the intermediate aquifer system ranged from approximately 0.0004 to 0.004 ft/ft. Linear groundwater flow velocities for the intermediate aquifer system range between 0.002 to 0.2 ft/day.

Nine aquifer tests for the intermediate aquifer (SWFWMD, 1988) were performed within a 15-mile radius of the site. The average aquifer characteristics from these tests were determined and are summarized in Table 2.3.2-3. For the intermediate aquifer, average values of transmissivity, storage coefficient, and leakance are 808 ft²/day, 0.00013, and 0.00015 cubic foot per day per cubic foot (ft³/day/ft³), respectively. The ratio of horizontal to vertical hydraulic conductivity may range between 2 to 3 orders of magnitude (100 to 1,000).

The groundwater quality of the intermediate aquifer system is generally classified as G-II. The water quality of the intermediate aquifer is dependent on the chemical constituents of the aquifer matrix and the quality of the surficial aquifer. The ambient groundwater quality monitoring program of SWFWMD (1988) presents the following regional trends:

- TDS, 200 to 300 mg/L;
- Total hardness, <120 mg/L;
- Chlorides, <25 mg/L;
- Sulfates, <25 mg/L.

Additional background groundwater quality data for Polk County was obtained from the FDER groundwater monitoring program. The data for the intermediate aquifer is summarized in Table 2.3.2-9. Site-specific groundwater quality from the intermediate aquifer was measured from a sampling event in May 1991. The groundwater quality data for the upper and lower intermediate aquifer systems are summarized

Table 2.3.2-9. FDER Intermediate Aquifer Groundwater Quality Monitoring Program--Polk County

Intermediate Aquifer Parameters	Groundwater Quality		Average Value	Standard Deviation	Range	
	Units	Standard*			Minimum	Maximum
<u>In situ Measurements</u>						
pH	SU		7.4944	0.331	7.100	8.200
<u>Classical</u>						
Arsenic	mg/L	0.05	0.0006	0.002	0.000	0.005
Arsenic (dissolved)	µg/L	--	0.0000	0.000	0.000	0.000
Chloride	mg/L	250	17.4380	17.644	4.200	64.100
Fluoride	mg/L	2.0	0.3665	0.147	0.193	0.685
Nitrate	mg/L	10.0	0.0215	0.029	0.000	0.075
Selenium	mg/L	0.01	0.0000	0.000	0.000	0.000
Selenium (dissolved)	µg/L	--	0.0000	0.000	0.000	0.000
Sodium	mg/L	160	14.2150	13.420	2.900	45.000
Sulfate	mg/L	250	26.2900	60.319	0.000	205.000
TDS	mg/L	500	259.8000	159.503	44.000	640.000
<u>Other Metals</u>						
Barium	mg/L	1.0	0.0096	0.019	0.000	0.050
Barium (dissolved)	µg/L	--	0.0000	0.000	0.000	0.000
Cadmium	mg/L	0.010	0.0004	0.001	0.000	0.002
Cadmium (dissolved)	µg/L	--	0.0000	0.000	0.000	0.000
Chromium (total)	mg/L	0.05	0.0028	0.009	0.000	0.028
Chromium (dissolved)	µg/L	--	0.0000	0.000	0.000	0.000
Copper	mg/L	1.0	0.0030	0.005	0.000	0.016
Copper (dissolved)	µg/L	--	30.0000	0.000	30.000	30.000
Iron	mg/L	0.3	2.9767	2.559	0.000	7.280
Iron (dissolved)	µg/L	--	0.0000	0.000	0.000	0.000
Lead	mg/L	0.05	0.0120	0.026	0.000	0.070
Manganese	mg/L	0.05	0.0301	0.036	0.000	0.114
Manganese (dissolved)	µg/L	--	0.0000	0.000	0.000	0.000
Mercury	mg/L	0.002	0.0000	0.000	0.000	0.000
Silver	mg/L	0.05	0.0000	0.000	0.000	0.000
Zinc	mg/L	5.0	0.0389	0.045	0.000	0.130
Zinc (dissolved)	µg/L	--	0.0000	0.000	0.000	0.000

Table 2.3.2-9. FDER Intermediate Aquifer Groundwater Quality Monitoring Program--Polk County (Continued, Page 2 of 2)

Intermediate Aquifer Parameters	Groundwater		Average Value	Standard Deviation	Range	
	Units	Quality Standard*			Minimum	Maximum
Organics						
Endrin	µg/L	0.2	0.0000	0.000	0.000	0.000
Methoxychlor	µg/L	100.0	0.0000	0.000	0.000	0.000
Toxaphene	µg/L	5.0	0.0000	0.000	0.000	0.000
2,4-D	µg/L	100	0.0000	0.000	0.000	0.000
2,4,5-TP, silvex	µg/L	10	0.0000	0.000	0.000	0.000
Benzene	µg/L	1.0	1.6330	4.081	0.000	13.200
Carbon tetrachloride	µg/L	3.0	0.0000	0.000	0.000	0.000
Ethylene dibromide	µg/L	0.02	0.0000	0.000	0.000	0.000
Tetrachloroethene	µg/L	3.0	0.0000	0.000	0.000	0.000
Trichloroethene	µg/L	3.0	0.0000	0.000	0.000	0.000
Vinyl chloride	µg/L	1.0	0.0000	0.000	0.000	0.000
1,2-Dichloroethane	µg/L	3.0	0.0000	0.000	0.000	0.000
1,1,1-Trichloroethane	µg/L	0.2	0.0000	0.000	0.000	0.000

Note: -- = no data available.

*Standards from Chapter 17-550, F.A.C.

Source: FDER, 1992.

in Tables 2.3.2-10 and 2.3.2-11, respectively. The laboratory analyses may be found in Appendix 11.7.3. With the exception of Radium 226 (GW1-I1) and TDS (GW2-I3), the intermediate aquifer meets primary and secondary drinking water standards.

Floridan Aquifer

The Floridan aquifer includes the Suwannee Limestone, Ocala Group, Avon Park Formation, and a portion of the Oldsmar Formation. At the Polk Power Station site, the Floridan aquifer has two highly transmissive and producing zones: the Suwannee Limestone and Avon Park Formation. Primary recharge to the Floridan aquifer comes from the physiographic ridge areas to the north and east of the Polk Power Station site. Recharge from the intermediate aquifer system to the Floridan aquifer ranges from zero to greater than 10 inches per year (SWFWMD, 1988).

One 4-inch diameter monitor well was completed into the Suwannee Limestone within the Floridan aquifer (Figure 2.3.1-5). This well was used to monitor the changes in the groundwater level of the Floridan aquifer. A 35-ft screen was placed at approximately 300 to 335 ft bls (see Appendix 11.7.1 for well construction details). The potentiometric surface of the Floridan aquifer at the Tampa Electric Company Polk Power Station site ranged from approximately 40 to 53 ft-NGVD. The potentiometric surface has fluctuated approximately 10 to 15 ft from the end of the dry season to the end of the wet season. Table 2.3.2-1 provides a summary of the groundwater level measurements taken from the Floridan aquifer. The hydrograph illustrated as Figure 2.3.2-7 presents the time-dependent fluctuation of the potentiometric surface for the Floridan aquifer. The most recent published regional potentiometric surface maps (May and September 1990) of the Floridan aquifer indicate that the potentiometric surface ranges from 30 to 50 ft for the dry season (Figure 2.3.2-8) and wet season (Figure 2.3.2-9), respectively. The groundwater flow direction for the Floridan aquifer is from the northeast toward the southwest. Hydraulic gradients for this aquifer range from approximately 0.0003 to 0.001 ft/ft.

Table 2.3.2-10. Groundwater Quality Summary for Upper Intermediate Aquifer

Parameter	Units	Groundwater Quality				Mean	Maximum	Minimum	Standard Deviation
		Standard	GW-1S-II	GW-2S-II	GW-3S-II				
pH (<i>in situ</i>)	s.u.	6.5-8.5	8.4	8.2	7.4	8.0	8.4	7.9	0.28
Arsenic EPA 206.2	µg/L	50.0	<10.000	<10.000	21	7	21	<MDL	10
Barium	mg/L	1.0	<0.300	<0.300	<0.300	--	--	--	--
Cadmium	µg/L	0.010	<0.800	<0.800	<0.800	--	--	--	--
Chromium	mg/L	0.05	<0.050	<0.050	<0.050	--	--	--	--
Lead EPA 239.2	µg/L	50.0	<5.000	<5.000	<5.000	--	--	--	--
Mercury EPA 245.1	µg/L	0.2	<0.200	<0.200	<0.200	--	--	--	--
Nitrogen, nitrate	mg/L	10.0	<1.000	<1.000	<1.000	--	--	--	--
Silver	µg/L	50.0	<0.070	<0.070	<0.070	--	--	--	--
Chloride	mg/L	250.0	5.7	16	14	11.9	16	5.7	4.5
Color	Pt-Co	15	15	20	15	17	20	15	2
Copper	mg/L	1.0	<0.030	<0.030	<0.030	--	--	--	--
Fluoride, soluble	mg/L	4.0	0.53	1	1	0.84	1	0.53	0.22
Iron	mg/L	0.3	<0.300	<0.300	<0.300	--	--	--	--
Manganese	mg/L	0.05	<0.050	<0.050	<0.050	--	--	--	--
Sodium	mg/L	160.0	22	30	20	24	30	20	4
Sulfate	mg/L	250	5.2	38	7.8	17	38	5.2	14.9
Surfactants	mg/L	0.5	0.063	0.02	0.1	0.061	0.1	0.02	0.033
TDS	mg/L	500	320	270	240	277	320	240	33
Endrin	µg/L	0.2	<0.080	<0.080	<0.080	--	--	--	--
Methoxychlor	µg/L	100.0	<100.000	<100.000	<100.000	--	--	--	--
Toxaphene	µg/L	5.0	<3.000	<3.000	<3.000	--	--	--	--
2,4-D	µg/L	100.0	<10.000	<10.000	<10.000	--	--	--	--
2,4,5-Trichlorophenol	µg/L	10.0	<1.000	<1.000	<1.000	--	--	--	--
Benzene	µg/L	1.0	<0.600	<0.600	<0.600	--	--	--	--
Carbon tetrachloride	µg/L	3.0	<0.500	<0.500	<0.500	--	--	--	--
1,2-Dibromoethane	µg/L	0.02	<0.020	<0.020	<0.020	--	--	--	--
Tetrachloroethylene	µg/L	3.0	<5.000	<5.000	<5.000	--	--	--	--
Trichloroethylene	µg/L	3.0	<5.000	<5.000	<5.000	--	--	--	--
Chloroform	µg/L	*	<0.400	<0.400	<0.400	--	--	--	--
Bromodichloromethane	µg/L	*	<0.600	<0.600	<0.600	--	--	--	--

2.3.2-26

Table 2.3.2-10. Groundwater Quality Summary for Upper Intermediate Aquifer (Continued, Page 2 of 2)

Parameter	Units	Groundwater Quality				Mean	Maximum	Minimum	Standard Deviation
		Standard	GW-1S-II	GW-2S-II	GW-3S-II				
Dibromochloromethane	µg/L	*	<1.000	<1.000	<1.000	--	--	--	--
Bromoform	µg/L	*	<2.000	<2.000	<2.000	--	--	--	--
Vinyl chloride	µg/L	1.0	<0.800	<0.800	<0.800	--	--	--	--
1,2-Dichloroethane	µg/L	3.0	<1.000	<1.000	<1.000	--	--	--	--
1,1,1-Trichloroethane	µg/L	200.0	<0.800	<0.800	<0.800	--	--	--	--
Turbidity	NTU	1	7.4	<1.000	20	9.1	20	<MDL	8.3
Gross alpha	pCi/L	15	4.8 ±6.9	<2.0	<2.0	1.6	4.8	<MDL	2.3
Radium 226	pCi/L	†	6.2 ±0.9	0.6 ±0.3	<0.6	2.3	6.2	<MDL	2.8
Radium 228	pCi/L	†	1.4 ±3.0	<1.0	<1.0	0.5	1.4	<MDL	0.7

*Total trihalomethane water quality standard is 100 mg/L.

†Combined Radium 226 and 228 water quality standard is 5 pCi/L.

Source: ECT, 1992.

2.3.2-27

Table 2.3.2-11. Groundwater Quality Summary for Lower Intermediate Aquifer

Parameter	Units	Groundwater Quality				Mean	Maximum	Minimum	Standard Deviation
		Standard	GW-1S-II	GW-2S-II	GW-3S-II				
pH (<i>in situ</i>)	s.u.	6.5-8.5	8.6	8.1	8.5	8.4	8.6	8.1	0.07
Arsenic EPA 206.2	µg/L	50.0	<10.000	<10.000	<10.000	--	--	--	--
Barium	mg/L	1.0	<0.300	<0.300	<0.300	--	--	--	--
Cadmium	µg/L	0.010	1.3	<0.500	<0.800	0.4	1.3	<MDL	0.6
Chromium	mg/L	0.05	<0.050	<0.050	<0.050	--	--	--	--
Lead EPA 239.2	µg/L	50.0	9	<5.000	<5.000	3.0	9	<MDL	4.2
Mercury EPA 245.1	µg/L	0.2	<0.200	<0.200	<0.200	--	--	--	--
Nitrogen, nitrate	mg/L	10.0	<1.000	<1.000	<1.000	--	--	--	--
Silver	µg/L	50.0	<0.070	<0.070	<0.070	--	--	--	--
Chloride	mg/L	250.0	18	23	11	17	23	11	5
Color	Pt-Co	15	15	10	10	12	15	10	2
Copper	mg/L	1.0	<0.030	<0.030	<0.030	--	--	--	--
Fluoride, soluble	mg/L	4.0	1	0.81	1.7	1.17	1.7	0.81	0.38
Iron	mg/L	0.3	<0.300	<0.300	<0.300	--	--	--	--
Manganese	mg/L	0.05	<0.050	<0.050	<0.050	--	--	--	--
Sodium	mg/L	160.0	22	58	22	34	58	22	17
Sulfate	mg/L	250	45	54	5.5	34.8	54	5.5	21.1
Surfactants	mg/L	0.5	0.043	0.04	0.06	0.048	0.06	0.04	0.009
TDS	mg/L	500	280	600	230	370	600	230	164
Endrin	µg/L	0.2	<0.080	<0.080	<0.080	--	--	--	--
Methoxychlor	µg/L	100.0	<100.000	<100.000	<100.000	--	--	--	--
Toxaphene	µg/L	5.0	<3.000	<3.000	<3.000	--	--	--	--
2,4-D	µg/L	100.0	<10.000	<10.000	<10.000	--	--	--	--
2,4,5-Trichlorophenol	µg/L	10.0	<1.000	<1.000	<1.000	--	--	--	--
Benzene	µg/L	1.0	<0.600	<0.600	<0.600	--	--	--	--
Carbon tetrachloride	µg/L	3.0	<0.500	<0.500	<0.500	--	--	--	--
1,2-Dibromoethane	µg/L	0.02	<0.020	<0.020	<0.020	--	--	--	--
Tetrachloroethylene	µg/L	3.0	<5.000	<5.000	<5.000	--	--	--	--
Trichloroethylene	µg/L	3.0	<5.000	<5.000	<5.000	--	--	--	--
Chloroform	µg/L	*	<0.400	<0.400	<0.400	--	--	--	--
Bromodichloromethane	µg/L	*	<0.600	<0.600	<0.600	--	--	--	--

2.3.2-28

Table 2.3.2-11. Groundwater Quality Summary for Lower Intermediate Aquifer (Continued, Page 2 of 2)

Parameter	Units	Groundwater Quality				Mean	Maximum	Minimum	Standard Deviation
		Standard	GW-1S-II	GW-2S-II	GW-3S-II				
Dibromochloromethane	µg/L	*	<1.000	<1.000	<1.000	--	--	--	--
Bromoform	µg/L	*	<2.000	<2.000	<2.000	--	--	--	--
Vinyl chloride	µg/L	1.0	<0.800	<0.800	<0.800	--	--	--	--
1,2-Dichloroethane	µg/L	3.0	<1.000	<1.000	<1.000	--	--	--	--
1,1,1-Trichloroethane	µg/L	200.0	<0.800	<0.800	<0.800	--	--	--	--
Turbidity	NTU	1	49	15	8.5	24.2	49	8.5	17.8
Gross alpha	pCi/L	15	<2.0	<2.0	<2.0	--	--	--	--
Radium 226	pCi/L	†	0.7 ±0.3	1.2 ±0.4	1.2 ±0.4	1.0	1.2	0.7	0.2
Radium 228	pCi/L	†	3.4 ±3.2	<1.0	<1.0	1.1	3.4	<MDL	1.6

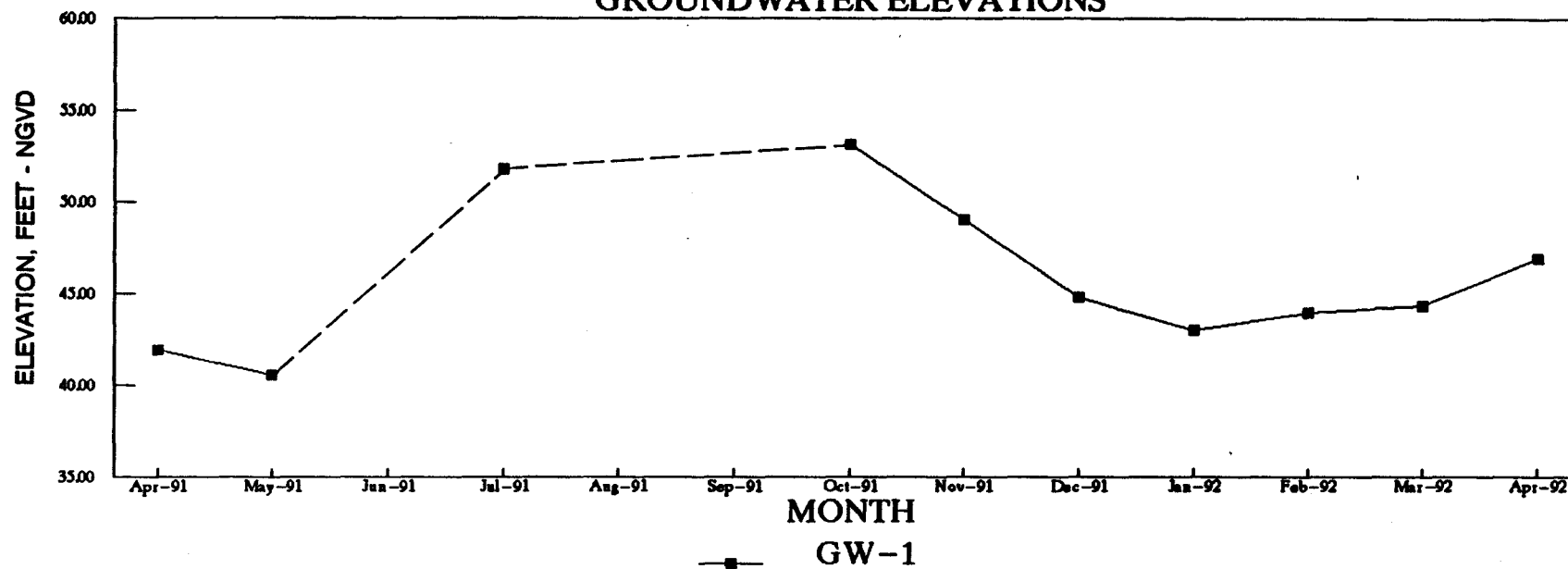
*Total trihalomethane water quality standard is 100 mg/L.

†Combined Radium 226 and 228 water quality standard is 5 pCi/L.

Source: ECT, 1992.

2.3.2-30

FLORIDAN AQUIFER GROUNDWATER ELEVATIONS



LEGEND

- DASHED WHEN APPROXIMATE
- SOLID WHEN MONTHLY DATA COLLECTED

FIGURE 2.3.2-7.

HYDROGRAPH FOR FLORIDAN AQUIFER

Source: ECT, 1992.



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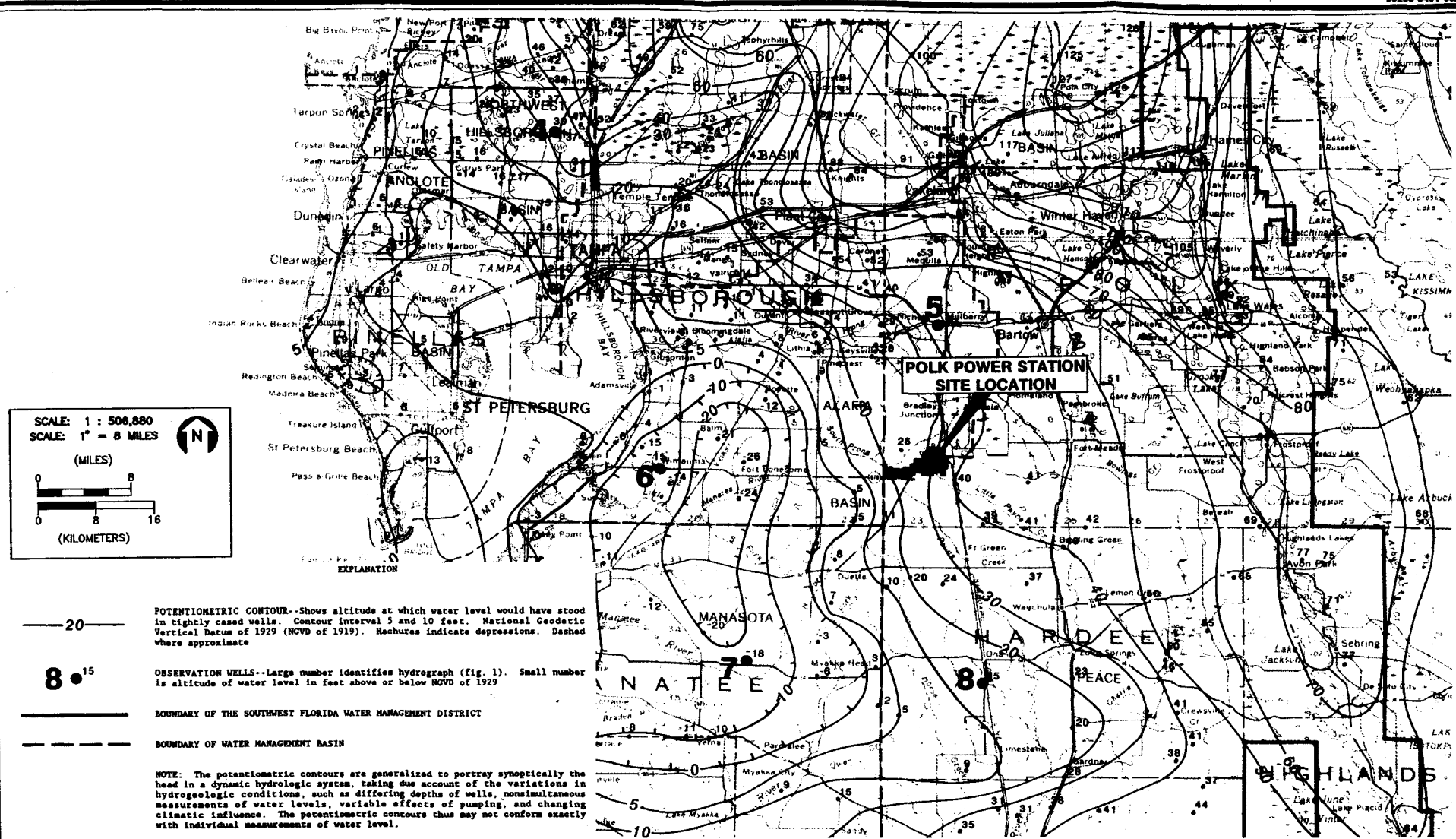


FIGURE 2.3.2-8.

POTENTIOMETRIC SURFACE OF THE UPPER FLORIDAN AQUIFER, WEST-CENTRAL FLORIDA, MAY, 1990

Source: L.A. Knochenmus, 1990.


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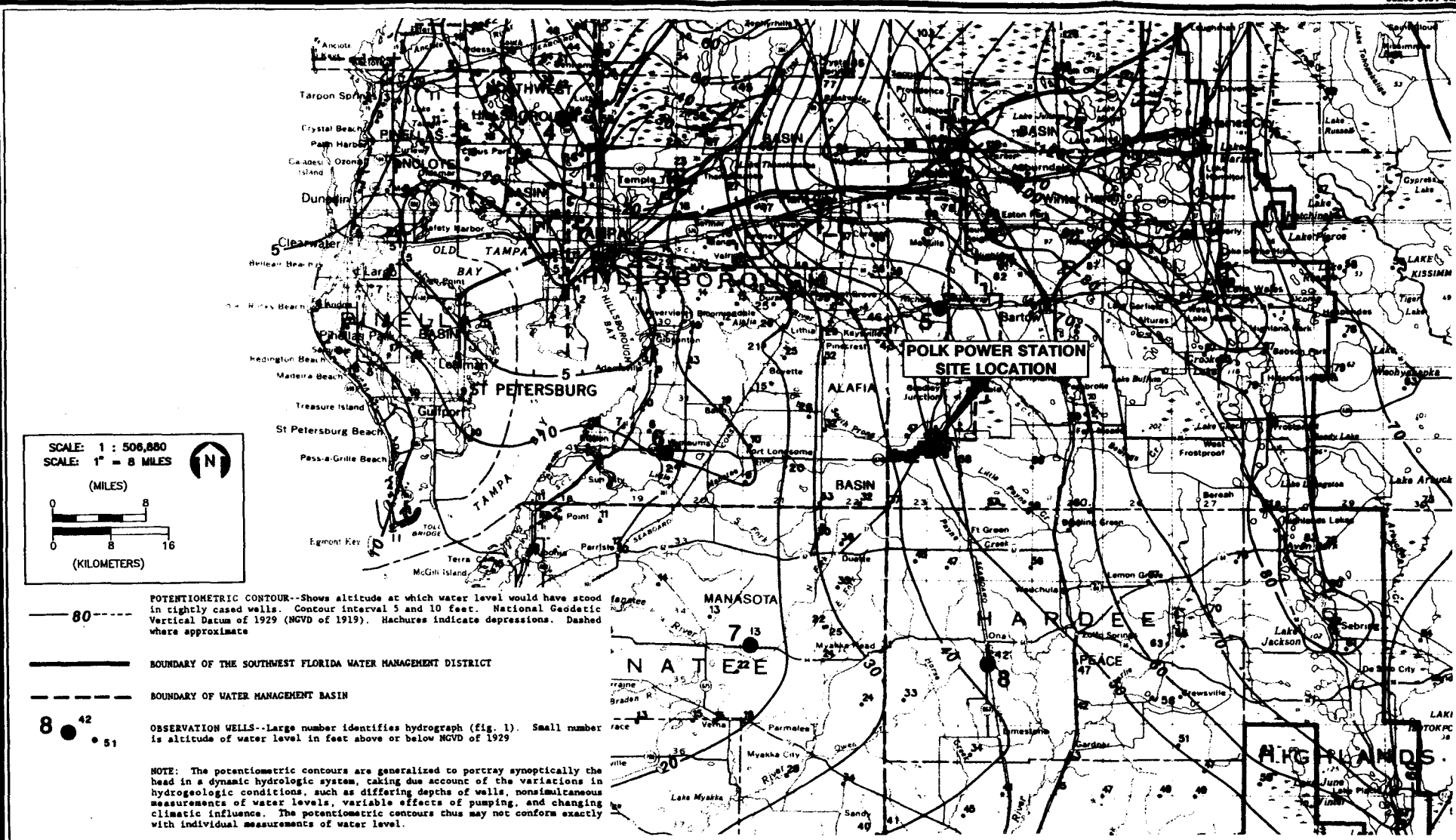


FIGURE 2.3.2-9.

POTENTIOMETRIC SURFACE OF THE UPPER FLORIDAN AQUIFER, WEST-CENTRAL FLORIDA, SEPTEMBER, 1990

Source: R.A. Mularoni and L.A. Knochenmus, 1990.

The results of ten aquifer tests for the Floridan aquifer performed within a 15-mile radius of the site are summarized in Table 2.3.2-3. The average aquifer characteristics for the Floridan aquifer are a transmissivity value of approximately 293,000 ft²/day, a storage coefficient of 0.001, and a leakance value of approximately 0.00021 ft³/day/ft³.

The specific capacity of a well is well yield in gallons per minute divided by the amount of drawdown in feet (gpm/ft). This parameter provides a means to estimate the aquifer transmissivity. The average specific capacity for the Floridan aquifer from more than 70 aquifer tests presented by Stewart (1966) was approximately 380 gpm/ft with a range of 31 to greater than 2,500 gpm/ft.

Based on the SWFWMD ambient groundwater quality monitoring program, several background trends are presented (SWFWMD, 1988):

- TDS, 200 to 300 mg/L;
- Total hardness, <120 mg/L;
- Chlorides, <25 mg/L; and
- Sulfates, 25 to 250 mg/L.

Additional background water quality data was obtained from the FDER groundwater monitoring program. The background data for the Floridan aquifer is summarized in Table 2.3.2-12. Site-specific groundwater quality from the upper Floridan aquifer was measured from a sampling event in May 1991. The groundwater quality data is summarized in Table 2.3.2-13, and the laboratory analyses are included in Appendix 11.7.3. The groundwater from the Floridan aquifer meets primary and secondary drinking water standards.

As rainwater percolates through the aquifer systems, the groundwater becomes mineralized as constituents are dissolved into solution. Therefore, the groundwater quality varies between the three aquifer systems (Figure 2.3.2-10). The groundwater quality of the intermediate and Floridan aquifer systems are similar, with the

Table 2.3.2-12. FDER Floridan Aquifer Groundwater Quality Monitoring Program--
Polk County

Floridan Aquifer Parameters	Units	Groundwater Quality Standard*	Average Value	Standard Deviation	Range	
					Minimum	Maximum
<u>In situ Measurements</u>						
pH	s.u.		7.5749	0.488	6.400	8.300
<u>Classical</u>						
Arsenic	mg/L	0.05	0.0005	0.001	0.000	0.002
Arsenic (dissolved)	µg/L	--	0.0000	0.000	0.000	0.000
Chloride	mg/L	250	8.3770	3.151	4.460	17.500
Fluoride	mg/L	2.0	0.2069	0.150	0.000	0.589
Nitrate	mg/L	10.0	0.0139	0.024	0.000	0.110
Selenium	mg/L	0.01	0.0000	0.000	0.000	0.000
Selenium (dissolved)	µg/L	--	NA			
Sodium	mg/L	160	7.4638	5.652	3.000	32.600
Sulfate	mg/L	250	6.5738	14.434	0.000	81.500
TDS	mg/L	500	152.3439	61.543	58.000	289.000
<u>Other Metals</u>						
Barium	mg/L	1.0	0.0034	0.012	0.000	0.052
Barium (dissolved)	µg/L	--	NA			
Cadmium	mg/L	0.010	0.0005	0.001	0.000	0.003
Cadmium (dissolved)	µg/L	--	NA			
Chromium (total)	mg/L	0.05	0.0000	0.000	0.000	0.002
Chromium (dissolved)	µg/L	--	NA			
Copper	mg/L	1.0	0.0044	0.007	0.000	0.029
Copper (dissolved)	µg/L	--	0.1210	0.000	0.121	0.121
Iron	mg/L	0.3	0.6904	1.106	0.000	4.550
Iron (dissolved)	µg/L	--	0.0565	0.022	0.050	0.140
Lead	mg/L	0.05	0.0147	0.042	0.000	0.190
Manganese	mg/L	0.05	0.0193	0.029	0.000	0.110
Manganese (dissolved)	µg/L	--	12.6667	13.013	0.000	26.000
Mercury	mg/L	0.002	0.0001	0.000	0.000	0.001
Silver	mg/L	0.05	0.0006	0.003	0.000	0.014
Zinc	mg/L	5.0	0.0176	0.021	0.000	0.092
Zinc (dissolved)	µg/L	--	3.1600	5.473	0.000	9.480

Table 2.3.2-12. FDER Floridan Aquifer Groundwater Quality Monitoring Program--
Polk County (Continued, Page 2 of 2)

Floridan Aquifer Parameters	Units	Groundwater	Average Value	Standard Deviation	Range	
		Quality Standard*			Minimum	Maximum
<u>Organics</u>						
Endrin	µg/L	0.2	0.0000	0.000	0.000	0.000
Methoxychlor	µg/L	100.0	0.0000	0.000	0.000	0.000
Toxaphene	µg/L	5.0	0.0000	0.000	0.000	0.000
2,4-D	µg/L	100	0.0000	0.000	0.000	0.000
2,4,5-TP, silvex	µg/L	10	0.0000	0.000	0.000	0.000
Benzene	µg/L	1.0	0.0649	0.321	0.000	1.900
Carbon tetrachloride	µg/L	3.0	0.0135	0.082	0.000	0.500
Ethylene dibromide	µg/L	0.02	0.0000	0.000	0.000	0.000
Tetrachloroethene	µg/L	3.0	0.0135	0.082	0.000	0.500
Trichloroethene	µg/L	3.0	0.0135	0.082	0.000	0.500
Vinyl chloride	µg/L	1.0	0.0135	0.082	0.000	0.500
1,2-Dichloroethane	µg/L	3.0	0.0135	0.082	0.000	0.500
1,1,1-Trichloroethane	µg/L	0.2	0.0135	0.082	0.000	0.500

Note: -- = no data available.

*Standards from Chapter 17-550, F.A.C.

Source: FDER, 1991.

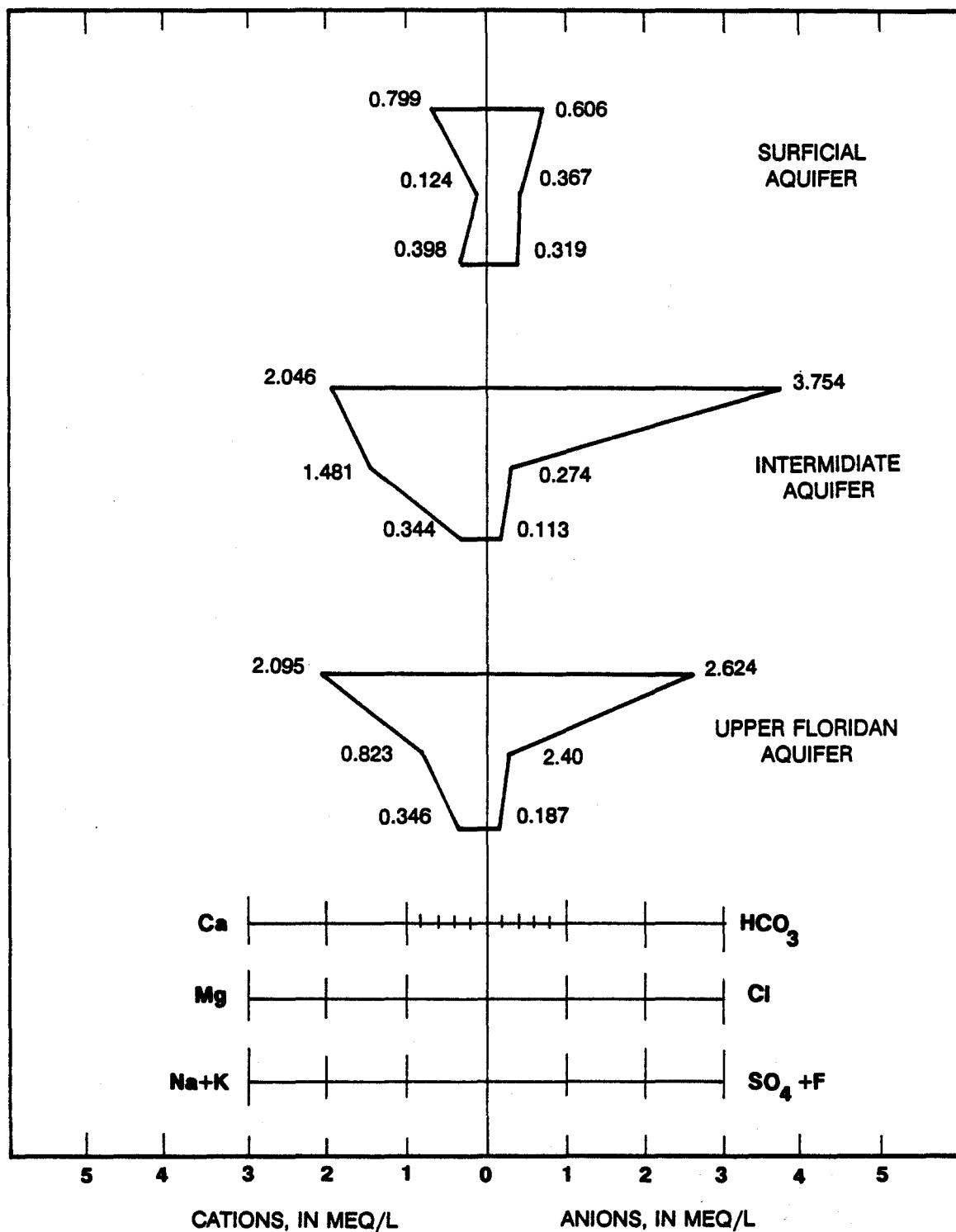
Table 2.3.2-13. Floridan Aquifer Groundwater Quality at GW-1--Floridan Aquifer

Parameter	Units	Groundwater Quality Standards*	Minimum Detection Limit	GW-1-F1 Floridan Aquifer
pH (<i>in situ</i>)	s.u.	6.5-8.5		8.1
Arsenic	µg/L	50.0	10	<10.000
Barium	mg/L	1.0	0.3	<0.300
Cadmium	µg/L	0.010	0.8	<0.800
Chromium	mg/L	0.05	0.05	<0.050
Lead	µg/L	50.0	5	<5.000
Mercury	µg/L	0.2	0.2	<0.200
Nitrogen, nitrate	mg/L	10.0	1	<1.000
Silver	µg/L	50.0	0.07	<0.070
Chloride	mg/L	250.0	1	11.00
Color	Pt-Co	15	5	20.00
Copper	mg/L	1.0	0.03	<0.030
Fluoride, soluble	mg/L	4.0	0.01	0.50
Iron	mg/L	0.3	0.03	<0.300
Manganese	mg/L	0.05	0.05	<0.050
Sodium	mg/L	160.0	1	15.00
Sulfate	mg/L	250	5	34.00
Surfactants	mg/L	0.5	0.02	0.06
Solids, total dissolved	mg/L	500	5	220.00
Endrin	µg/L	0.2	0.08	<0.080
Methoxychlor	µg/L	100.0	100	<100.000
Toxaphene	µg/L	5.0	3	<3.000
2,4-D	µg/L	100.0	10	<10.000
2,4,5-Trichlorophenol	µg/L	10.0	1	<1.000
Benzene	µg/L	1.0	0.6	<0.600
Carbon tetrachloride	µg/L	3.0	0.5	<0.500
1,2-Dibromoethane	µg/L	0.02	0.02	<0.020
Tetrachloroethylene	µg/L	3.0	5	<5.000
Trichloroethylene	µg/L	3.0	5	<5.000
Chloroform	µg/L	*	0.4	<0.400
Bromodichloromethane	µg/L	*	0.6	<0.600
Dibromochloromethane	µg/L	*	1	<1.000
Bromoform	µg/L	*	2	<2.000
Vinyl chloride	µg/L	1.0	0.8	<0.800
1,2-Dichloroethane	µg/L	3.0	1	<1.000
1,1,1-Trichloroethane	µg/L	200.0	0.08	<0.800
Turbidity	NTU	1		20.00
Gross alpha	pCi/L	15	2	<2.0
Radium 226	pCi/L	†	0.6	1.0 ± 0.4
Radium 228	pCi/L	†	1	<1.0

*Total trihalomethane water quality standard is 100 mg/L.

†Combined Radium 226 and 228 water quality standard is 5 pCi/L.

Source: ECT, 1992.



MEQ/L = MILLIEQUIVALENT PER LITER

FIGURE 2.3.2-10.

MEDIAN QUALITY OF WATER IN THE SURFICIAL,
INTERMEDIATE, AND UPPER FLORIDAN AQUIFERS

Source: Hutchinson, 1978.



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exception that lower concentrations of magnesium occur in the Floridan aquifer. Additionally, elevated sulfate concentrations occur in certain areas of Polk County associated with the deep upper Floridan aquifer. The groundwater within the Floridan aquifer system is considered to be of good quality.

Characteristic Confining Units

As previously discussed, the intermediate aquifer system is divided and bounded on top and bottom by confining units near the Tampa Electric Company Polk Power Station site. The locations of two hydrogeologic cross-sections are provided as Figure 2.3.2-11, and the two hydrogeologic cross-sections are provided as Figures 2.3.2-12 and 2.3.2-13. From these hydrogeologic cross-sections and Figures 2.3.1-6, the approximate thicknesses of the calcareous mudstone/clay confining units can be determined as follows:

- Top confining unit, 20 to 30 ft thick;
- Middle confining unit, 40 to 60 ft thick; and
- Bottom confining unit, 15 to 50 ft thick.

These figures also illustrate the heterogeneous nature of the confining units in southwest Polk County. Hydrographs at each groundwater monitor station GW-1 through GW-5 are illustrated as Figures 2.3.2-14 through 2.3.2-18. By review and comparison of the water level fluctuations between the aquifer systems, the degree of their hydraulic connection and communication can be determined.

Recharge between the surficial and intermediate aquifer is classified as no recharge (0 inches per year) to moderate recharge (10 inches per year). Recharge between the intermediate and Floridan aquifers is also classified as no recharge to moderate recharge. At monitor station GW-1, a soil sample was obtained from the Tampa Clay of the Nocatee member of the Arcadia Formation at a depth of approximately 270 ft bls. A laboratory permeability test on this sample indicated a low permeability of 3×10^{-7} cm/sec (8.5×10^{-4} ft/day).

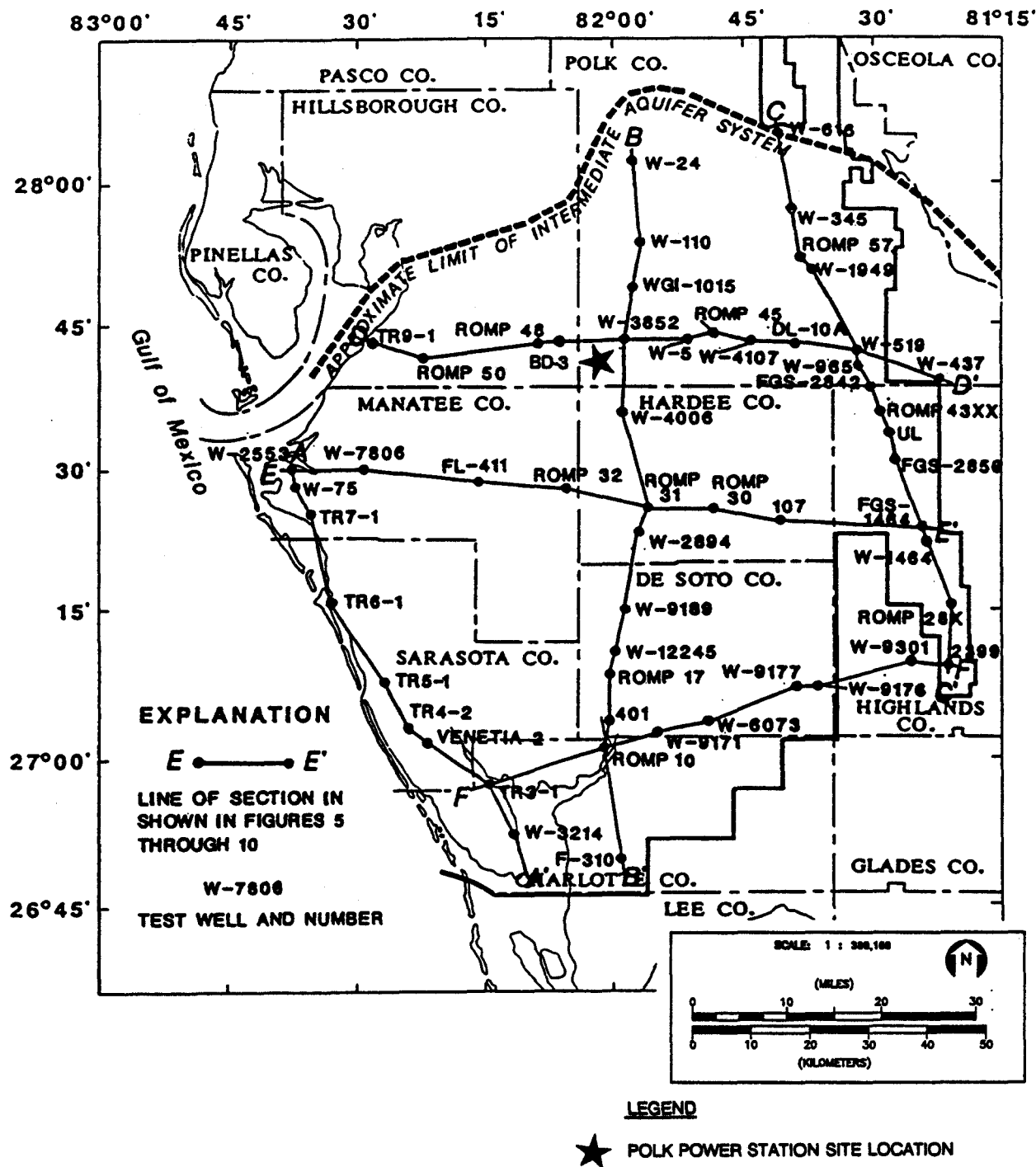


FIGURE 2.3.2-11.

LOCATIONS OF HYDROGEOLOGICAL CROSS SECTIONS

Source: Modified from Duerr, 1988 (Fig. 6); ECT, 1992.

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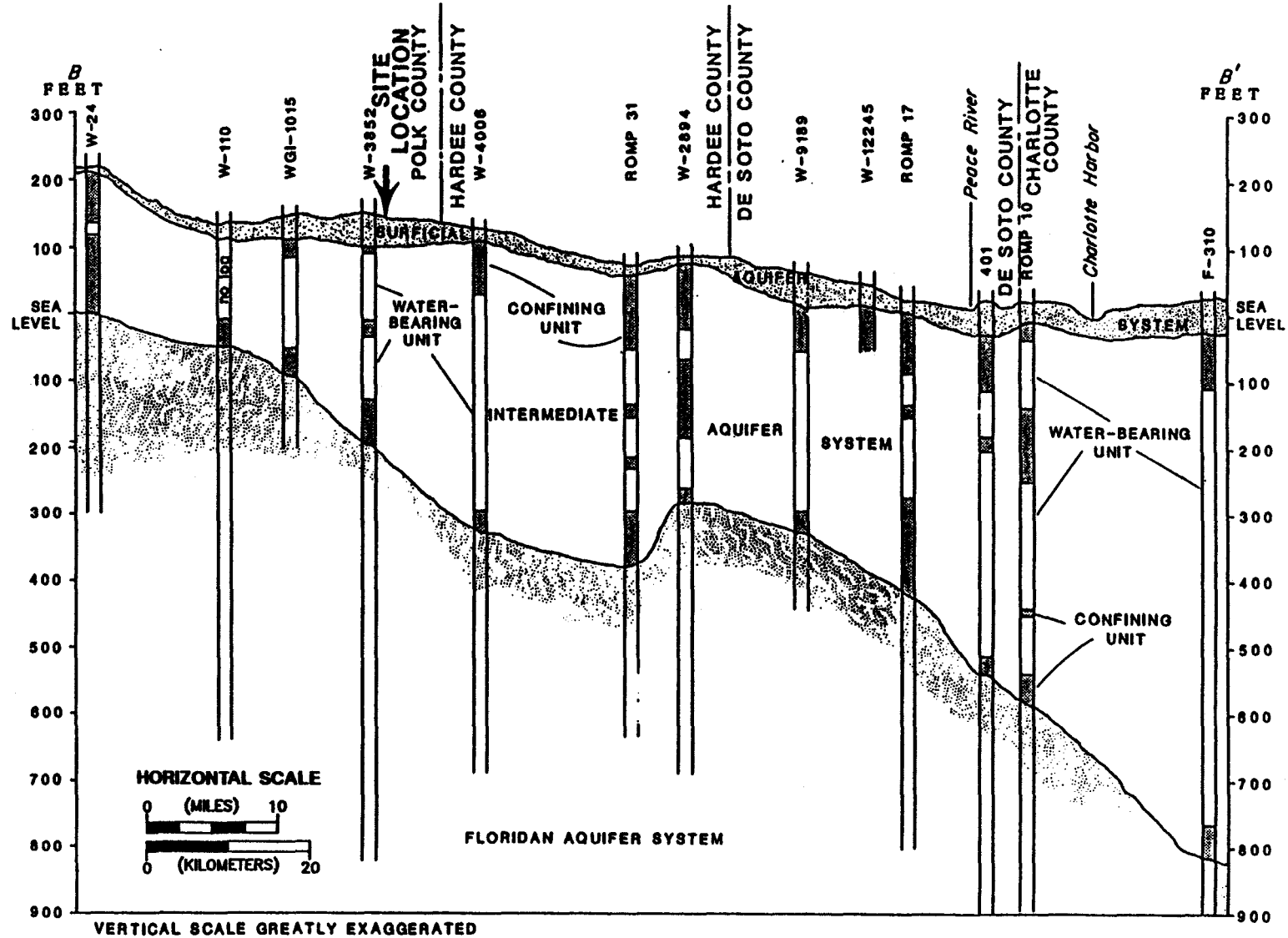


FIGURE 2.3.2-12.

GENERALIZED HYDROGEOLOGIC CROSS SECTION B - B'

Source: Modified from Duerr, 1988 (Fig. 6); ECT, 1992.

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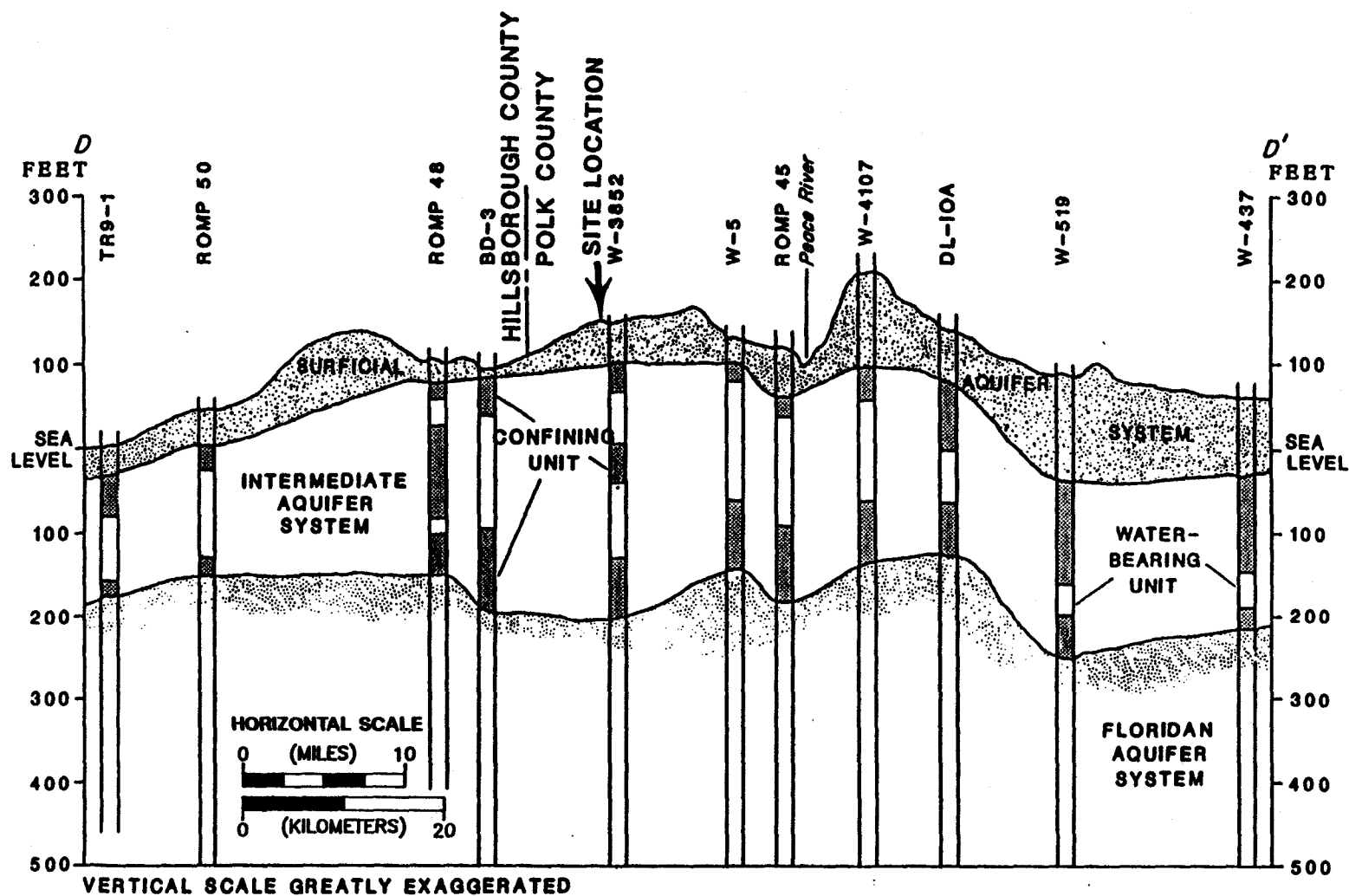


FIGURE 2.3.2-13.

GENERALIZED HYDROGEOLOGIC CROSS SECTION D - D'

Source: Modified from Duerr, 1988 (Fig. 4-5); ECT, 1992.



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2.3.2-42

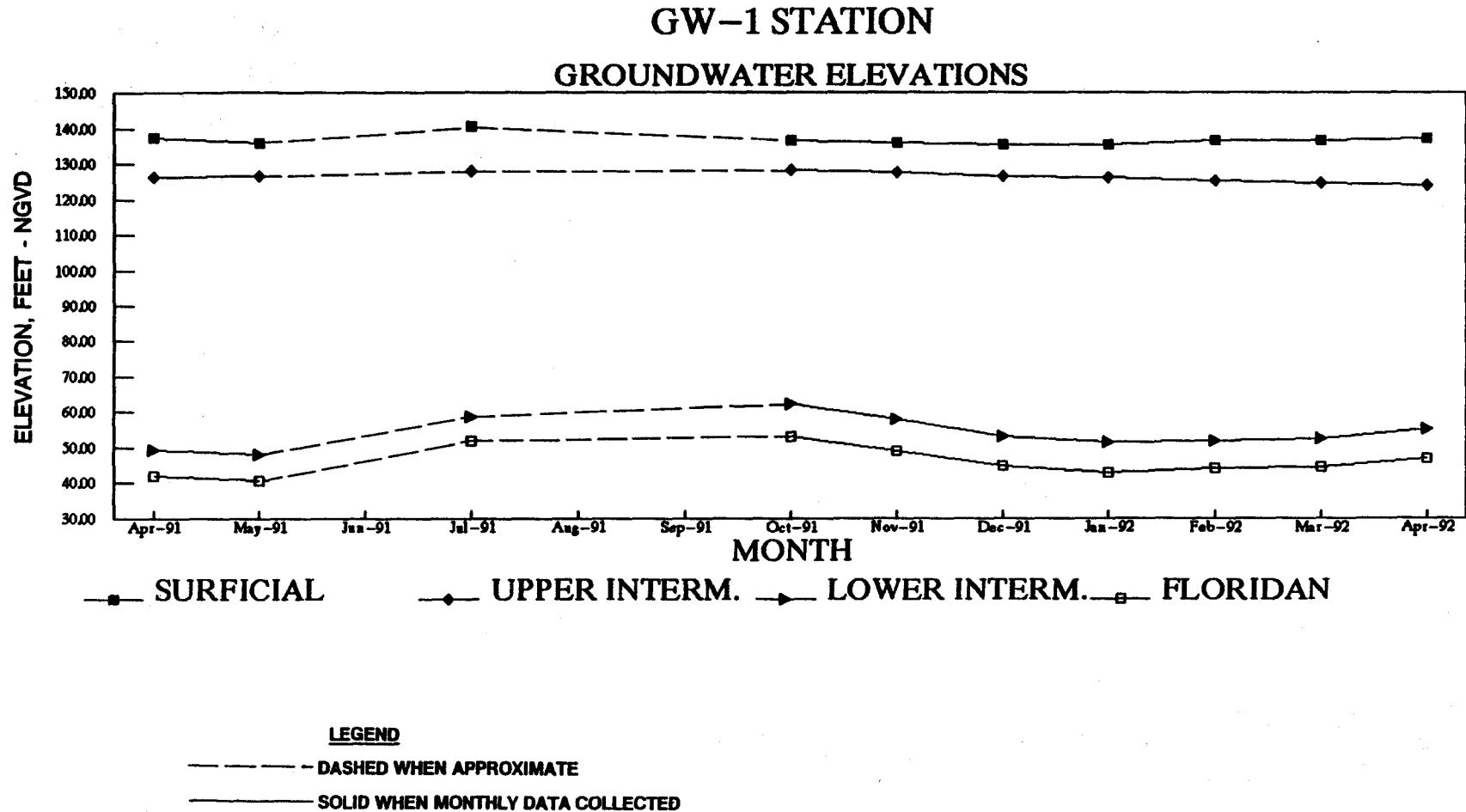


FIGURE 2.3.2-14.

HYDROGRAPH FOR GROUNDWATER MONITOR STATION GW-1

Source: ECT, 1992.



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2.3.2-43

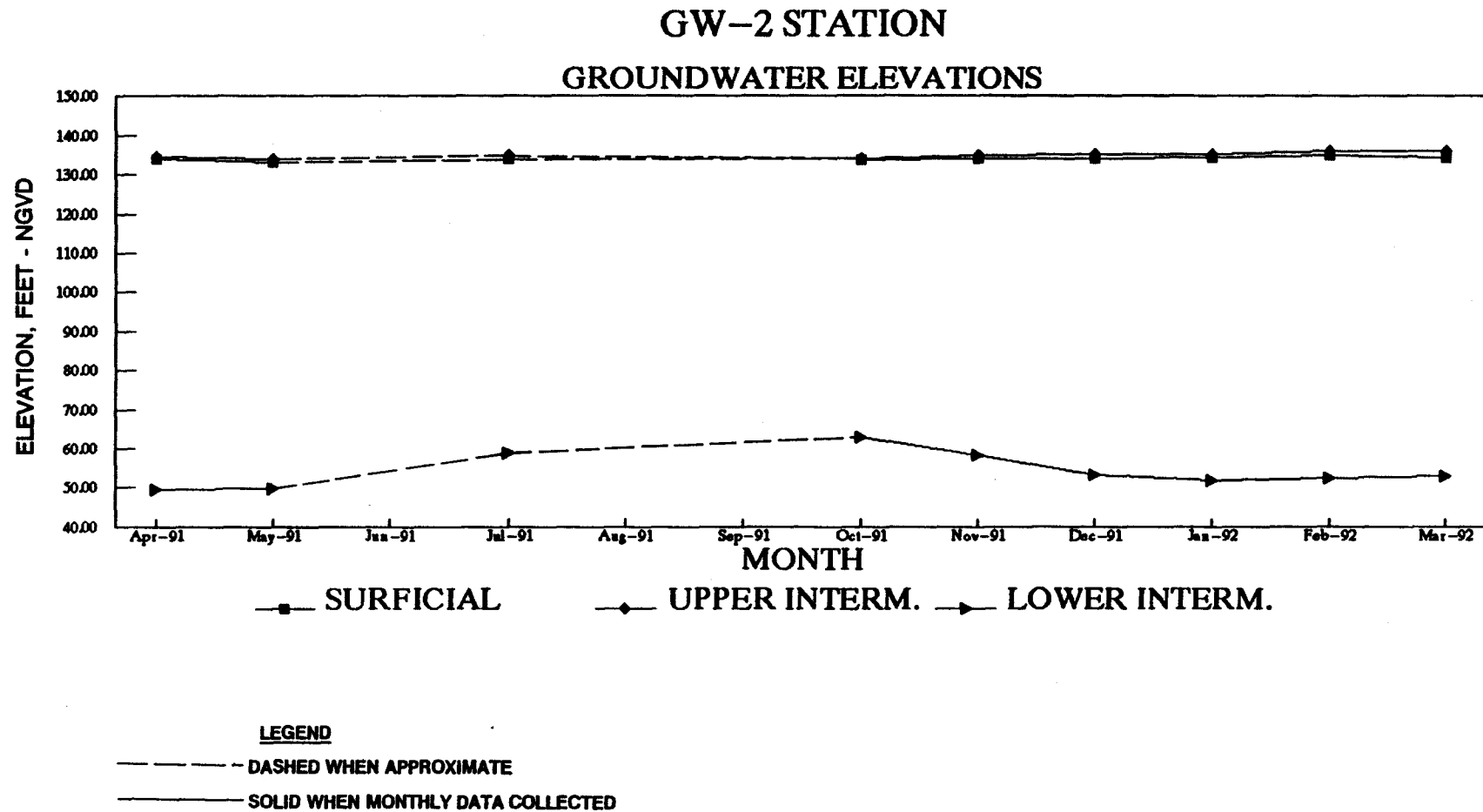


FIGURE 2.3.2-15.

HYDROGRAPH FOR GROUNDWATER MONITOR STATION GW-2

Source: ECT, 1992.



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2.3.2-44

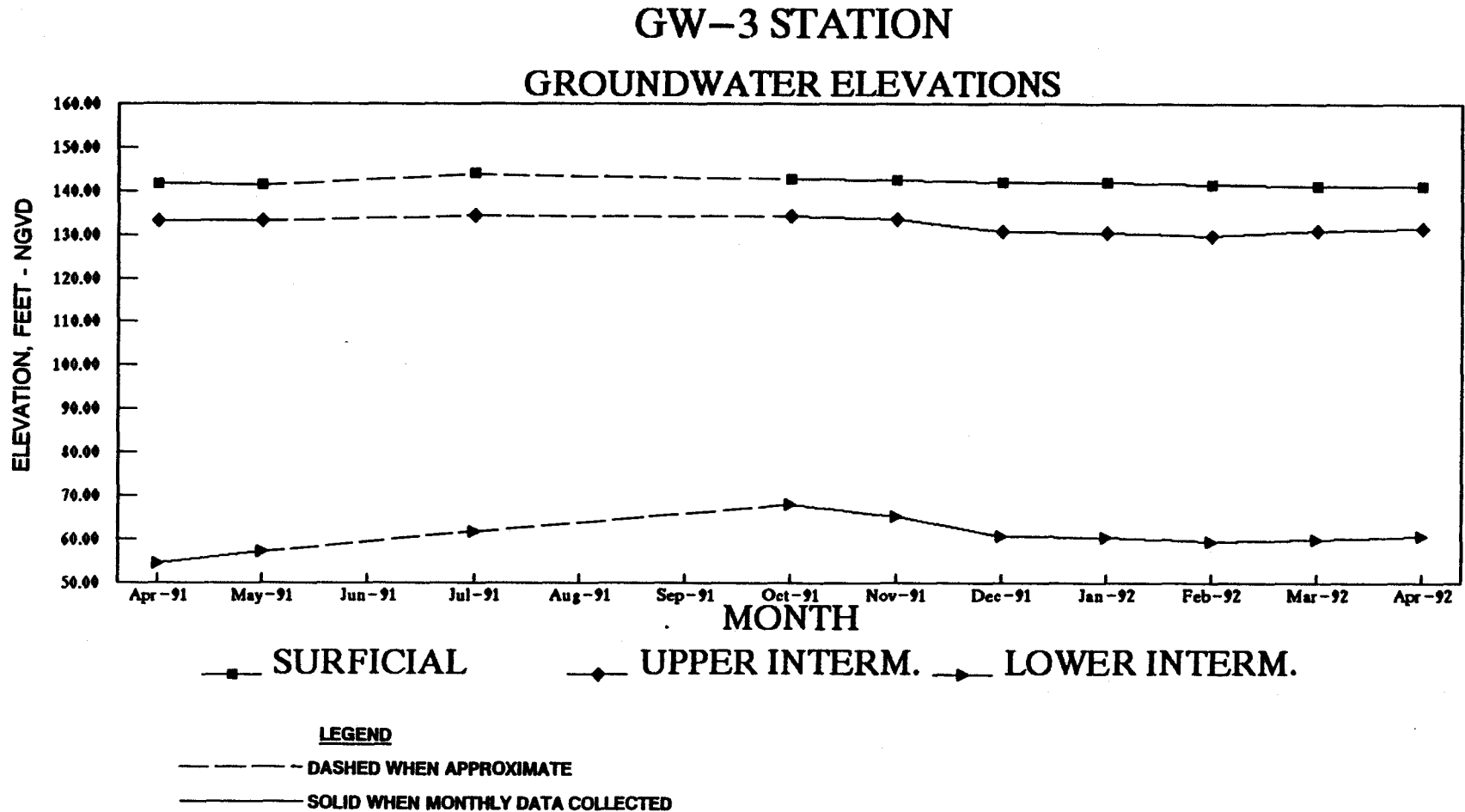


FIGURE 2.3.2-16.

HYDROGRAPH FOR GROUNDWATER MONITOR STATION GW-3

Source: ECT, 1992.



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2.3.2-45

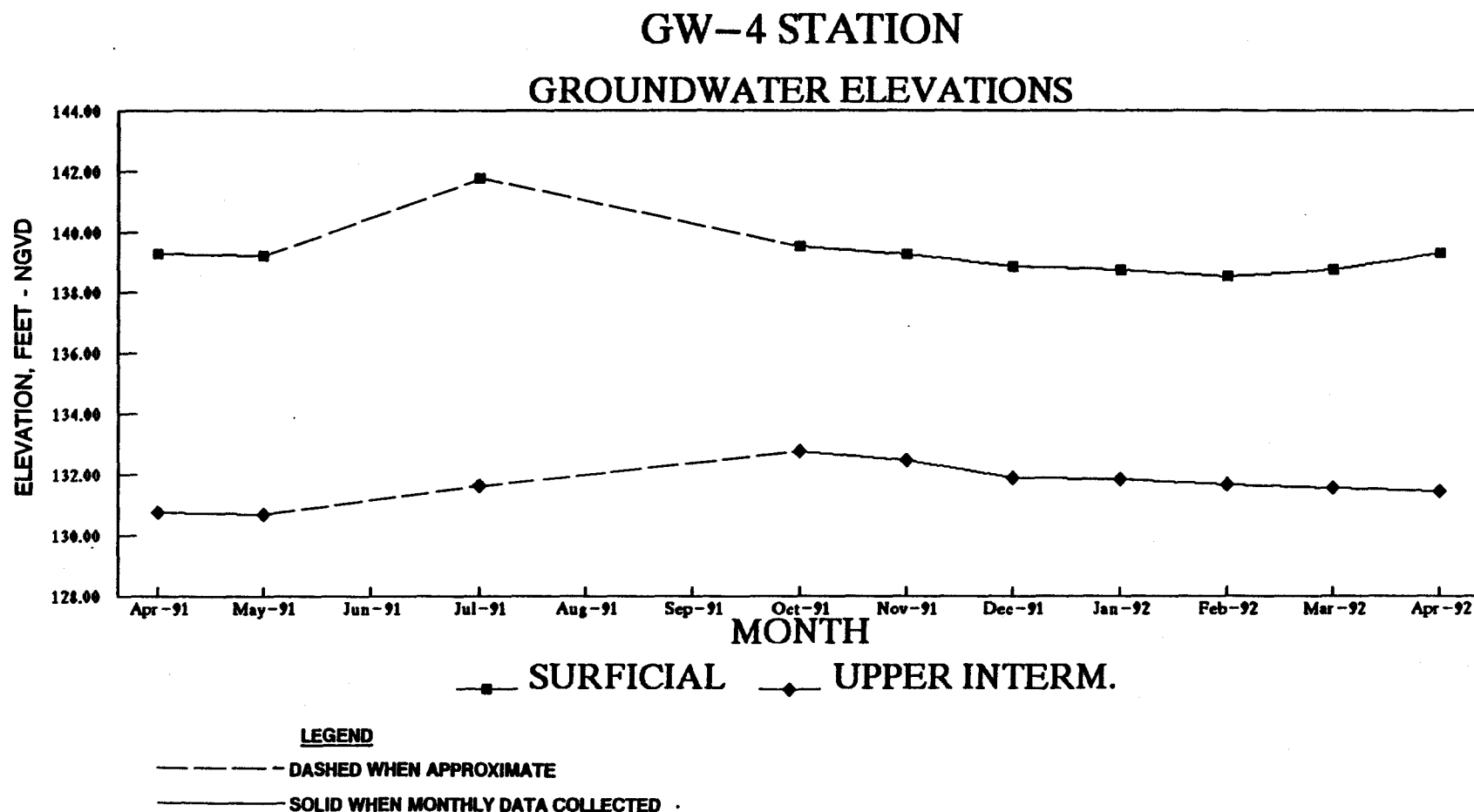


FIGURE 2.3.2-17.

HYDROGRAPH FOR GROUNDWATER MONITOR STATION GW-4

Source: ECT, 1992.



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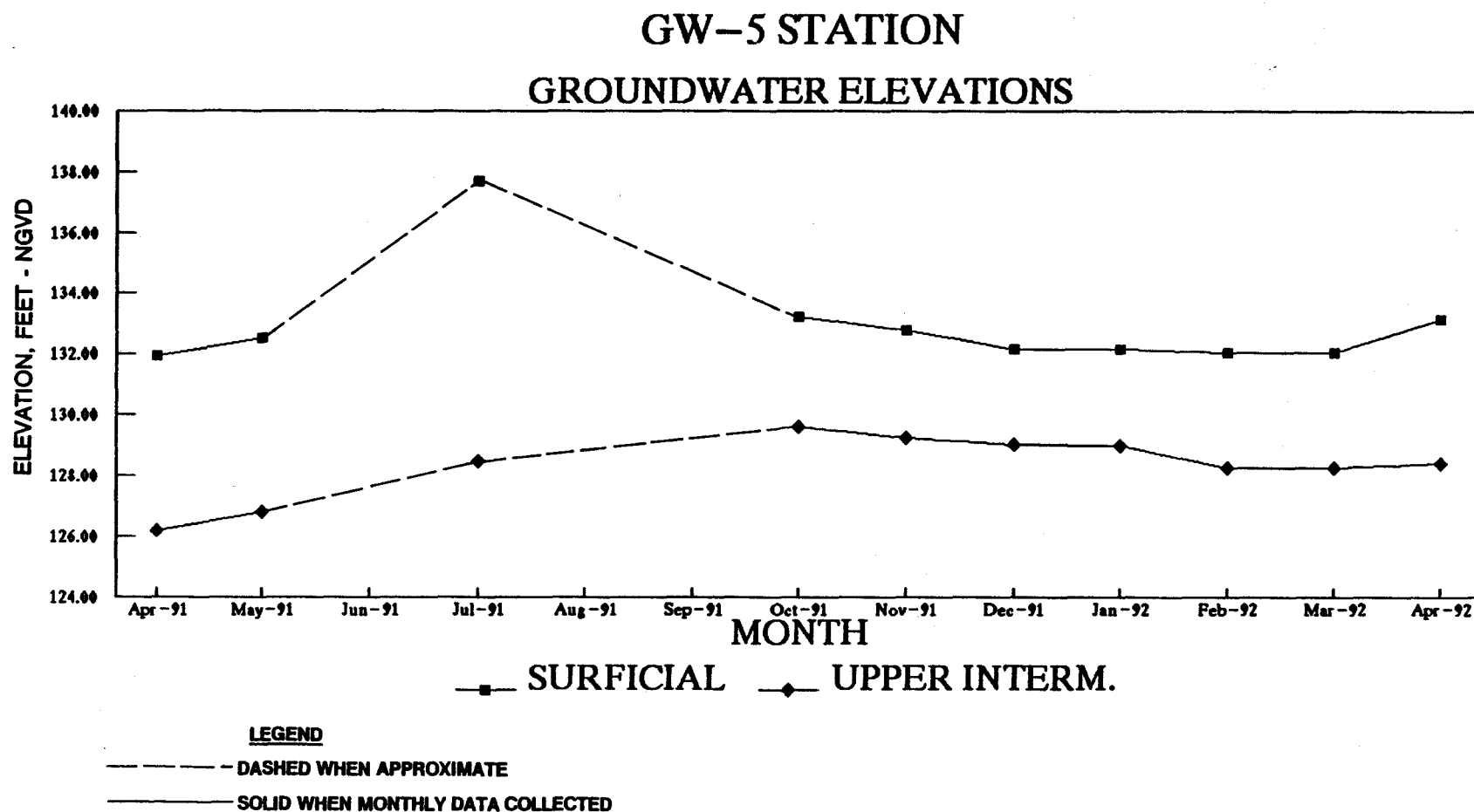


FIGURE 2.3.2-18.

HYDROGRAPH FOR GROUNDWATER MONITOR STATION GW-5

Source: ECT, 1992.



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2.3.2.2 Karst Hydrogeology

The entire state of Florida is underlain by an extensive thickness of carbonate strata. These sedimentary rocks are subject to dissolution by the percolation of naturally occurring and slightly acidic recharge from rainfall. Over time, this process will develop solution cavities and features (secondary porosity) within the rock sequence as recharge infiltrates through the carbonate strata. The irregular surface which eventually results from this process is called *karst topography*. Karst topography is usually recognizable on topographic maps by a high number of circular features, often containing water.

One of the more notable features of such terrain is sinkholes. The circular depressions caused by sinkhole formation are found throughout Florida, including Polk County. Sinkholes may provide an avenue for the surface water, groundwater from an overlying aquifer, and pollutants to rapidly infiltrate into lower stratigraphic units and aquifers. Generally, karst activity occurs at a slow rate resulting with the gradual subsidence of the land surface over a large area. This slow dissolution process of the carbonate strata has been estimated to result in subsidence of as much as 1 ft every 5,000 to 6,000 years (Sinclair *et al.*, 1985). The types of sinkholes which develop in Florida are controlled by the geology and hydrogeology of the region. The three major types of sinkholes common throughout Florida include solution sinkholes, cover-collapse sinkholes, and cover-subsidence sinkholes. These sinkholes are readily distinguishable by their mode of formation.

The thickness and type of cover that overlies the carbonate strata has a significant influence on the susceptibility to and the type of karst topography that develops. The presence of a thick clay sequence or other less permeable material with high artesian pressure reduces the recharge potential. Hence, this type of cover results in less susceptibility to the development of karst features and sinkholes. Figure 2.3.2-19 depicts the various zones of the different type of sinkholes for West Central Florida. The Polk Power Station site is located in Zone 7, where sinkhole development is rare, but some cover-collapse sinkholes are known to occur (Sinclair *et al.*, 1985).

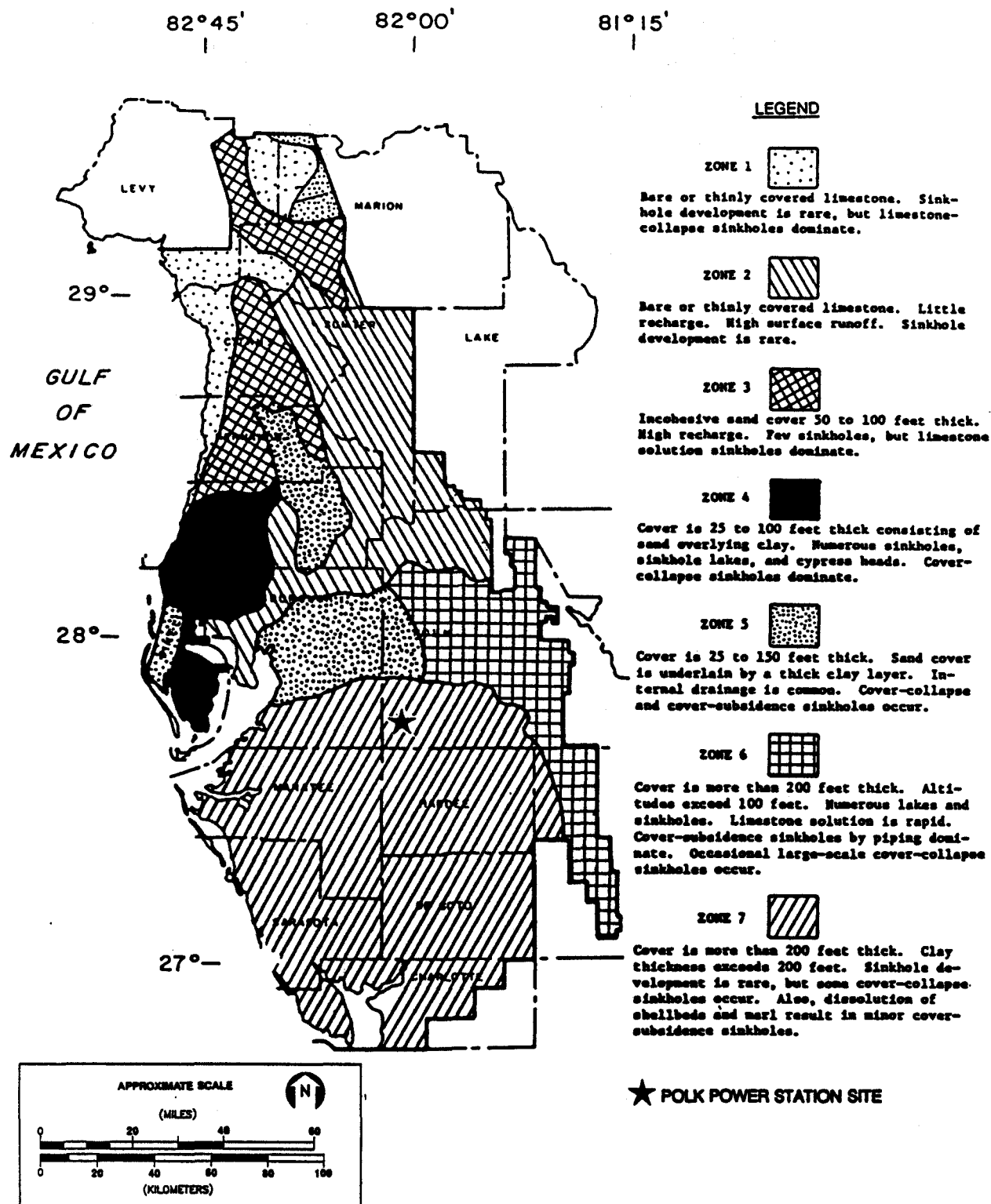


FIGURE 2.3.2-19.

ZONES OF DIFFERENT SINKHOLE TYPES

Source: USGS, Duette NE & Baird Quads.



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The Polk Power Station site is located in the southwest corner of Polk County which appears to have undergone some karst deformation. Through review of two USGS 7.5-minute topographic quadrangles (Duette Northeast and Baird), several closed surface depressions were detected within the site boundaries. Review of the data obtained from the onsite drilling program conducted in support of the Polk Power Station licensing efforts indicates that the surficial depressions investigated have little correlation to the underlying stratigraphy. Thus, it is unlikely that these depressions represent active karst conditions. Much of the area surrounding the site has undergone phosphate mining throughout the 1900s. The mining and reclamation activities have caused irregular landscapes with numerous tailings mounds, clay settling ponds, plus drainage ditches and ponds. These activities limit the usefulness of the topographic maps, so old aerial photographs were also reviewed. The number of sinkholes and circular depressions increases toward the north and northeast of the Polk Power Station site approaching the topographic ridges. These topographic ridges and the gaps between them are believed to be the surface expression of former shoreline terraces and underlying structural features. The clay and dense carbonate sequence of the Hawthorn Group is approximately 250 ft thick beneath the site location. The presence of this thick, relatively impermeable, stratigraphic sequence limits the local recharge to the Floridan aquifer and reduces the potential for sinkhole development.

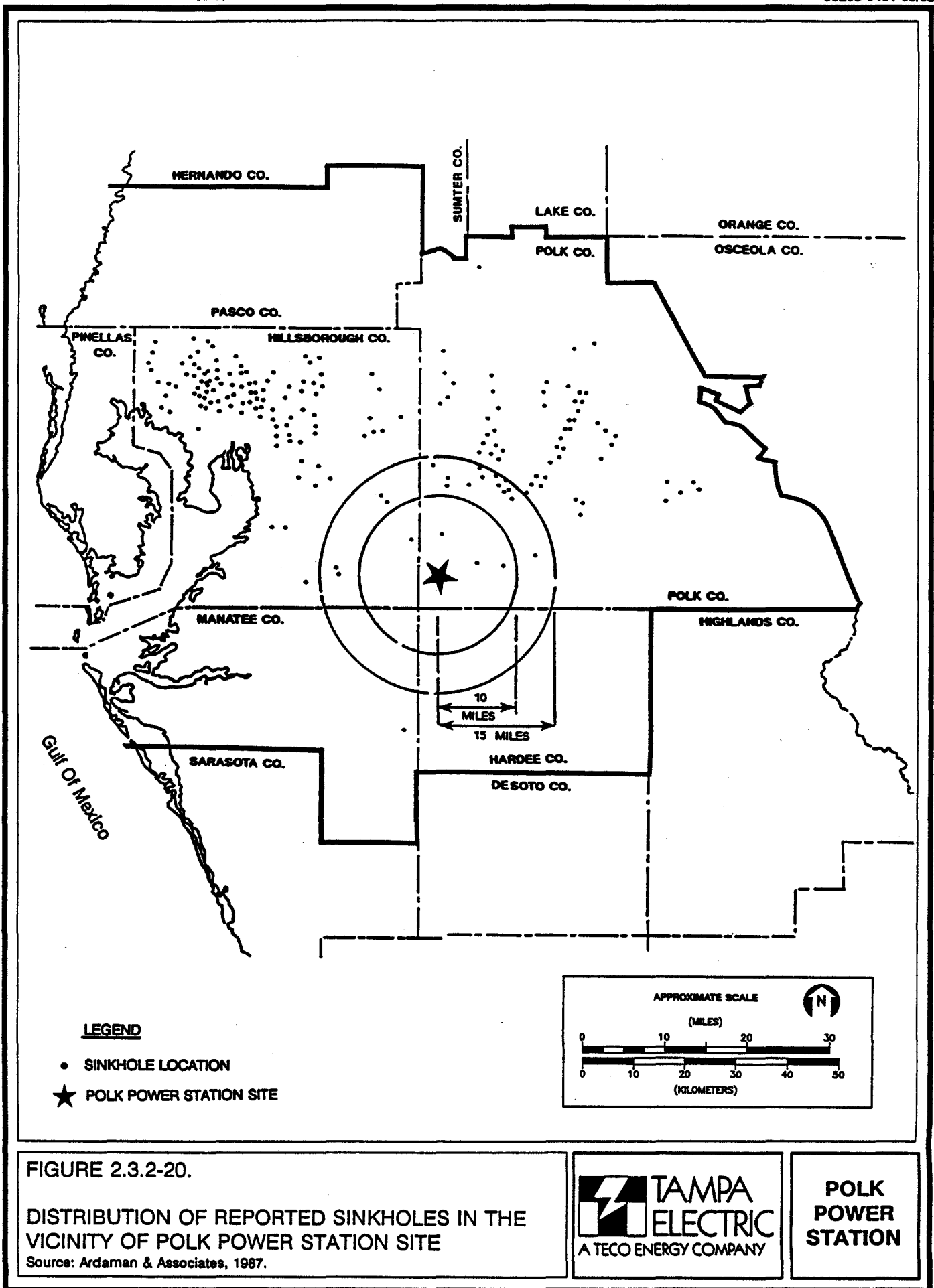
Significant sea level fluctuations occurred during the Pleistocene epoch at the site location making karst activity possible. The various sea level and shoreline elevations include the Okefenokee Shoreline (150 ft-NGVD), Wicomico Shoreline (100 ft-NGVD), Pamlico Shoreline (30 ft-NGVD), and Silver Bluff Shoreline (8 ft-NGVD). These shorelines and the sea level fluctuations would have the greatest likelihood of impacting any geologic units above this elevation. The drilling program at the site indicates that these elevation ranges are represented by the calcareous deposits within the Hawthorn Group. The Suwannee Limestone was not encountered above an elevation of -145 ft-NGVD. This indicates that the carbonate sequence which comprises the Floridan aquifer is relatively deep and should have

been removed from the extensive karst activity and solutioning effects during the Pleistocene epoch.

A sinkhole occurrence assessment included a review of information obtained from the Florida Sinkhole Research Institute (FSRI) and other sinkhole reports. The data indicate that no sinkhole of sufficient size or dimension to be noticed has formed during the site mining activities. Based on the available sinkhole data, only four sinkholes were reported in a 10-mile radius from the site within the past 35 years (Figure 2.3.2-20). Figure 2.3.2-21 illustrates the distance from the site to the reported sinkholes. Table 2.3.2-14 summarizes some pertinent data regarding these four sinkholes.

Thus, through the comparison of the topographic features, structural contours, apparent lineations, and surface-water features, it is evident that geology and structural geology affect the occurrence of sinkholes in Polk County (Sinclair *et al.*, 1985). Based on the available information the potential for sinkhole development at the Tampa Electric Company Polk Power Station site is relatively low, compared to most other areas in Polk County.

Faults, fractures, and lineaments are commonly expressed on aerial photographs and satellite imagery as conspicuous linear features. Features and lineaments are also commonly associated with the presence of sinkholes. Data from available literature and previous studies were reviewed for the identification of linear features in southwest Polk County. A lineament map for Polk and Hillsborough Counties prepared by Ardaman & Associates (1987) is presented as Figure 2.3.2-22. None of the major lineaments identified in this or other studies intersect or pass beneath the Polk Power Station site. In Polk County, the prominent lineations appear to align with the northwest-southeast trend of the Ocala Platform and the topographic ridges with a series of less prominent lineaments at approximate right angles. The topographic ridges and the gaps between them are believed to be the surface expression of underlying structural features (Sinclair *et al.*, 1985).



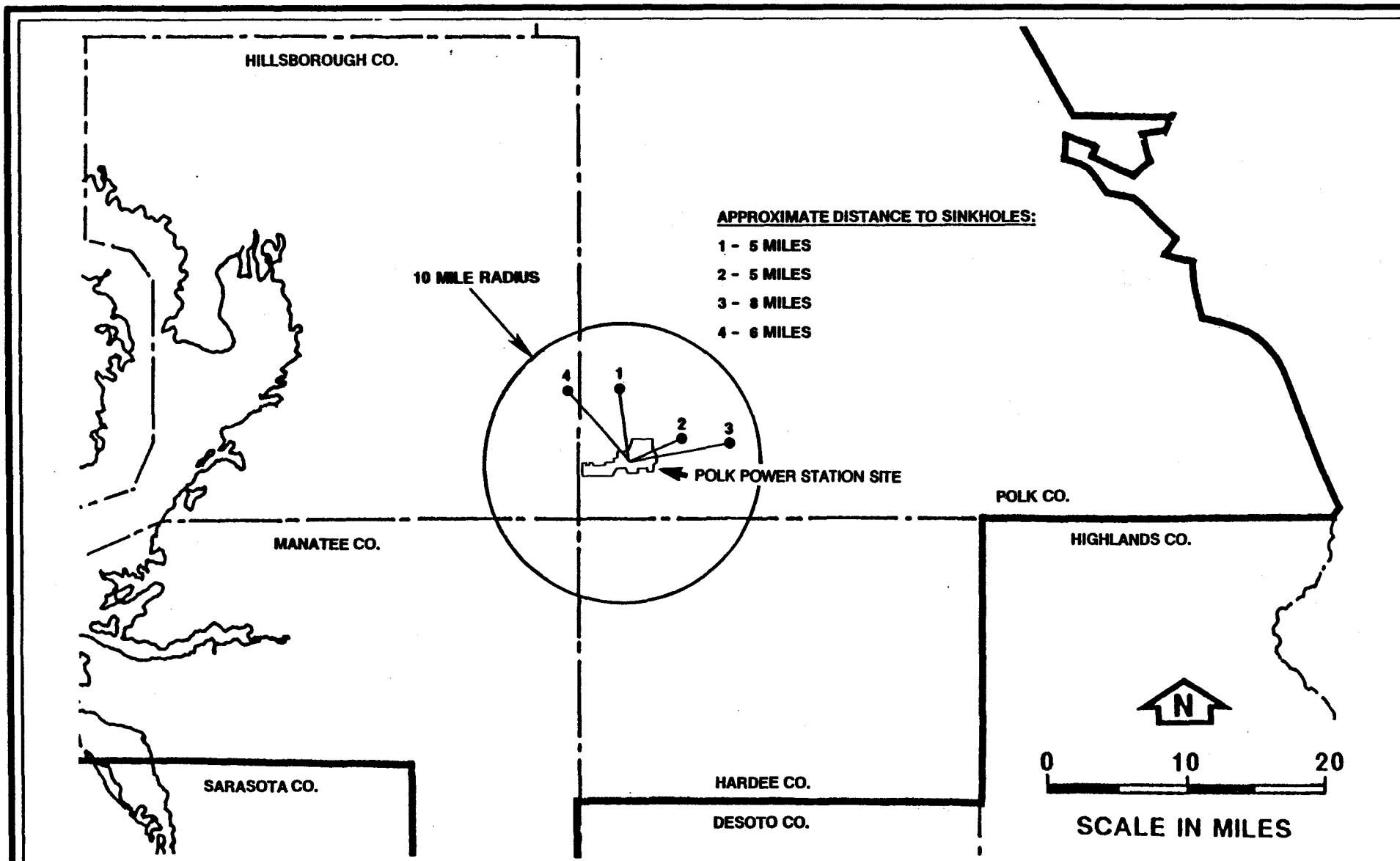


FIGURE 2.3.2-21.

SINKHOLE IDENTIFICATION MAP

Source: FSRI; ECT, 1992.



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Table 2.3.2-14. Available Information on Sinkholes within 10 Miles of the Polk Power Station Site

Sinkhole Number	FSRI Code Number	Year of Occurrence	Location				Section	County	Dimensions (ft)			Elevation (ft-msl)				Rainfall over 90 days before sinkhole developed (inches)
			Longi-tude	Latitude	Range	Town-ship			Length	Width	Depth	Land Surface	Lime-stone	Water Table	Potential Surface	
1	16-703	NA	--	--	--	--	--	Polk	--	--	--	--	--	--	--	--
2	16-704	NA	--	--	--	--	--	Polk	--	--	--	--	--	--	--	--
3	16-017	1968	81 50 05	27 44 35	25E	31S	32	Polk	200	200	45	125	-285	NA	55	NA
4	10-648	1989	82 03 24	27 46 16	22E	31S	24	Hillsborough	100	100	15	122	-130	NA	95	8.75

NA = Specific information not available for these sinkholes from FSRI database.

Sources: FSRI, 1989; confirmed through verbal communication with Barry Beck, Ph.D., January 20, 1992.

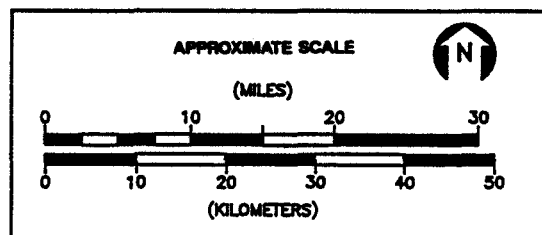
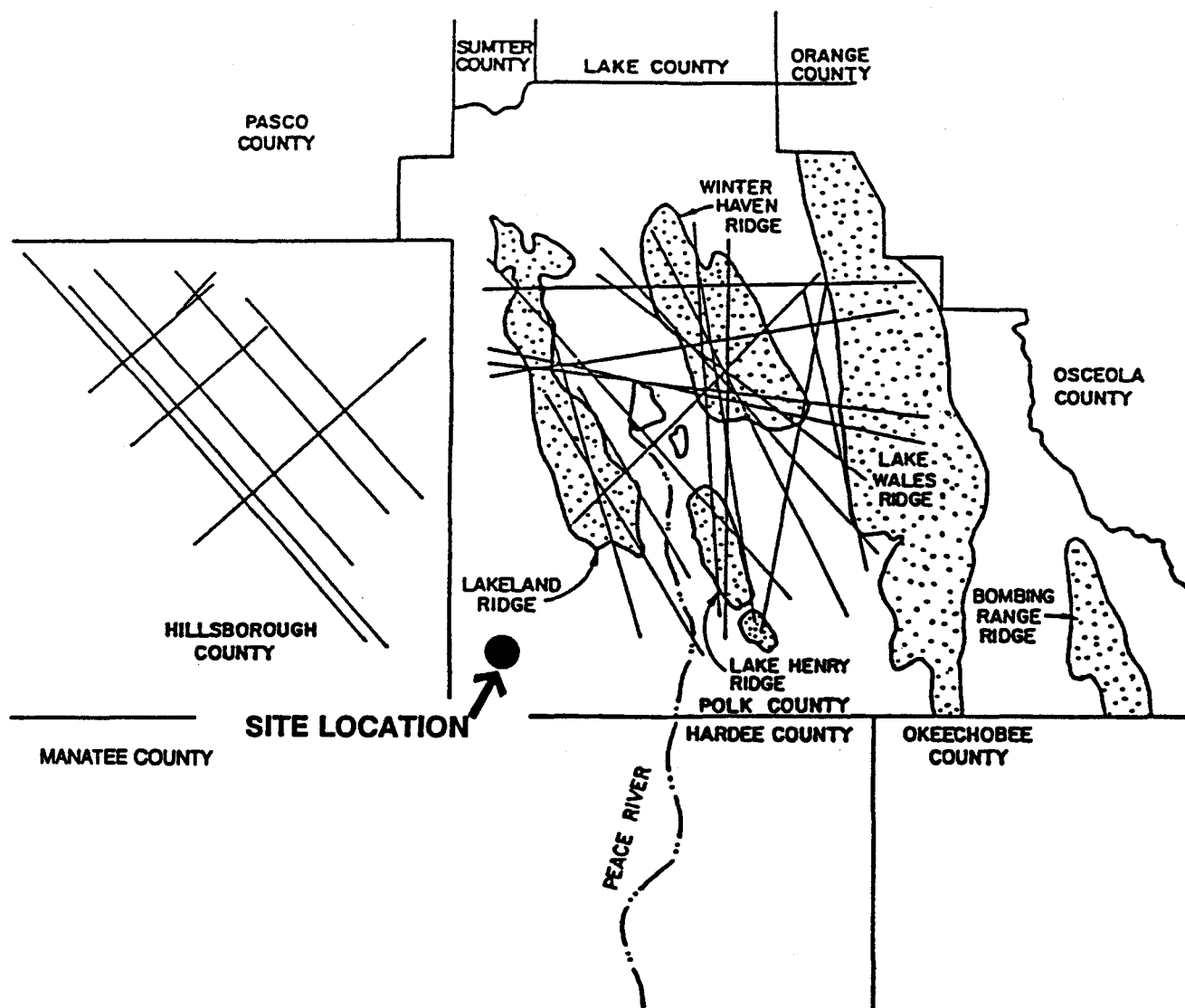


FIGURE 2.3.2-22.

PROMINENT LINEAMENTS IN POLK AND HILLSBOROUGH COUNTIES

Source: Ardaman & Associates, 1987.

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In summary, small surface depressions dot the uplands between the two major stream systems that drain the Tampa Electric Company Polk Power Station area. This area has not been inundated by the sea since pre-Pleistocene time. The scarcity and small size of the depressions suggest that sinkhole activity has been relatively minor in the site area.

Although solution cavities probably exist in the carbonate rocks of the Floridan aquifer, and they may be large, the aquifer is buried beneath approximately 300 ft of unconsolidated clastic and poorly consolidated carbonate rock material. Though possible, it seems highly unlikely that collapse within the deeply-buried Floridan aquifer will have an effect at the land surface.

Carbonate rocks of the intermediate aquifer occur within the surficial clastic sediments at depths of 30 to 50 ft. These are the first carbonate rocks with which water, percolating through the surficial aquifer, makes contact. Solution cavities, particularly in the upper part of the intermediate aquifer, are probably responsible for the small land-surface depressions.

Surface lineations, related to fracture zones in the bedrock, are relatively scarce in the Polk Power Station area, suggesting either that groundwater circulation has not been adequate to develop large solution cavities along fractures, or that the bedrock is too deeply buried for these features to affect the land surface.

Recharge to the intermediate aquifer, and below, is relatively slight. The potential for dissolution of carbonate rocks is, likewise, limited.

The thick section of relatively cohesive sandy clay and clay that overlies the carbonate rocks appears to have sufficient bearing strength to bridge cavities of small to moderate size. When the bearing strength is exceeded, however, collapse at land surface will quickly result. It seems unlikely that sinkholes any larger than the existing small depressions will occur in the area.

A more detailed evaluation and discussion of karst conditions is provided in the Sinkhole Evaluation Report provided in Appendix 11.7.5.

2.3.3 SITE WATER BUDGET AND AREA USES

2.3.3.1 Site Water Budget

Meteorological data representative of the hydrological characteristics of the Polk Power Station site, with the exception of pan evaporation data, were obtained from the National Weather Service (NWS) station at Bartow, Florida, for the years 1941 through 1990. Annual precipitation for the period of record varies from 37.19 to 83.44 inches with an average of 53.42 inches. July has the highest monthly average with 8.48 inches, while November has the lowest with 2.13 inches. The annual average temperature is 72.5°F with extreme low and high temperatures of 18°F and 103°F, respectively, recorded for this region. Table 2.3.3-1 presents a summary of the meteorological data. Appendices 11.8.1, 11.8.2, and 11.8.3 contain the detailed meteorological data.

Pan evaporation data were obtained from the Lake Alfred Experiment Station at Lake Alfred, Florida, for the years 1965 through 1990. Annual pan evaporation for the period of record varies from 66.8 to 86.3 inches with a mean of 73.4 inches. The highest monthly mean occurs in May with 8.7 inches, while December has the lowest monthly mean with 3.3 inches. The pan evaporation rates may be adjusted to indicate lake evaporation rates by multiplying by a pan coefficient of 0.70. The average annual lake evaporation is, therefore, 51.4 inches. Dohrenwend (1976) estimated the evapotranspiration rates for the State of Florida and determined that the general evapotranspiration rate for the project area is approximately 36 inches per year.

The estimated annual runoff from the proposed site for the pre-mining condition was derived from discharge data collected at nearby USGS stream gauging stations (USGS, 1991). The USGS station on the South Prong Alafia River near Lithia, Florida, drains a 107-square-mile (mi²) area and records an average discharge of 101 cubic feet per second (cfs). This is equivalent to 12.82 inches of annual surface and sub-surface runoff for the watershed. The South Prong Alafia River drainage basin lying within the project site boundaries covers 816 acres. Therefore, the estimated average annual discharge from the project site to the South Prong Alafia

Table 2.3.3-1. Meteorological Data from Bartow and Lake Alfred, Florida

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<u>Total Monthly Precipitation (inches)</u>													
Average	2.27	2.97	3.53	2.51	4.57	7.30	8.48	7.39	6.62	2.83	2.13	2.17	53.42
Maximum	7.79	8.42	11.53	8.40	13.05	15.03	17.58	14.39	15.59	9.10	7.40	11.38	83.44
Minimum	0.03	0.24	0.05	0.00	0.02	0.73	2.91	2.60	1.04	0.20	0.00	0.15	37.19
<u>Maximum Daily Precipitation (inches)</u>													
Average	1.00	1.44	1.31	1.24	1.61	2.34	2.07	1.86	2.10	1.23	1.10	1.05	
Extreme	3.36	4.07	4.72	3.56	4.30	9.82	4.00	4.64	6.75	5.06	4.57	3.49	
<u>Monthly Average Temperature (°F)</u>													
	60.9	62.2	67.5	72.3	77.4	80.7	82.1	82.2	80.6	74.6	67.3	62.0	72.5
<u>Monthly Average of Daily Maximum Temperature (°F)</u>													
Maximum	83.1	82.3	87.3	90.3	94.4	95.4	94.9	95.3	93.5	88.6	85.0	79.9	89.1
Average	73.3	75.3	79.9	84.8	89.4	91.7	92.3	92.6	90.4	85.4	79.3	74.4	84.1
<u>Monthly Average of Daily Minimum Temperature (°F)</u>													
Minimum	37.0	43.5	49.4	53.5	60.7	66.8	69.3	68.3	66.5	59.2	48.8	44.5	55.5
Average	49.2	50.7	55.2	59.8	65.3	70.4	71.8	72.1	71.1	64.3	56.7	51.1	61.4
<u>Monthly Pan Evaporation (inches)</u>													
Average	3.5	4.3	6.4	7.7	8.7	7.8	7.7	7.4	6.5	5.7	4.0	3.3	73.4
Maximum	5.4	6.3	8.5	9.7	10.5	9.9	8.9	8.5	8.6	7.1	4.7	4.2	86.3
Minimum	2.8	2.6	5.1	6.9	7.4	6.4	6.4	6.3	5.4	4.1	3.1	2.5	66.8

Source: NWS, 1990.

River is approximately 1.20 cfs. The USGS station on Payne Creek near Bowling Green, Florida, drains 121 mi² and records an average discharge of 96.6 cfs, which is equivalent to 10.84 inches of annual surface and sub-surface runoff for the watershed. The Payne Creek and Little Payne Creek drainage basins lying within the proposed site boundaries cover 716 and 2,816 acres, respectively. Therefore, the estimated average annual discharges from the project site to Payne Creek and Little Payne Creek are 0.89 and 3.51 cfs, respectively. The site hydrology is more extensively discussed in Section 2.3.4.

The peak discharge resulting from the 25-year, 24-hour storm event was computed for the pre-mining condition using the HEC-1 Flood Hydrograph Package. The total precipitation for this event is 9 inches. The peak discharges were computed to be 541 cfs to the South Prong Alafia River, 1,063 cfs to Little Payne Creek, and 506 cfs to Payne Creek. Section 2.3.4 provides additional discussions of the hydrologic modeling and Appendix 11.8.9 provides the detailed pre-mining modeling results.

Groundwater recharge rates for Polk County were examined by SWFWMD for the intermediate and upper Floridan aquifers (SWFWMD, 1988). Stewart (1980) was cited as using the vertical hydraulic conductivity and thickness of the overlying confining layer to calculate recharge to the upper Floridan aquifer in the project area as being less than 2 inches per year. Ryder (1985), using a two-layered, steady-state, digital model, reported the recharge as being 2 to 5 inches per year. SWFWMD staff, using head differences and leakance values, calculated a recharge rate of 2 to 10 inches per year for the area of the proposed site. Using the same technique, SWFWMD staff also estimated the recharge to the intermediate system in the southern west-central Florida groundwater basin as being 0 to 2 inches per year.

Hutchinson (1978) developed a hydrologic budget for the upper Peace and eastern Alafia River basins. Annual average values for inputs and outputs to the zone of shallow groundwater were calculated as follows: precipitation, 48.0 inches (1966-1975); input from streams, 0.3 inches; input by return flow of groundwater pumpage,

5.6 inches; evapotranspiration, 41.2 inches; runoff from Alafia River, 4.1 inches; runoff from Peace River, 5.9 inches; pumpage from the shallow groundwater zone, 0.1 inches; and leakage from the shallow groundwater zone to the lower unit of the Floridan aquifer, 2.6 inches. Although these values cannot be rigidly applied to the proposed site, they agree favorably with the values obtained from other sources.

2.3.3.2 Area Uses

Water use projections have been estimated by SWFWMD (1992) through the year 2020 for its jurisdictional areas. The municipal and other potable water uses in Polk County within the district are expected to increase from a mean rate of 75.0 million gallons per day (MGD) in 1990 to 108.4 MGD in 2020. Increases are expected in agricultural water use, from 140.4 to 224.6 MGD, industrial use, from 67.7 to 128.2 MGD, and recreational use, from 7.6 to 11.3 MGD. Mining related water use is expected to decrease from 90.7 to 37.1 MGD. Overall, the projected average daily water use for Polk County is expected to increase from 381.4 MGD in 1990 to 509.6 MGD in 2020, equivalent to an average annual increase of approximately one percent.

Regional groundwater users with average permitted withdrawal rates exceeding 0.5 MGD are shown in Figure 2.3.3-1 which is accompanied by Table 2.3.3-2. The 36- by 42-mile superimposed grid is the range considered in the regional groundwater modeling of the project and is believed to encompass all influenced areas. The map includes wells used for water supply, industrial, and mining purposes and two water supply well fields.

Table 2.3.3-3 lists the permitted groundwater users located within 5 miles of the proposed site. Of these users, only the facilities operated by Agrico, IMC Fertilizer, Inc., and Seminole Fertilizer Corporation have been permitted for average withdrawal rates exceeding 500,000 gallons per day (gpd). The total average withdrawal rate for the industries listed is approximately 63 MGD. There are no major surface water users within 5 miles of the site.

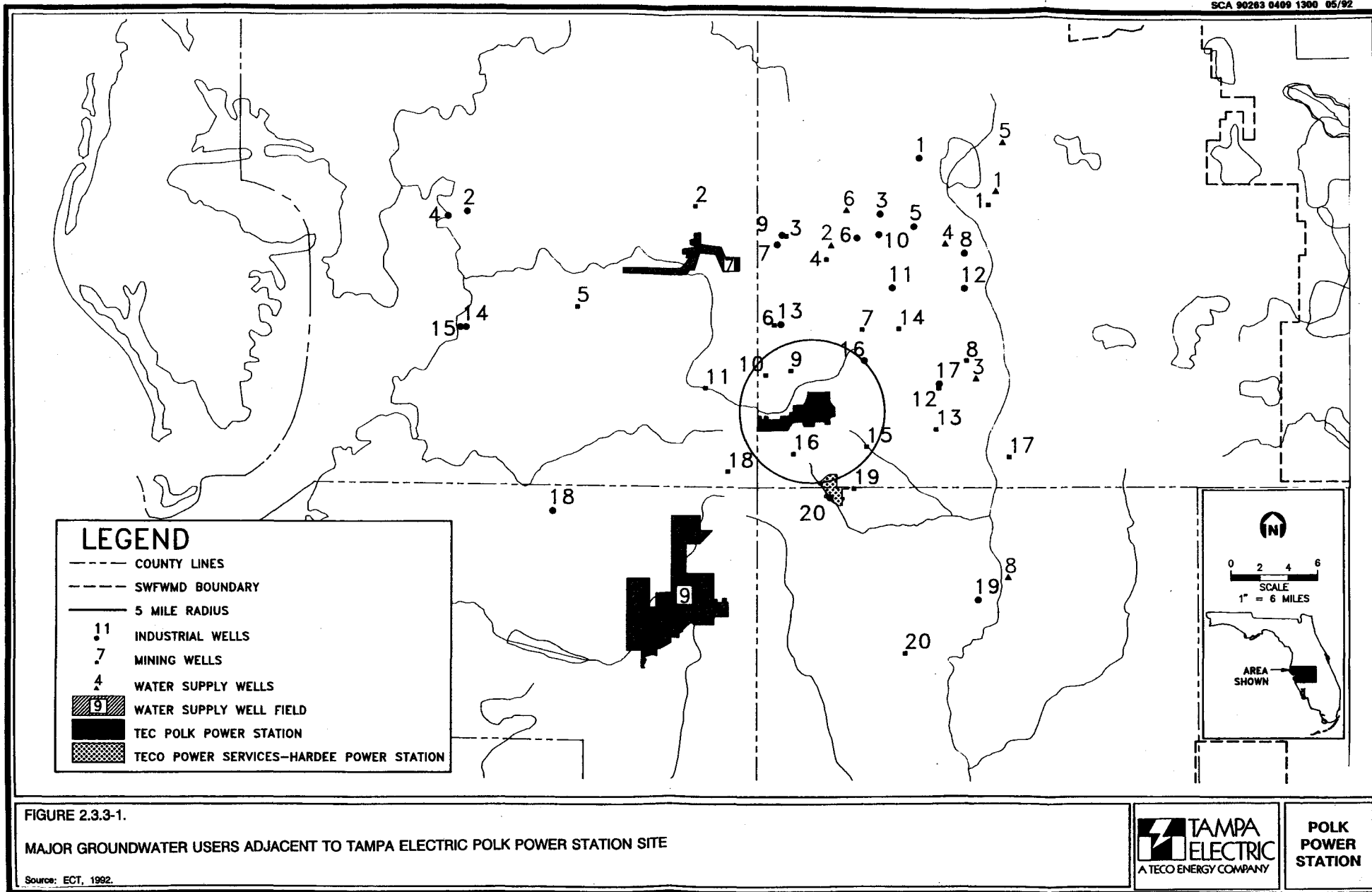


Table 2.3.3-2. Water Use Permits (WUP) with Average Permitted Quantities Above 0.5 MGD as of August 1990

Map Number	Name	WUP Number	Latitude	Longitude	Total Average Permitted (MGD)	Total Maximum Permitted (MGD)
<u>Water Supply Wells</u>						
1	City of Mulberry	06124	--	--	1.3	1.8
2	City of Fort Meade	00645	--	--	1.7	3.3
3	City of Bartow	00341	--	--	3.5	6.3
4	Polk County Board of County Commissioners/ Lake Garfield	06507	--	--	1.3	2.8
5	Polk County Board of County Commissioners/ Lake Garfield	06506	--	--	1.6	2.5
6	City of Winter Haven	04607	--	--	7.6	13.1
7	South Central Hillsborough Regional	04352	--	--	24.1	44.6
8	City of Wauchula	04461	--	--	0.9	1.5
9	MCPWD-East County Wellfield	07470	--	--	12.0	13.5
<u>Industrial Wells</u>						
1	Allsun Products	0022602	275810	815246	0.7	1.0
2	Nitram, Inc.	0193004	275437	822338	0.6	0.9
3	W.R. Grace & Company	0222401	275441	815521	7.5	8.6
4	IMC Fertilizer, Inc.	0305003	275419	822454	3.7	4.6
5	U.S. Agri-chemicals	0044001	275400	815258	7.4	9.7
6	Royster Company	0319502	275314	815650	2.0	2.5
7	Conserv, Inc.	0376702	275243	820223	6.3	10.5

2.3.3-6

Table 2.3.3-2. Water Use Permits (WUP) with Average Permitted Quantities Above 0.5 MGD as of August 1990
(Continued, Page 2 of 3)

Map Number	Name	WUP Number	Latitude	Longitude	Total Average Permitted (MGD)	Total Maximum Permitted (MGD)
8	Orange-Co of Florida, Inc.	0283402	275224	814941	0.7	--
9	Mobil Mining & Minerals Company	0231702	275317	820200	13.3	15.1
10	CF Chemical, Inc.	0061003	275333	815528	7.8	18.5
11	Farmland Industries, Inc.	0153902	275022	815435	9.5	15.0
12	Kaplan Industries, Inc.	0240703	275020	814942	1.0	--
13	IMC Fertilizer, Inc.	0305302	274800	820201	20.7	32.0
14	Tampa Electric Company	0623301	274739	822347	1.0	1.9
15	Tampa Electric Company	0537900	274740	822356	8.6	10.8
16	Agrico Chemical Company	0067802	274550	815615	2.3	8.2
17	U.S. Agri-Chemicals	0043802	274437	815108	8.6	12.0
18	Florida Power & Light Company	0542304	273621	821735	1.9	8.6
19	American Orange Corporation	0011201	273059	814826	1.3	2.6
20	TECO Power Services--Hardee Power Station	0209731	273816	815752	3.8	8.6

Mining Wells

1	IMC Fertilizer, Inc.	0083801	275539	814757	0.5	0.7
2	IMC Fertilizer, Inc.	0103903	275452	820755	2.7	3.6
3	Mobil Mining & Minerals Company	0231702	275317	820200	13.2	15.1
4	IMC Fertilizer, Inc.	0304902	275153	814851	23.3	27.0
5	Phillips & Jordan, Inc. (Corporation)	0636601	274851	821557	0.5	2.2

Table 2.3.3-2. Water Use Permits (WUP) with Average Permitted Quantities Above 0.5 MGD as of August 1990
(Continued, Page 3 of 3)

Map Number	Name	WUP Number	Latitude	Longitude	Total Average Permitted (MGD)	Total Maximum Permitted (MGD)
6	IMC Fertilizer, Inc.	0305302	274800	820201	20.7	32.0
7	Seminole Fertilizer, Inc.	0002904	274645	815628	5.8	7.2
8	Mobil Mining & Minerals Company	0231802	274559	814923	14.0	15.0
9	IMC Fertilizer, Inc.	0078102	274513	820118	7.5	14.8
10	Mobil Oil Corporation	0033202	274453	820353	6.4	7.9
11	IMC Fertilizer, Inc.	0020302	274403	820708	6.0	7.7
12	U.S. Agri-Chemicals	0147704	274429	815119	9.3	15.3
13	Gardinier, Inc.	0229704	274145	815121	12.0	15.0
14	Estech, Inc.	0384102	274752	815358	6.5	13.7
15	Agrico Mining Company	0107801	274029	815605	9.0	12.0
16	Agrico Mining Company	0108101	273957	820100	13.8	17.3
17	Mobil Mining & Minerals Company	0540301	273958	814616	16.5	19.0
18	IMC Fertilizer, Inc.	0357303	273847	820530	10.8	15.0
19	CF Industries, Inc.	0366902	273755	815653	7.7	10.3
20	Nu-Gulf Industries, Inc.	0374001	273014	820827	8.0	12.9
21	Farmland Industries, Inc.	0526402	272654	815216	9.2	18.0

Note: -- = no data available.

Source: SWFWMD, 1992.

Table 2.3.3-3. Summary of Permitted Wells Within a 5-Mile Radius of the Tampa Electric Company Polk Power Station Site

WPI No.	CUP Permittee	Total Permitted Average (gpd)	Total Permitted Maximum (gpd)	Permitted Average Daily (gpd)	Section	Township	Range	Use	Number of Wells
03053-03	IMC Fertilizer, Inc.	20,736,000	32,000,000	0	8,9,10,11,13	31	23	Mining	32
10298-00	Polk County Board of Commissioners	175,000	0	0	11	31	23	Public supply	2
00781-03	IMC Fertilizer, Inc.	9,320,000	18,600,000	0	14,20,25,26,27,28,29,34,36	31	23	Mining	14
00029-05	Seminole Fertilizer Corporation	6,380,000	720,000	0	30,31	31	24	Mining	
					12,13,23,24,36	31	23	Mining	9
					7,18,17,19,21,28,30,31,32,33	31	24	Mining	9
					12	32	23	Mining	9
					4,5,6,7,8,9,16,17,18	32	24	Mining	9
10564-00	Jerry M. Holt	4,400	0	0	14	31	23	Irrigation	1
01078-01	Agrico Chemical Company	9,000,000	12,000,000	8,089,500	36	31	23	Mining	1
					14,23,24,25,26,30	32	23	Mining	2
					30	32	24	Mining	1
					10,15,16,17,20,21,27,28,33	32	23	Mining	12
01081-01	Agrico Chemical Company	13,804,000	17,284,000	12,406,550					
06670-03	Agrico Chemical Company	327,000	4,710,000	217,000	16,17,28,29	32	23	Irrigation	5
01884-03	Isham M. Sharpe	161,000	2,460,000	155,000	5,7,8	32	23	Irrigation	2
02514-02	Isham M. Sharpe	83,600	840,000	0	4	32	23	Irrigation	1
04547-01	Guy A. Lamb	20,000	260,000	17,600	1	32	23	Irrigation	1
05757-01	Richard Clark	41,300	1,152,000	33,419	5	32	23	Irrigation	1
06377-01	Claude E. Mann, Inc.	38,000	420,000	0	6	32	23	Irrigation	1
06987-01	Charles G. Robinson	95,700	1,590,000	71,800	5	32	23	Irrigation	1
08459-01	Polk County Board of Commissioners	25,000	0	0	9	32	23	Irrigation	4
01915-02	Hubert A. Walker	28,000	310,000	0	18	32	23	Irrigation	1
06143-01	Imperial Phosphates, Inc.	62,400	96,000	60,800	25	31	23	Industrial	1
08647-00	William Dobbs	16,800	165,000	16,800	27	31	23	Irrigation	1
00678-02	Agrico Chemical Company	2,330,000	8,160,000	1,820,000	20,29,30	31	24	Industrial	5
09836-00	John C. Barnett	14,000	165,000	0	33	31	24	Irrigation	1

Source: SWFWMD, 1992.

A local survey was conducted to identify non-permitted wells located within 2 miles of the perimeter of the site. Approximately 110 wells, primarily residential, were found concentrated along Albritton and Bethlehem Roads. Table 2.3.3-4 lists these wells. Of those wells in which information is available, the casing diameter is generally 2 or 4 inches, and the depth of the well is between 25 and 420 ft. Figures 2.3.3-2 and 2.3.3-3 illustrate the residence locations; the number of these figures correlates to the data provided in Table 2.3.3-4.

Table 2.3.3-4. Summary of Non-Permitted Residential Wells Within 2 Miles of the Tampa Electric Company Polk Power Station Site Boundaries

Number	Name	County	Quarter	Quarter	Section	Town- ship	Range	Casing Diameter (inches)	Casing Depth (ft)	Well Depth (ft)	Wells Present
1,2	Mulberry Welding	P	SW	NW	3	32S	23E	4	90	--	1
3	Mr. Sharpe	P	SE	NE	5	32S	23E	4	--	--	1
3A	Mr. Sharpe	P	SE	NE	5	32S	23E	4	--	--	1
4	Ray Albritton	P	SW	NE	5	32S	23E	2	46	156	1
5	N/A	P	NW	SE	5	32S	23E	--	--	--	1
6	David Wheeler	P	NW	SE	5	32S	23E	4	--	240	1
6A	David Wheeler	P	NW	SE	5	32S	23E	2	--	25	1
7	N/A	P	NW	SE	5	32S	23E	--	--	--	1
8	C. Perry	P	NW	SE	5	32S	23E	4	--	200	1
9	T. Morris	P	NW	SE	5	32S	23E	4	--	--	1
9A	T. Morris	P	NW	SE	5	32S	23E	2	--	--	1
10	N/A	P	NW	SE	5	32S	23E	--	--	--	--
11	N/A	P	NW	SE	5	32S	23E	--	--	--	--
12	N/A	P	NW	SE	5	32S	23E	--	--	--	--
13	Mark Spivey	P	NW	SE	5	32S	23E	2	--	88	1
14	Milla	P	NW	SE	5	32S	23E	--	--	--	--
15	Simpsons	P	NW	SE	5	32S	23E	2	--	30	1
16	N/A	P	SW	SE	5	32S	23E	2	--	--	1
17	Cochran	P	SW	SE	5	32S	23E	--	--	--	--
20	N/A	P	SE	NW	5	32S	23E	--	--	--	--
21	N/A	P	SE	NW	5	32S	23E	--	--	--	--
22	N/A	P	NE	NW	5	32S	23E	--	--	--	--
23	N/A	P	NE	SW	5	32S	23E	--	--	--	1
24	N/A	P	SW	NW	5	32S	23E	--	--	--	--
25	N/A	P	SW	NW	5	32S	23E	--	--	--	--
26	McNeil	P	SW	NW	5	32S	23E	2	--	87	1
26A	McNeil	P	SW	NW	5	32S	23E	2	--	35	1

2.3.3-11

Table 2.3.3-4. Summary of Non-Permitted Residential Wells Within 2 Miles of the Tampa Electric Company Polk Power Station Site Boundaries
(Continued, Page 2 of 5)

Number	Name	County	Quarter	Quarter	Section	Town- ship	Range	Casing Diameter (inches)	Casing Depth (ft)	Well Depth (ft)	Wells Present
27	James Gant	P	SE	NW	5	32S	23E	2	--	--	1
28	N/A	P	SW	NW	5	32S	23E	--	--	--	--
29	N/A	P	NW	SW	5	32S	23E	--	--	--	1
30	N/A	P	NW	SW	5	32S	23E	--	--	--	--
31	Rick Strawbridge	P	NW	SW	5	32S	23E	2	--	--	1
32	N/A	P	NW	SW	5	32S	23E	--	--	--	--
33	N/A	P	SW	NW	5	32S	23E	--	--	--	--
34	Fowler	P	NE	SE	6	32S	23E	2	--	--	1
35	Borden Pearce	P	SE	NE	6	32S	23E	2	--	84	1
35A	Borden Pearce	P	SE	NE	6	32S	23E	1.5	--	94	1
38	N/A	P	SE	NE	6	32S	23E	--	--	--	--
39	N/A	P	NE	SE	6	32S	23E	--	--	--	--
40	N/A	P	SE	NE	6	32S	23E	--	--	--	--
41	N/A	P	NW	NE	6	32S	23E	--	--	--	--
42	N/A	P	NW	SE	6	32S	23E	--	--	--	--
43	N/A	P	SW	NE	6	32S	23E	--	--	--	--
44	N/A	P	SW	NE	6	32S	23E	--	--	--	--
45	N/A	P	SW	NE	6	32S	23E	--	--	--	--
46	N/A	P	NW	SE	6	32S	23E	4	--	--	1
47	N/A	P	NW	SE	6	32S	23E	2	--	--	1
48	Nancy Walls	P	SW	NE	6	32S	23E	4	--	--	1
49	N/A	P	SW	NE	6	32S	23E	--	--	--	--
50	N/A	P	NW	SE	6	32S	23E	--	--	--	--
51	N/A	P	NE	SW	6	32S	23E	2	--	--	1
52	N/A	P	NE	SW	6	32S	23E	2	--	--	1
53	N/A	P	NE	SW	6	32S	23E	4	--	--	1
54	Starling	P	SW	NW	6	32S	23E	--	--	--	1

2.3.3-12

Table 2.3.3-4. Summary of Non-Permitted Residential Wells Within 2 Miles of the Tampa Electric Company Polk Power Station Site Boundaries
(Continued, Page 3 of 5)

Number	Name	County	Quarter	Quarter	Section	Town- ship	Range	Casing Diameter (inches)	Casing Depth (ft)	Well Depth (ft)	Wells Present
55	N/A	P	NW	SW	6	32S	23E	--	--	--	--
56	N/A	P	NW	SW	6	32S	23E	2	--	--	1
57	N/A	P	SW	NW	6	32S	23E	--	--	--	--
58	Cochran	P	SW	NW	6	32S	23E	2	--	--	1
58A	Cochran	P	SW	NW	6	32S	23E	2	--	--	1
59	George Pope	P	SW	NW	6	32S	23E	4	--	80	1
60	Carmin Howell	P	NW	SW	6	32S	23E	4	--	--	1
61	N/A	P	NW	SW	6	32S	23E	2	--	--	1
62	O'Neal	P	NW	SW	6	32S	23E	2	--	--	1
63	Simmons	P	SW	NW	6	32S	23E	4	--	230	1
64	N/A	P	SW	NW	6	32S	23E	2	--	--	1
65	N/A	P	SW	NW	6	32S	23E	4	--	--	1
66	N/A	H	NE	SE	1	32S	22E	--	--	--	--
68	N/A	H	NW	SE	1	32S	22E	2	--	--	1
69	N/A	H	NE	NE	12	32S	22E	2	--	--	1
70	N/A	P	SW	SW	6	32S	23E	--	--	--	--
71	N/A	P	SW	SW	6	32S	23E	2	--	--	1
72	N/A	P	SE	SW	6	32S	23E	--	--	--	--
73	N/A	P	NE	NW	7	32S	23E	--	--	--	--
74	N/A	P	SE	SW	6	32S	23E	2	--	--	1
75	Alderman	P	SW	SE	6	32S	23E	--	--	--	1
75A	Alderman	P	SW	SE	6	32S	23E	--	--	--	1
76	N/A	P	NW	NE	7	32S	23E	--	--	--	--
77	N/A	P	NE	NE	7	32S	23E	--	--	--	--
78	N/A	P	NE	NW	8	32S	23E	--	--	--	--
79	N/A	P	SE	SW	5	32S	23E	--	--	--	--
80	N/A	P	NE	NW	8	32S	23E	--	--	--	--

2.3.3.13

Table 2.3.3-4. Summary of Non-Permitted Residential Wells Within 2 Miles of the Tampa Electric Company Polk Power Station Site Boundaries
(Continued, Page 4 of 5)

Number	Name	County	Quarter	Quarter	Section	Town- ship	Range	Casing Diameter (inches)	Casing Depth (ft)	Well Depth (ft)	Wells Present
81	N/A	P	SW	SE	5	32S	23E	--	--	--	--
83	N/A	P	SW	SE	5	32S	23E	--	--	--	--
84	N/A	P	SW	SW	4	32S	23E	--	--	--	--
85	N/A	P	SW	SW	4	32S	23E	--	--	--	--
86	N/A	P	SW	SW	4	32S	23E	--	--	--	--
87	N/A	P	SE	SW	4	32S	23E	--	--	--	--
88	N/A	P	SE	SW	4	32S	23E	--	--	--	--
89	N/A	P	SE	SW	4	32S	23E	--	--	--	--
90	N/A	P	SE	SW	4	32S	23E	--	--	--	--
91	N/A	H	NE	NE	12	32S	22E	--	--	--	--
92	N/A	H	SE	NE	12	32S	22E	--	--	--	--
93	N/A	H	SE	NE	12	32S	22E	--	--	--	--
94	N/A	H	NE	SE	12	32S	22E	4	--	--	1
95	N/A	H	NE	SE	12	32S	22E	4	--	--	1
96	Rick Jackson	H	NE	SE	12	32S	22E	4	--	380	1
96A	Rick Jackson	H	NE	SE	12	32S	22E	4	--	420	1
97	N/A	H	SW	SE	12	32S	22E	4	--	--	1
98	N/A	H	SW	SE	12	32S	22E	4	--	--	1
99	N/A	H	SW	SE	12	32S	22E	2	--	--	1
100	Tucker	H	SE	SW	12	32S	22E	4	--	--	1
100A	Tucker	H	SE	SW	12	32S	22E	2	--	--	1
101	N/A	H	SE	SW	12	32S	22E	2	--	--	1
102	N/A	H	SW	SW	12	32S	22E	2	--	--	1
103	N/A	H	SW	SW	12	32S	22E	4	--	--	1
104	N/A	H	SW	SW	12	32S	22E	--	--	--	--
105	N/A	H	SW	SW	12	32S	22E	--	--	--	--
106	N/A	H	SW	SW	12	32S	22E	--	--	--	--

Table 2.3.3-4. Summary of Non-Permitted Residential Wells Within 2 Miles of the Tampa Electric Company Polk Power Station Site Boundaries
(Continued, Page 5 of 5)

Number	Name	County	Quarter	Quarter	Section	Town- ship	Range	Casing Diameter (inches)	Casing Depth (ft)	Well Depth (ft)	Wells Present
107	N/A	H	SW	SW	12	32S	22E	4	--	--	1
110	N/A	H	SE	NE	14	32S	22E	--	--	--	--
112	N/A	H	SE	NE	14	32S	22E	--	--	--	--
113	Thornto (or) Lamb	P	--	--	35	31S	23E	4	68	240	1
114	Thornto (or) Lamb	P	--	--	35	31S	23E	4	--	--	--
115	Wayne Lamb	P	SE	SE	1	32S	23E	4	76	224	1
116	Guy Lamb	P	--	--	--	32S	23E	4	73	228	1
117	J. Bennett	P	--	--	11	32S	23E	8	--	--	--

Note: Retained, but questionable:

20 - Gate locked, no mail box, no visible structure.

21 - Gate locked, no mail box, no visible structure.

22 - Gate locked, no mail box, no visible structure.

39 - No one home, windows broken out.

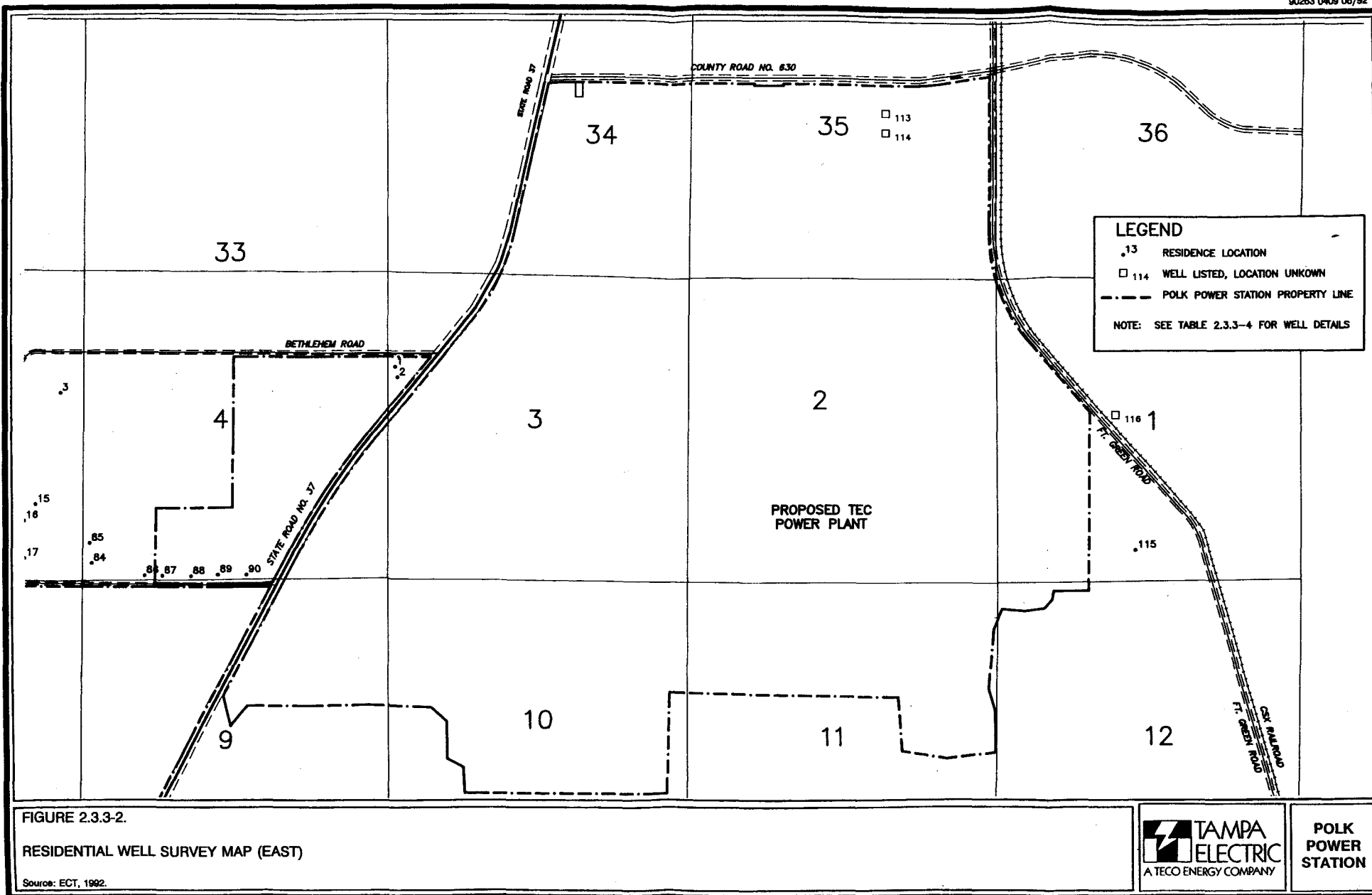
NA = name not available, residence with no individual home during survey.

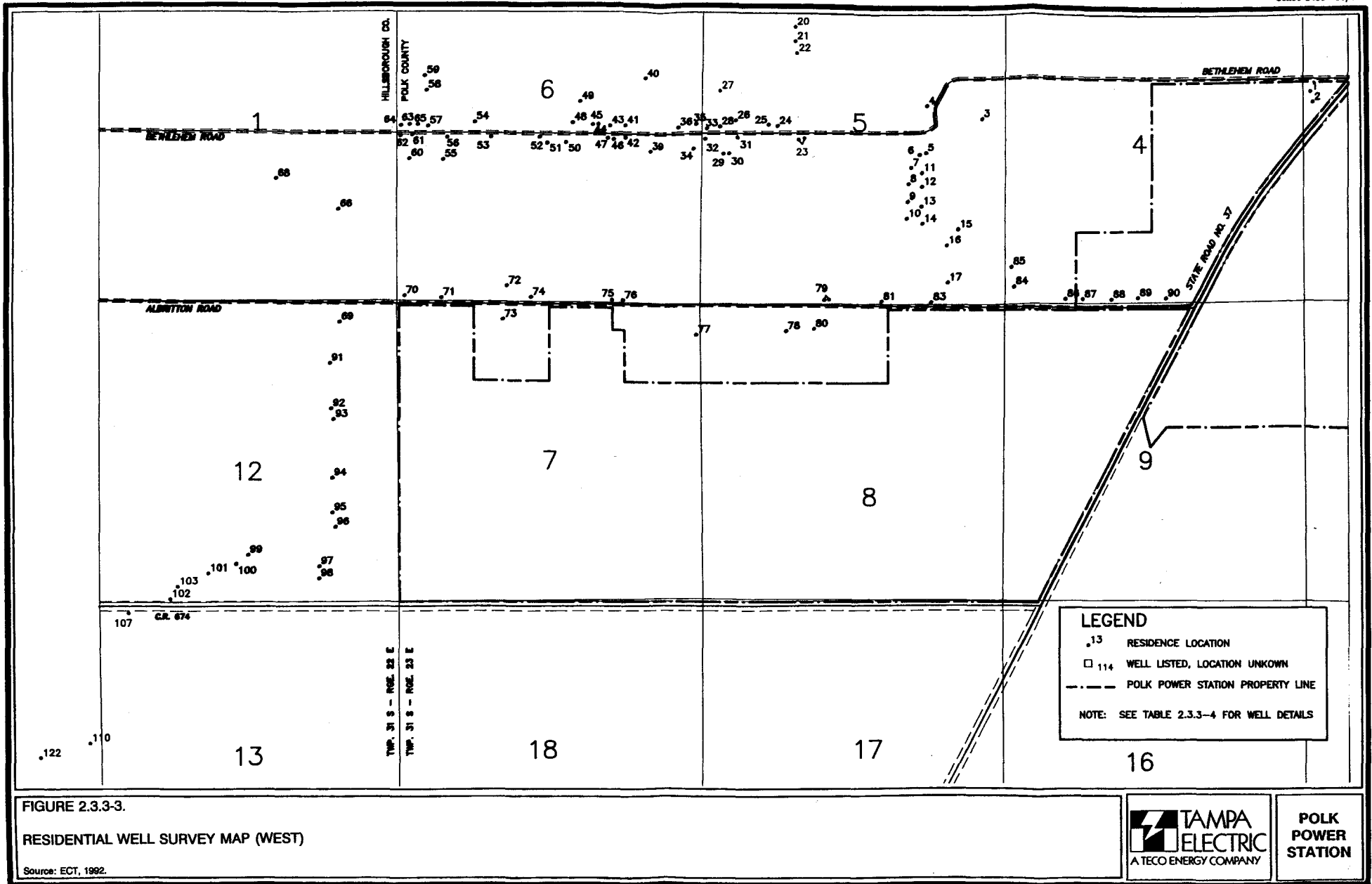
-- = no data available.

P = Polk County.

H = Hillsborough County.

Source: ECT, 1992.





2.3.4 SURFICIAL HYDROLOGY

2.3.4.1 Hydrologic Characterization

Surface Water Quantity

The field measurement program conducted in support of the Polk Power Station project is described in Section 2.3.4.2. This information augmented the substantial quantity of existing water quantity and quality data available from various sources such as USGS, EPA STORET, and FDER. The following hydrologic characterization is based on the aforementioned data.

The portion of the Polk Power Station site to the east of SR 37 consists primarily of mined-out lands with water-filled mine cuts between spoil piles surrounding an unmined parcel of land and old mined and unreclaimed lands. The area to the west of SR 37 is currently being mined for phosphate matrix and these operations are scheduled to continue into 1994. In general, lands surrounding the site and in the region have also been impacted by previous and ongoing phosphate mining operations. Most of the project site is located within the Fort Green Mine operated by Agrico.

The area within the site boundaries is drained by three streams: the South Prong Alafia River, Payne Creek, and Little Payne Creek. The South Prong Alafia River is a tributary of the Alafia River which flows into Hillsborough Bay; Payne Creek and Little Payne Creek are tributaries of the Peace River which flows into Charlotte Harbor.

Before mining operations in the site area, hereafter referred to as the pre-mining condition, the project site included 816 acres in the South Prong Alafia River watershed located in the north and northwest portions of the property to the west of SR 37 and the extreme northwest corner of the property to the east of SR 37. The Payne Creek watershed included 716 acres located in the southeast portion of the tract lying to the west of SR 37, and the Little Payne Creek watershed included 2,816 acres all located to the east of SR 37. The pre-mining watershed boundaries

within the project site are shown in Figure 2.3.4-1. The total drainage areas, including offsite areas, at selected locations along the streams for the pre-mining condition are presented in Table 2.3.4-1.

According to the SCS soil survey of Polk County (SCS, 1990), the soils of the project site have been classified in the general soil groups Smyrna-Myakka, which is described as nearly level poorly drained sandy soils, some underlain by loamy material, and Arents-Water, which are soils that have been strip mined for phosphate or silica sand. More specifically, the western and northern portions of the site are primarily represented by the Smyrna-Myakka soil complex and the southeastern portion mostly Arents-Water complex.

USGS has maintained two stream gauging stations located near the proposed project site with long-term water-stage records. The gauge on the South Prong Alafia River near Lithia, Florida [Station No. 02301300 at latitude 27° 47' 47" north and longitude 82° 07' 04" west (Section 9, Township 31 South, Range 22 East)], is located approximately 8 miles northwest of the Polk Power Station site and approximately 10 miles downstream from the project boundary (see Figure 2.3.4-2). The total drainage area at this station is 107 mi² and the average discharge is 101 cfs for the period of record from December 1962 through September 1990. Another gauge on Payne Creek near Bowling Green, Florida [Station No. 02295420 at latitude 27° 37' 13" north and longitude 81° 49' 33" west (Section 9, Township 33 South, Range 25 East)], is approximately 12 miles southeast of the site and approximately 16 miles downstream from the project boundary. The drainage area at this station is 121 mi² and the average discharge is 96.6 cfs for the period of record from October 1963 to September 1968 and from October 1979 through September 1990. The mean monthly discharges at both gauging stations are listed in Appendix 11.8.4.

The average flows and drainage areas of five USGS gauging stations in west-central Florida are shown in Table 2.3.4-2. The discharge per square mile was calculated for each station. The values for the gauges along the Alafia River system range from

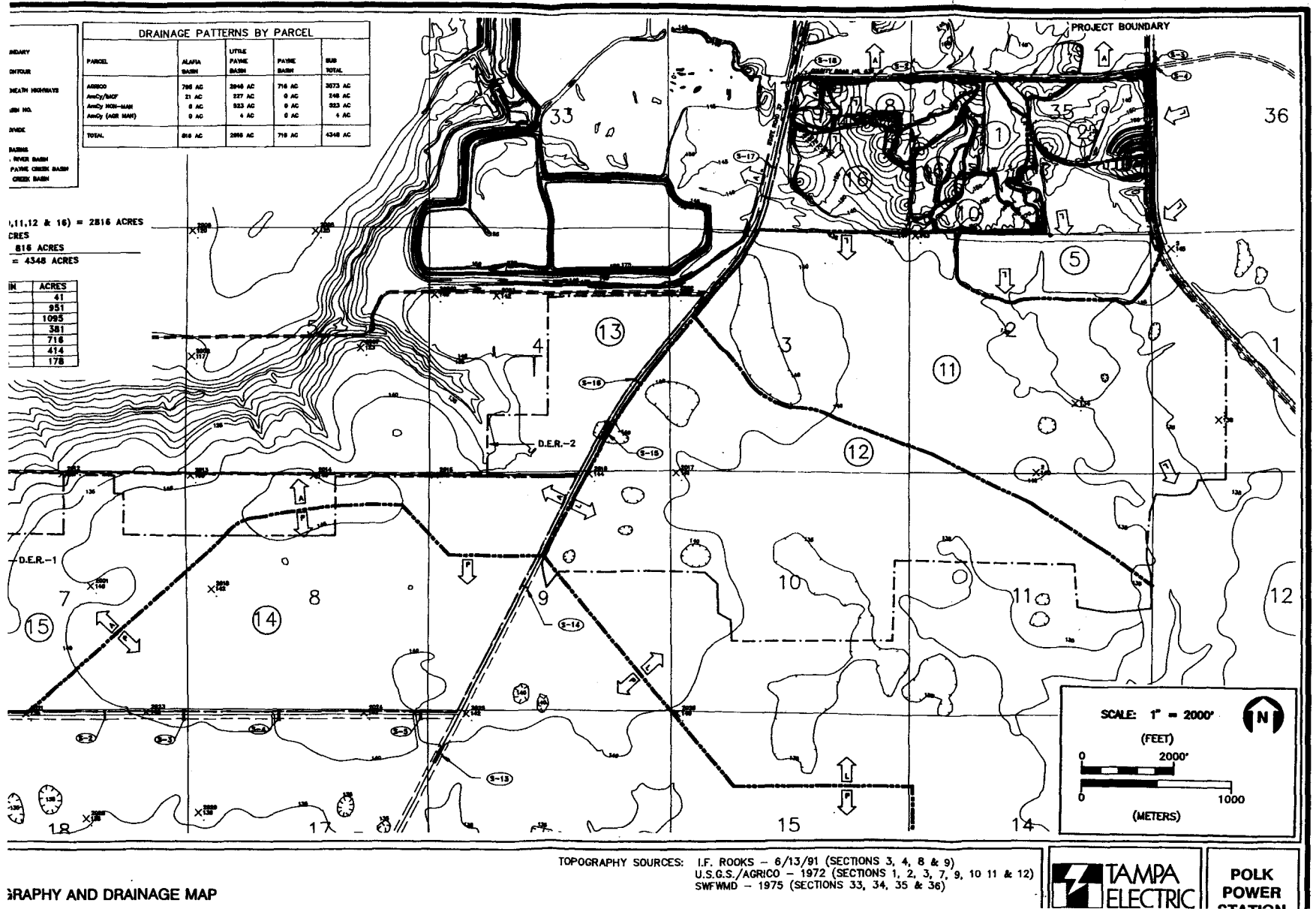


Table 2.3.4-1. Pre-Mining Drainage Areas for Selected Locations (acres)

Location	Onsite	Offsite	Total
<u>Alafia River Drainage Basin</u>			
South Prong Alafia River at Hillsborough/ Polk County Line	816	20,219	21,035
South Prong Alafia River near Lithia	816	67,231	68,047
Alafia River at Lithia	816	213,151	213,967
Alafia River near Riverview	816	257,951	258,767
<u>Little Payne Creek Drainage Basin</u>			
At Fort Green Road	2,816	3,751	6,567
4.5 miles downstream from Fort Green Road	2,816	15,751	18,567
At Route 665 near Bowling Green	2,816	21,877	24,693
<u>Payne Creek Basin Drainage Basin</u>			
At SR 37	716	2,957	3,673
4.2 miles downstream from SR 37	716	12,953	13,669
At Fort Green Road	716	25,635	26,351
<u>Payne Creek and Little Payne Creek Drainage Basin</u>			
At U.S. Highway 17 near Bowling Green (including Little Payne Creek Basin)	3,532	74,342	77,874

Sources: USGS, 1990.
ECT, 1992.

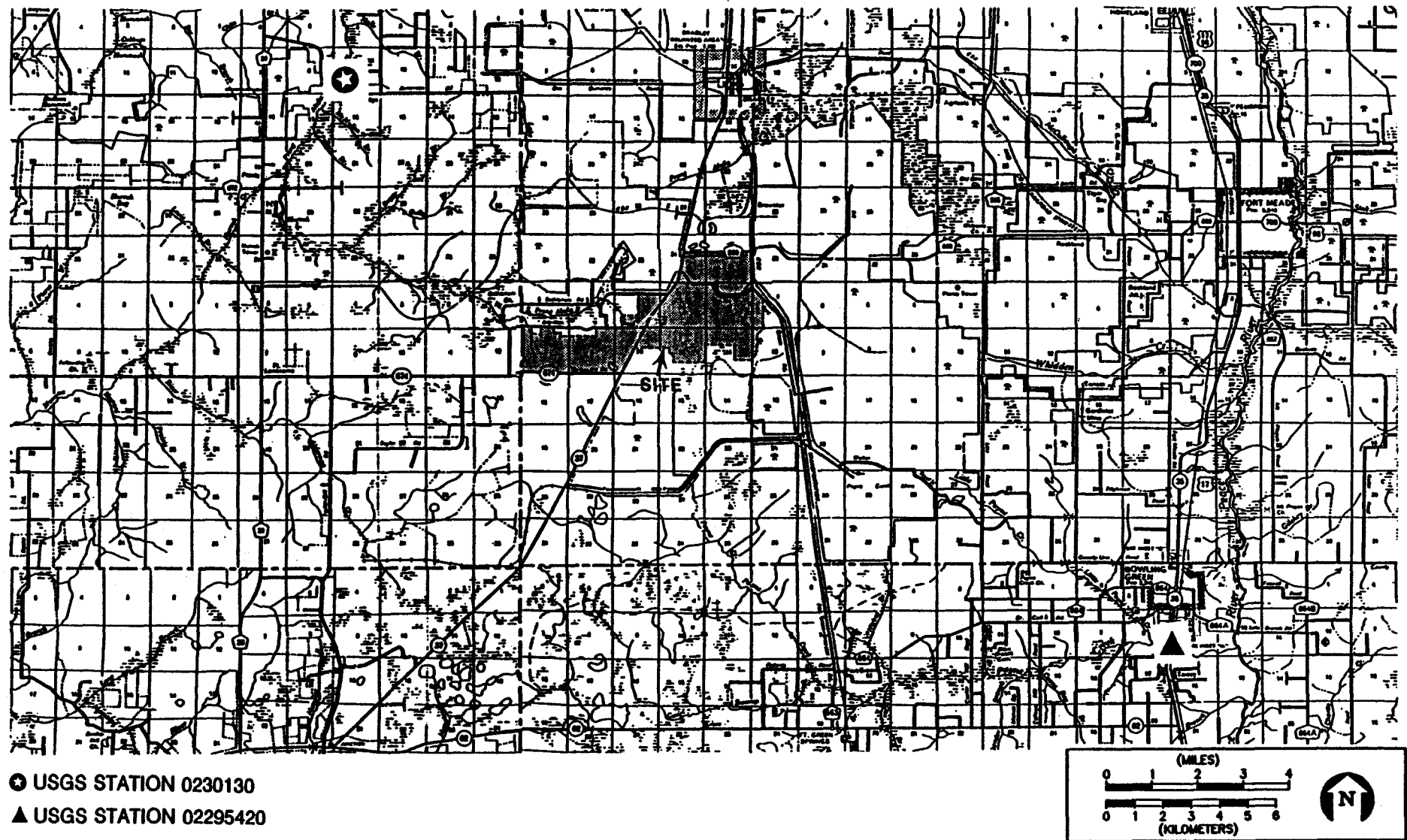


FIGURE 2.3.4-2.

LOCATION OF USGS SURFACE WATER STATIONS

Source: USGS, 1990.

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Table 2.3.4-2. Annual Average Discharge at Selected Gauging Stations

Station	Drainage Area (mi²)	Average Discharge (cfs)	CSM
South Prong Alafia River near Lithia	107	101.0	0.944
North Prong Alafia River at Keysville	135	156.0	1.156
Alafia River at Lithia	335	346.0	1.033
Payne Creek near Bowling Green	121	96.6	0.798
Peace River at Zolfo Springs	826	632.0	0.765

Source: USGS, 1990.

0.94 to 1.16 cfs per square mile (CSM). The contribution per square mile from the Peace River basin is somewhat less, having values in the range of 0.77 to 0.80 CSM. These values are typical for the terrain and soils of Florida. To estimate the average flow contributed by the areas located within the project site boundaries, the values for discharge per square mile (0.94 CSM) for the South Prong Alafia River and Payne Creek were applied to the onsite drainage basin areas. The Payne Creek gauging station near Bowling Green (0.80 CSM) is located downstream of the confluence of the Little Payne Creek and Payne Creek and was, therefore, applicable to both the Payne Creek and Little Payne Creek subwatersheds. Consequently, the pre-mining average discharges from the Polk Power Station site to the South Prong Alafia River, Payne Creek, and Little Payne Creek were calculated to be 1.20, 0.89, and 3.51 cfs, respectively.

USGS, using the log-Pearson type III frequency distribution, has calculated the 7-day, 10-year (7Q10) low-flow rates for the South Prong Alafia River and Payne Creek gauging stations using gauge data through 1981 (USGS, 1985). The 7Q10 low-flows for the South Prong Alafia River and Payne Creek are 3.0 and 1.6 cfs, respectively; additional statistics are presented in Table 2.3.4-3.

To obtain site-specific information on the surface water resources surrounding the Polk Power Station site, Tampa Electric Company established and implemented a comprehensive surface water monitoring program consisting of seven monitoring stations. The locations of the seven stations are shown in Figure 2.3.4-3, and a description of the program is provided in Section 2.3.4.2. The monitoring period extended from February to August 1991 encompassing both dry and wet season conditions. Monthly stage discharge and water quality measurements were taken at all stations. Stations SW-2, SW-5, and SW-6 incorporated continuous stage measurements as well. The recorded water level data for these stations with continuous stage recorders are shown in Figures 2.3.4-4 through 2.3.4-6.

Table 2.3.4-3. Low-Flow Frequency Analysis

Period of Consecutive Days	Lowest Average Flow (cfs) for Indicated Recurrence Interval (years)			
	2	5	10	20
<u>South Prong Alafia River near Lithia</u>				
1	10	4.0	2.3	1.4
3	11	4.4	2.6	1.6
7	12	5.0	3.0	1.9
14	14	6.0	3.6	2.3
30	19	9.0	5.8	4.0
60	27	14	9.9	7.2
90	34	18	13	9.3
120	44	24	17	12
183	54	32	25	20
<u>Payne Creek near Bowling Green</u>				
1	3.2	1.6	1.2	1.0
3	3.7	1.8	1.4	1.1
7	4.8	2.2	1.6	1.3
14	5.8	2.5	1.7	1.3
30	7.9	3.3	2.1	1.5
60	13	5.0	2.9	1.9
90	18	8.3	5.5	3.8
120	23	12	9.1	7.2
183	36	18	12	8.2

Source: USGS, 1985a.

2.3.4-9

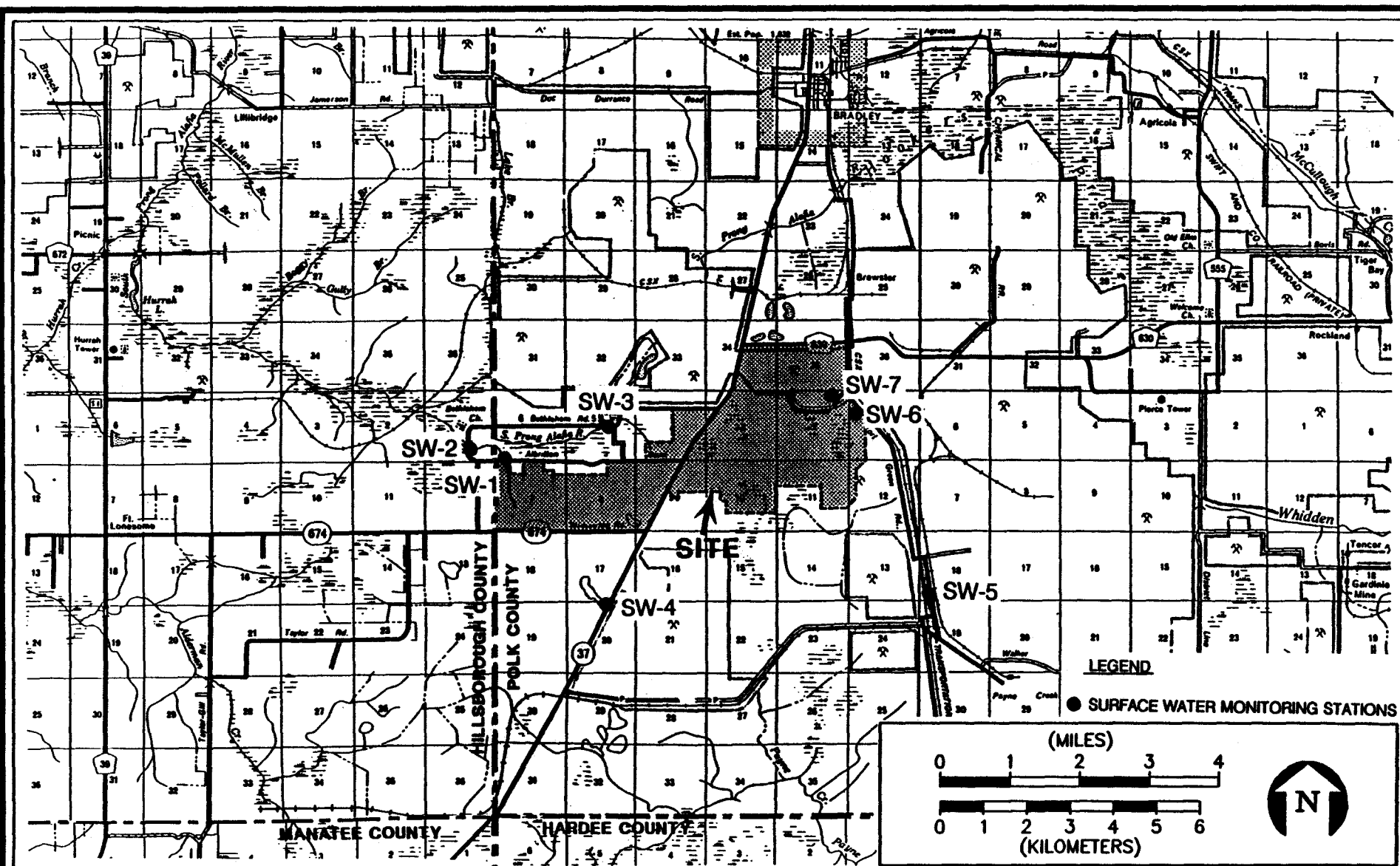


FIGURE 2.3.4-3.

SURFACE WATER MONITORING STATIONS

Sources: FDOT, 1976, 1977. ECT, 1991.



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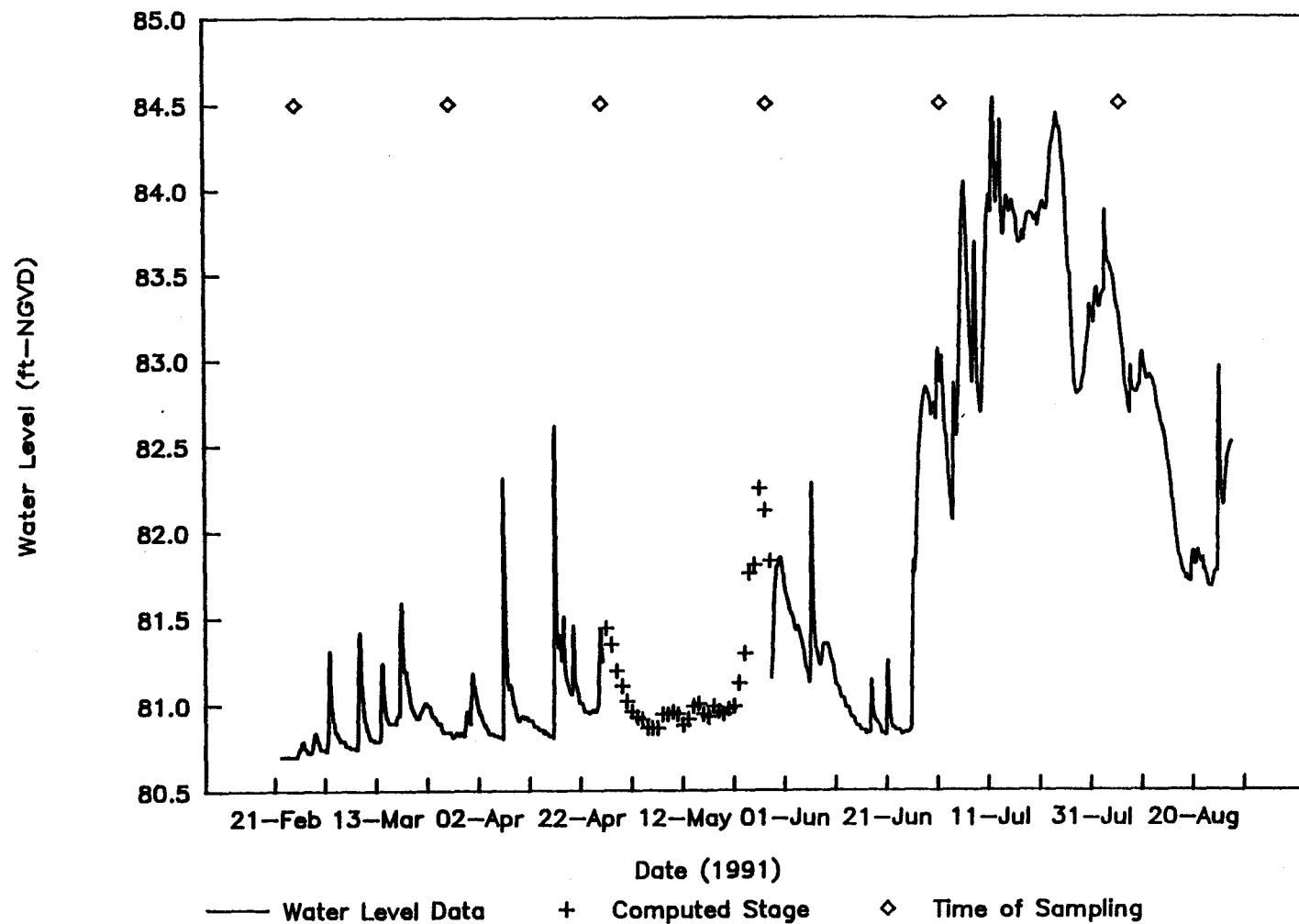


FIGURE 2.3.4-4.

WATER LEVEL DATA AT STATION SW-2

Source: ECT, 1992



**POLK
POWER
STATION**

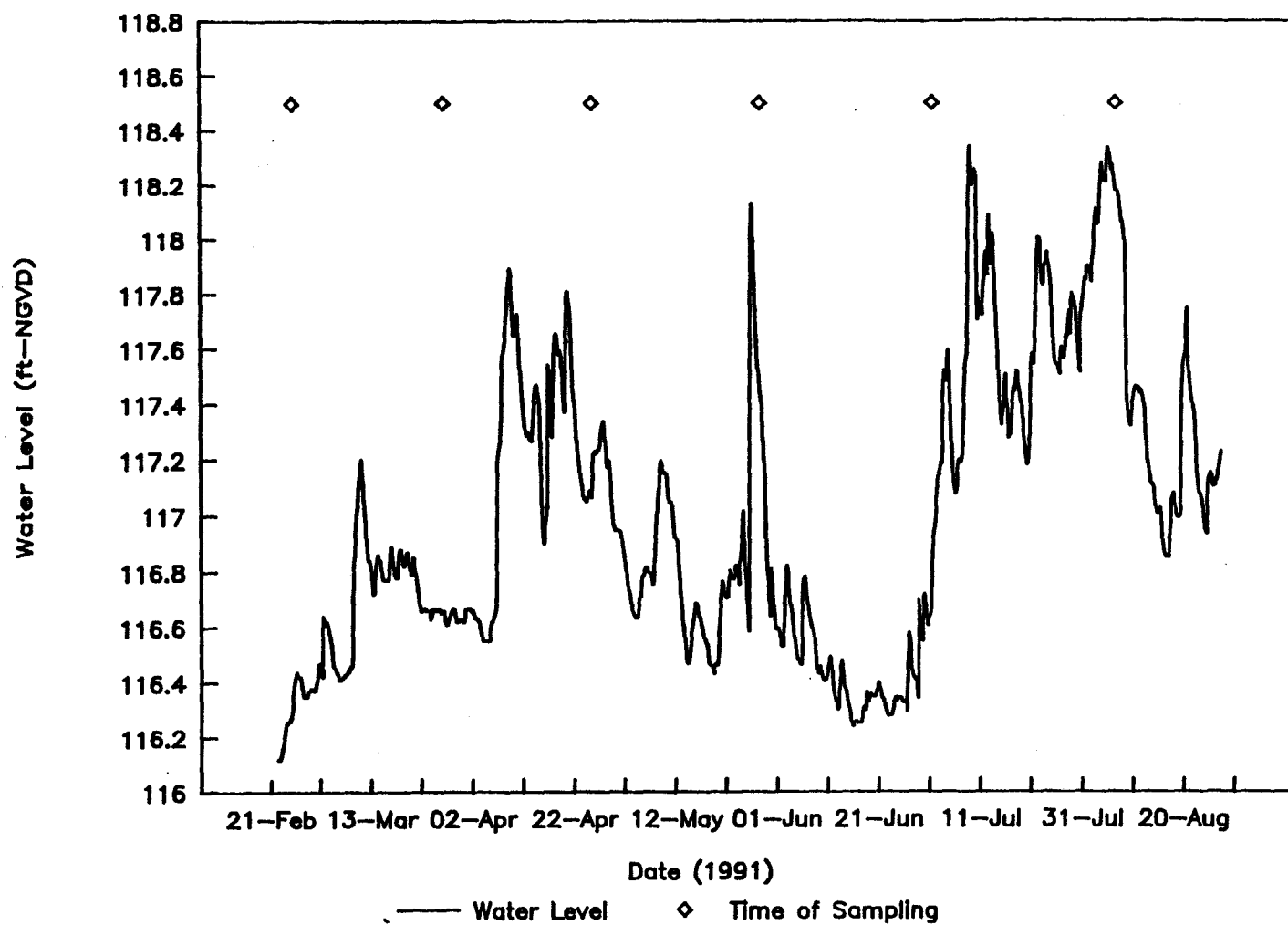


FIGURE 2.3.4-5.

WATER LEVEL DATA AT STATION SW-5

Source: ECT, 1992



**POLK
POWER
STATION**

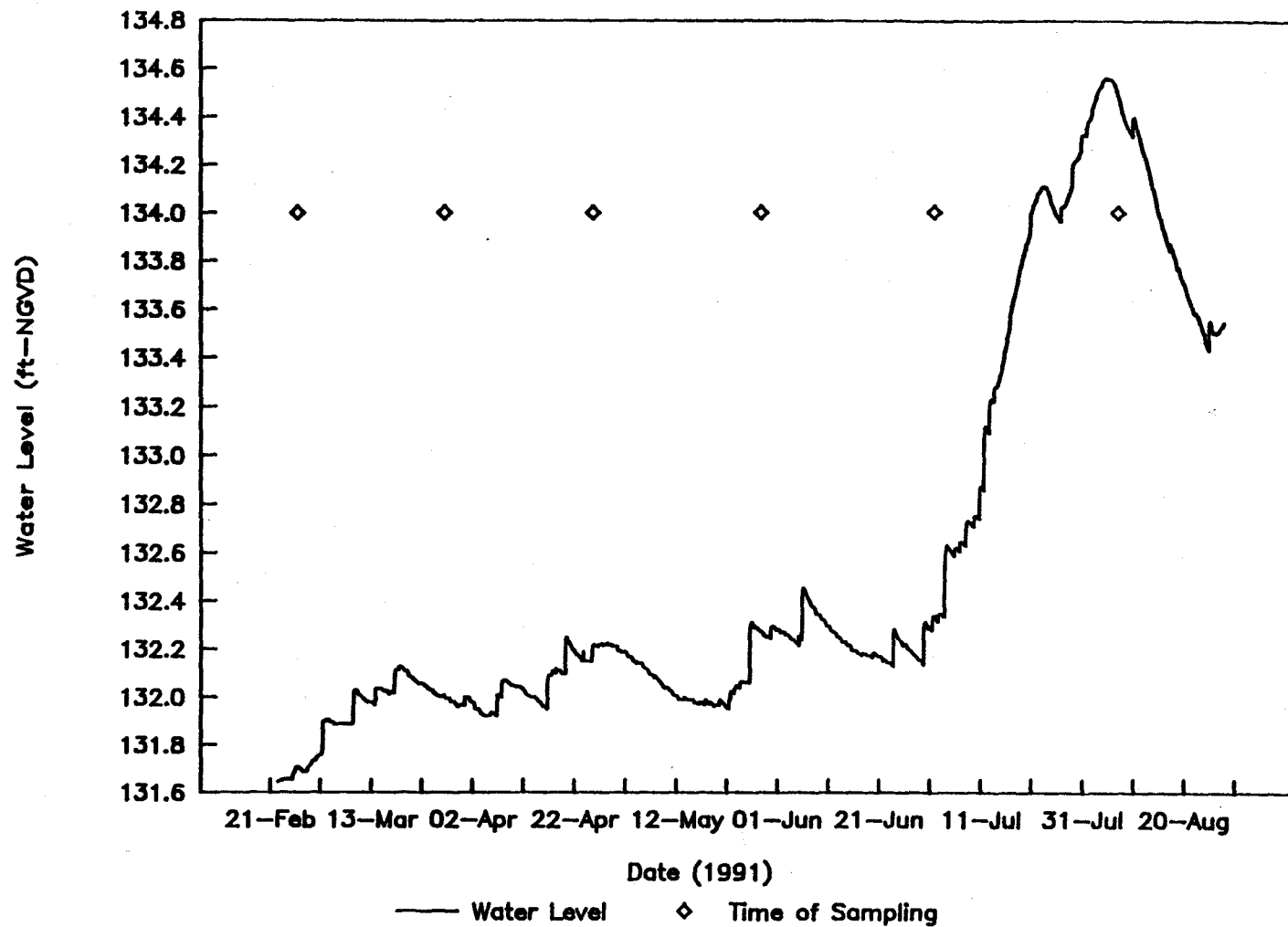


FIGURE 2.3.4-6.

WATER LEVEL DATA AT STATION SW-6

Source: ECT, 1992

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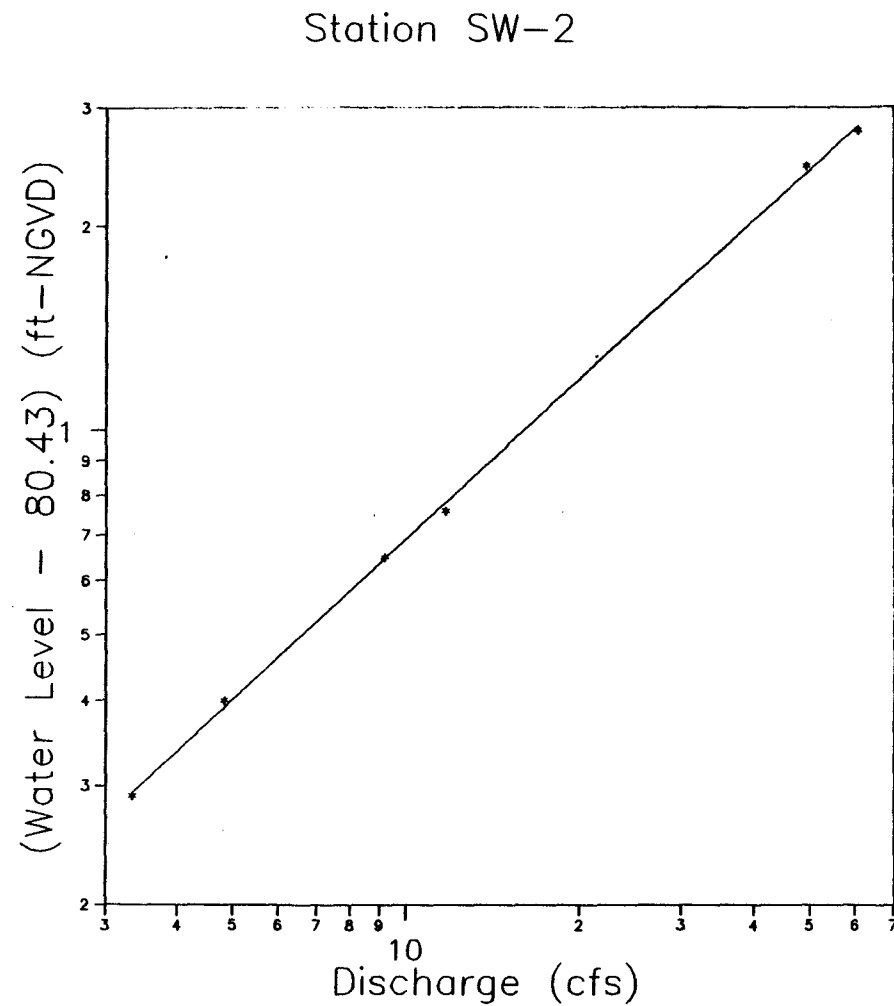
The stage at SW-2 fluctuated between a low level of 80.70 ft-NGVD on February 22, 1991, and a high level of 84.53 ft-NGVD on July 12, 1991. The stage at SW-5 fluctuated between a low level of 116.12 ft-NGVD on February 22, 1991, and a high level of 118.34 ft-NGVD on August 4, 1991. The stage at SW-6, located in a reclaimed lake, fluctuated much less erratically and had a low level of 131.65 ft-NGVD on February 22, 1991, and a high level of 134.56 ft-NGVD on August 4, 1991. All three records exhibit a rise in stage in late June and early July as a result of the seasonal increase in precipitation.

The average monthly stage discharge measurements at SW-1, SW-3, SW-4, and SW-7 were 103.00, 94.61, 128.80, and 133.58 ft-NGVD, respectively, during the monitoring period.

Because of a water level recorder malfunction at SW-2, water level data were not recorded between April 12 and May 29, 1991. To reconstruct the missing data, a correlation analysis was conducted using the following procedure:

- The daily average flows at SW-2 were calculated using the daily average stage data measurements based on an established stage-discharge relationship (see Fig. 2.3.4-7) established by the stage and discharge data;
- The daily flow data at SW-2 were compared with the daily flow data at the USGS gauging station on the South Prong Alafia River near Lithia. A correlation function was then established between the discharge at SW-2 and the USGS station;
- The daily discharges at SW-2 were computed for the period of equipment malfunction based on the correlation function using the daily discharges at the USGS station on the South Prong Alafia River near Lithia; and
- The daily stage data at SW-2 were computed for the period of equipment malfunction based on the stage-discharge relationship.

The reconstructed stage data are represented by +’s in Figure 2.3.4-4.



Instantaneous stream velocity measurements were taken monthly at Stations SW-2, SW-3, and SW-5 with a current meter across the stream. Flow was not measurable at SW-4 due to apparent stagnation. SW-6 and SW-7 were located in reclaimed lake and mine cuts; therefore, there were no flow data for these stations. Flow at SW-1 was too low to be measured with a flow meter; therefore, it was determined by measuring a timed volume of water as it exited a culvert under SR-674 (Albritton Road). Instantaneous discharge was calculated for Stations SW-2, SW-3, and SW-5 using standard USGS integration techniques. Stage-discharge relationships for SW-2, SW-3, and SW-5 were developed using these data. Examples of the stage-discharge curves are shown in Figure 2.3.4-7. Average daily water levels for the continuous recorders and the corresponding average daily discharges for Stations SW-2, SW-3, and SW-5 are provided in Appendix 11.8.5. The measured monthly water level and discharge data for all the surface water stations are also provided in Appendix 11.8.5.

Flood frequency information for Florida streams is provided by USGS (1982). Flood estimates are reported at selected gauging stations in the Peace River and Alafia River basins for 2- to 100-year recurrence intervals as shown in Table 2.3.4-4. These values were computed using a log-Pearson Type III distribution with long-term historical discharge data. The 100-year peak flow was estimated to be 4,330 cfs for the South Prong Alafia River gauging station near Lithia and 4,810 cfs for the Peace River at the Bartow gauging station.

Ardaman & Associates, Inc. conducted a hydrologic analysis of a 19,936-acre area (Ardaman, 1991) for the Agrico Fort Green Mine Reclamation Plan which included the majority of the proposed Polk Power Station project site area. The HEC-1 Flood Hydrograph Package was used to simulate the runoff hydrographs of the pre-mining watershed resulting from to a design storm. For the 24-hour, 25-year design storm, the pre-mining peak flow for the South Prong Alafia River basin (889 acres) was reported to be 514 cfs, that for Payne Creek basin (13,142 acres) was 2,503 cfs, and that for Little Payne Creek basin (3,711 acres) was 1,146 cfs. The peak discharge per square mile with the design storm was calculated to be 370 CSM for the South Prong

Table 2.3.4-4. Peak Flow (cfs) Frequency Analysis

Station	Years of Record	Drainage Area (mi ²)	Return Period (year)					
			2	5	10	25	50	100
South Prong Alafia River near Lithia	15	107	825	1,510	2,070	2,890	3,580	4,330
Alafia River at Lithia	46	335	3,060	6,580	10,000	15,900	21,700	28,800
Peace River at Bartow	39	390	978	1,740	2,350	3,240	3,990	4,810
Peace River at Zolfo Springs	46	826	4,830	8,370	11,300	15,600	19,400	23,600

Source: USGS, 1982.

Alafia River, 122 CSM for Payne Creek, and 198 CSM for Little Payne Creek, according to Ardaman's analysis.

Tampa Electric Company has also conducted hydrologic analyses and modeling to determine the runoff hydrograph resulting from a 24-hour, 25-year storm using the HEC-1 model. The results of the hydrologic modeling for pre-mining and post-reclamation stormwater runoff are discussed in Sections 3.8 and 5.3.1, and the detailed modeling results are provided in Appendix 11.8.9.

The 100-year floodplains on the site for the pre-mining condition were documented by FEMA (1983) and are shown in Figure 2.1.0-1. Only a small portion of the area lying to the west of SR 37 is located within the 100-year floodplain; and most of it has been or will be mined prior to Tampa Electric Company's use of the site. Most of the floodplain areas to the east of SR 37 were associated with the headwaters of Little Payne Creek where mining activities have also occurred. These mined areas were not the passageway of any other upstream stormwater runoff since they were located at the headwaters of the drainage basin. Therefore, the onsite mining activities did not increase the downstream flooding potential. A hydrological analysis conducted by Ardaman & Associates, Inc., also substantiated that the post-reclamation peak runoff would not exceed the pre-mining runoff due to the detention capacity of the reclaimed areas according to Agrico's approved reclamation plan for the site area.

Currently, the proposed site does not contribute to flood hazard potential because the existing conditions resulting from the mining operations (reclaimed lake, mine pits, etc.) provide for significant water retention.

Surface Water Quality

According to Chapter 17-302, F.A.C., the surface waters on and around the Polk Power Station site are classified to be Class III waters and the designated uses are recreation, propagation, and maintenance of a healthy, well-balanced population of

fish and wildlife. The nearest Outstanding Florida Water is the Little Manatee River. The nearest portion of this river designated as such is approximately 11.5 miles west of the Polk Power Station site.

Water quality of the South Prong Alafia River is considered *fair* by FDER (1990). Although better than the North Prong Alafia River, the South Prong is affected to some degree by the phosphate mining industry as well as agriculture development. Elevated nutrients and total suspended solids and depressed dissolved oxygen (DO) values remain a problem on the South Prong Alafia River. FDER (1990) considers the water quality in Payne Creek and Little Payne Creek to be *good*, nevertheless, DO concentrations occasionally below 5.0 mg/L and elevated nutrient level have been observed on these streams as well.

Data used to prepare the following description of surface water quality in the vicinity of the Polk Power Station site were obtained from a variety of sources, the most extensive being Tampa Electric Company's site-specific comprehensive monitoring program; EPA's STORET data; FDER Point Source Evaluation Section's (FDER/PSES's) intensive survey of the Alafia River Basin; and USGS' routine water quality data, much of which are reported in EPA's STORET system.

In the following paragraphs, the water quality of these waters is described in detail based on the aforementioned sources. Site-specific water quality data collected by Tampa Electric Company during 1991 include both the historically dry and wet seasons in this area of Florida. These data are compared with the longer-term historical data from EPA, FDER/PSES, and USGS by water body groups. For discussion purposes, the Tampa Electric Company surface water monitoring stations have been grouped according to distinct surface water systems as follows: (1) SW-1 through SW-3 (South Prong Alafia River and its tributary on the site); (2) SW-4 and SW-5 (Payne Creek and its tributary, Little Payne Creek); and (3) SW-6 (reclaimed lake) and SW-7 (old mine cut), which are also located in the pre-mining headwater area

of Little Payne Creek.. All of these Tampa Electric Company water quality monitoring stations are shown in Figure 2.3.4-3.

Further, rather than discuss each water quality parameter for each station, a number of tables and figures are presented that summarize the water quality data. These data include data collected by Tampa Electric Company and data from other sources such as EPA and FDER/PSES.

Mean values for all parameters at the Tampa Electric Company monitoring stations (SW-1 through SW-7) are presented in Table 2.3.4-5. Statistical summaries including the mean, maximum, minimum, standard deviation, and number of samples for the monitoring data are presented by station in Tables 2.3.4-6 through 2.3.4-12. These tables do not include those parameters which have not been detected during the course of the monitoring program. All monthly water quality data for the seven stations collected by Tampa Electric Company are presented in Appendix 11.8.8.

Extensive historical water quality data are available for the South Prong Alafia River and its tributaries. Specific sources include EPA's data from the South Prong Alafia River at Bethlehem Road and FDER/PSES, stations S3, S6 Tampa Electric Company monitoring Station SW-3), and S9 (coincide with Tampa Electric Company Monitoring Station SW-2). Basic water quality statistics for the South Prong Alafia River at Bethlehem Road (Tampa Electric Company Monitoring Station SW-2) obtained from FDER/ PSES and EPA are presented in Tables 2.3.4-13 and 2.3.4-14, respectively. EPA water quality statistics for Payne Creek near Bowling Green are presented in Table 2.3.4-15

In the following discussions, parameters of particular interest, either because they are engineering parameters or they represent historical water quality problems, are discussed in greater detail.

Table 2.3.4-5. Average Water Quality for Stations SW-1 through SW-7 Grouped by Basin or Water Body Type

Analyte	Units	South Prong Alafia River			Payne Creek/ Little Payne Creek		Lake and Mine Cut	
		SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-7
In Situ Measurements								
Temperature	°C	26.2	25.5	26.4	25.6	27.0	27.5	27.6
Specific Conductance	umhos/cm	143	351	383	201	377	307	333
Hydrogen Ion Activity (pH)		5.9	7.0	6.7	6.9	6.5	8.9	8.7
Dissolved Oxygen (DO)	mg/L	4.9	5.4	4.3	0.9	4.9	9.3	11.2
DO Saturation	%	59	65	52	12	60	115	140
Oxidation-Reduction Potential	V	0.103	0.033	0.110	0.068	0.082	0.044	0.013
Classical								
Alkalinity, Total as CaCO3	mg/L	10	75	84	66	92	82	67
Alkalinity, Bicarbonate	mg/L	10	75	84	66	92	60	55
Alkalinity, Carbonate	mg/L	0	0	0	0	0	0	10
Acidity, Total	mg/L	10	5	8	18	11	1	3
Hardness, Total as CaCO3	mg/L	44	138	153	81	117	104	108
Color	Pt-Co	144	77	89	263	43	48	111
Solids, Total	mg/L	122	252	287	167	242	227	270
Solids, Total Dissolved	mg/L	111	228	245	145	227	198	230
Solids, Total Suspended	mg/L	5	10	31	17	5	23	33
Turbidity	NTU	2.4	4.5	4.3	1.9	3.7	9.2	22
Chloride	mg/L	15	15	15	12	13	16	14
Fluoride, Soluble	mg/L	0.44	1.57	1.85	0.71	1.83	1.97	1.58
Sulfate	mg/L	21.2	61.2	68.7	0.8	63.0	38.2	58.0
Cyanide	mg/L	0	0.0	0.0	0.0	0.0	0.0	0.0
Sodium	mg/L	7	14	15	7	29	20	25
Calcium	mg/L	11	32	35	15	26	23	22
Magnesium	mg/L	3.1	15.0	16.2	10.6	12.3	12.2	13.5
Arsenic	ug/L	0	0	0	0	0	0	0
Selenium	ug/L	0	0	0	0	0	0	0
Total Anions	meq/L	0.85	2.06	2.29	0.67	2.49	1.65	2.02
Total Cations	meq/L	1.11	3.46	3.73	2.00	3.45	2.89	3.14
Ammonia (un-ionized)	mg/L	0	0	0	0	0	0.00	0.09
Nitrogen, Nitrate	mg/L	0	0.6	0.2	0	0	0	0
Nitrogen, Nitrite	mg/L	0	0.01	0.28	0	0	0	0
Nitrogen, Total Organic	mg/L	0.68	0.93	0.97	1.34	1.01	1.64	2.73
Nitrogen, Kjeldahl	mg/L	0.72	0.97	1.14	1.38	1.37	1.75	2.97
Phosphorus, Total	mg/L	0.82	1.17	1.28	0.71	0.49	0.47	4.52
Total Rec. Oil & Grease	mg/L	0	0	0	0	0	0	0
Surfactants	mg/L	0.02	0.02	0.03	0.02	0.01	0.01	0.01
5-day BOD	mg/L	2	2	4	4	7	9	14
Chemical Oxygen Demand	mg/L	51	41	49	82	40	58	72
Hydrogen Sulfide	mg/L	0.2	0.2	0.2	0.3	0.1	0.1	0.1
Other Metals								
Antimony	mg/L	0	0	0	0	0	0	0
Barium	mg/L	0	0	0	0	0	0	0
Beryllium	ug/L	0	0	0	0	0	0	0
Cadmium	ug/L	0	0	0	0	0	0	0
Chromium	mg/L	0	0	0	0	0	0	0
Chromium, Hexavalent	mg/L	0	0	0	0	0	0	0
Copper	mg/L	0	0	0	0	0	0	0
Iron	mg/L	0.3	0	0.2	1.2	0	0	0

Table 2.3.4-5. Average Water Quality for Stations SW-1 through SW-7 Grouped by Basin or Water Body Type
(Continued, Page 2 of 5)

Analyte	Units	South Prong Alafia River			Payne Creek/ Little Payne Creek		Lake and Mine Cut	
		SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-7
Lead	ug/L	2	2	2	2	2	2	2
Manganese	mg/L	0	0	0	0.01	0	0	0
Mercury	ug/L	0	0	0	0	0	0	0
Nickel	mg/L	0	0	0	0	0	0	0
Silver	ug/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Thallium	mg/L	0	0	0	0	0	0	0
Vanadium	mg/L	0	0	0	0	0	0	0
Zinc	mg/L	0	0	0.003	0	0.003	0	0
Radioactive Substances								
Radium 226	pCi/L	0	0.3	0.6	0	0.3	1.2	0.4
Radium 228	pCi/L	0	1.0	0.9	0.9	0.6	0	0.6
Gross Alpha	pCi/L	1.6	1.9	3.3	1.2	2.3	1.6	1.3
Organics (Phenols, Phthalates, PCBs)								
Phenol	ug/L	0	0	0	0	0	0	0
2-Chlorophenol	ug/L	0	0	0	0	0	0	0
2-Nitrophenol	ug/L	0	0	0	0	0	0	0
4-Nitrophenol	ug/L	0	0	0	0	0	0	0
2-Methyphenol	ug/L	-	0	0	0	0	-	-
4-Methyphenol	ug/L	-	0	0	0	0	-	-
2,4-Dimethylphenol	ug/L	0	0	0	0	0	0	0
2,4-Dichlorophenol	ug/L	0	0	0	0	0	0	0
4-Chloro-3-methylphenol	ug/L	0	0	0	0	0	0	0
2,4,5-Trichlorophenol	ug/L	-	0	0	0	0	-	-
2,4,6-Trichlorophenol	ug/L	0	0	0	0	0	0	0
2,4-Dinitrophenol	ug/L	0	0	0	0	0	0	0
2-Methyl-4,6-dinitrophenol	ug/L	0	0	0	0	0	0	0
Pentachlorophenol	ug/L	0	0	0	0	0	0	0
Di-n-butyl Phthalate	ug/L	0	0	0	0	0	0	0
bis(2-Ethyl hexyl) Phthalate	ug/L	0	0	0	0	0	0	0
Di-n-octyl Phthalate	ug/L	0	0	0	0	0	0	0
Butyl Benzyl Phthalate	ug/L	0	0	0	0	0	0	0
Diethyl Phthalate	ug/L	0	0	0	0	0	0	0
Dimethyl Phthalate	ug/L	0	0	0	0	0	0	0
PCB-1016	ug/L	0	0	0	0	0	0	0
PCB-1221	ug/L	0	0	0	0	0	0	0
PCB-1232	ug/L	0	0	0	0	0	0	0
PCB-1242	ug/L	0	0	0	0	0	0	0
PCB-1248	ug/L	0	0	0	0	0	0	0
PCB-1254	ug/L	0	0	0	0	0	0	0
PCB-1260	ug/L	0	0	0	0	0	0	0
Pesticides								
Aldrin	ug/L	0	0	0	0	0	0	0
Dieldrin	ug/L	0	0	0	0	0	0	0
Chlordane	ug/L	0	0	0	0	0	0	0
4,4-DDT	ug/L	0	0	0	0	0	0	0
4,4-DDD	ug/L	-	0	0	0	0	0	-
4,4-DDE	ug/L	-	0	0	0	0	0	-
Demeton	ug/L	0	0	0	0	0	0	0

Table 2.3.4-5. Average Water Quality for Stations SW-1 through SW-7 Grouped by Basin or Water Body Type
(Continued, Page 3 of 5)

Analyte	Units	South Prong Alafia River			Payne Creek/ Little Payne Creek		Lake and Mine Cut	
		SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-7
Endosulfan	ug/L	0	0	0	0	0	0	0
Endosulfan I	ug/L	-	0	0	0	0	0	-
Endosulfan II	ug/L	-	0	0	0	0	0	-
Endosulfan Sulfate	ug/L	-	0	0	0	0	0	-
Endrin	ug/L	0	0	0	0	0	0	0
Endrin Aldehyde	ug/L	-	0	0	0	0	0	-
Guthion	ug/L	0	0	0	0	0	0	0
Heptachlor	ug/L	0	0	0	0	0	0	0
Heptachlor Epoxide	ug/L	-	0	0	0	0	0	-
a-BHC	ug/L	-	0	0	0	0	0	-
b-BHC	ug/L	-	0	0	0	0	0	-
g-BHC	ug/L	-	0	0	0	0	-	-
d-BHC	ug/L	-	0	0	0	0	-	-
Lindane	ug/L	0	0	0	0	0	0	0
Malathion	ug/L	0	0	0	0	0	0	0
Methoxychlor	ug/L	0	0	0	0	0	0	0
Mirex	ug/L	0	0	0	0	0	0	0
Parathion	ug/L	0	0	0	0	0	0	0
Toxaphene	ug/L	0	0	0	0	0	0	0
Other Priority Pollutants								
Acrolein	ug/L	-	0	0	0	0	-	-
Acrylonitrile	ug/L	-	0	0	0	0	-	-
Benzene	ug/L	-	0	0	0	0	-	-
Bromodichloromethane	ug/L	-	0	0	0	0	-	-
Bromoform	ug/L	-	0	0	0	0	-	-
Bromomethane	ug/L	-	0	0	0	0	-	-
Carbon Tetrachloride	ug/L	-	0	0	0	0	-	-
Chlorobenzene	ug/L	-	0	0	0	0	-	-
Chloroethane	ug/L	-	0	0	0	0	-	-
2-Chloroethylvinyl Ether	ug/L	-	0	0	0	0	-	-
Chloroform	ug/L	-	0	0	0	0	-	-
Chloromethane	ug/L	-	0	0	0	0	-	-
Dibromochloromethane	ug/L	-	0	0	0	0	-	-
1,1-Dichloroethane	ug/L	-	0	0	0	0	-	-
1,2-Dichloroethane	ug/L	-	0	0	0	0	-	-
1,1-Dichloroethylene	ug/L	-	0	0	0	0	-	-
trans-1,2-Dichloroethylene	ug/L	-	0	0	0	0	-	-
1,2-Dichloropropane	ug/L	-	0	0	0	0	-	-
cis-1,3-Dichloropropene	ug/L	-	0	0	0	0	-	-
trans-1,3-Dichloropropene	ug/L	-	0	0	0	0	-	-
Ethyl Benzene	ug/L	-	0	0	0	0	-	-
Methylene Chloride	ug/L	-	0	0	0	0	-	-
1,1,2,2-Tetrachloroethane	ug/L	-	0	0	0	0	-	-
Tetrachloroethylene	ug/L	-	0	0	0	0	-	-
Toluene	ug/L	-	0	0	0	0	-	-
1,1,1-Trichloroethane	ug/L	-	0	0	0	0	-	-
1,1,2-Trichloroethane	ug/L	-	0	0	0	0	-	-
Trichloroethylene	ug/L	-	0	0	0	0	-	-
Trichlorofluoromethane	ug/L	-	0	0	0	0	-	-
Vinyl Chloride	ug/L	-	0	0	0	0	-	-

Table 2.3.4-5. Average Water Quality for Stations SW-1 through SW-7 Grouped by Basin or Water Body Type
(Continued, Page 4 of 5)

Analyte	Units	South Prong Alafia River			Payne Creek/ Little Payne Creek		Lake and Mine Cut	
		SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-7
Acenaphthene	ug/L	-	0	0	0	0	-	-
Acenaphthylene	ug/L	-	0	0	0	0	-	-
Anthracene	ug/L	-	0	0	0	0	-	-
Benzoic Acid	ug/L	-	0	0	0	0	-	-
Benzo(a)anthracene	ug/L	-	0	0	0	0	-	-
Benzo(a)pyrene	ug/L	-	0	0	0	0	-	-
Benzo(b)fluoranthene	ug/L	-	0	0	0	0	-	-
Benzo(k)fluoranthene	ug/L	-	0	0	0	0	-	-
Benzo(g,h,i)perylene	ug/L	-	0	0	0	0	-	-
Benzyl Alcohol	ug/L	-	0	0	0	0	-	-
bis(2-Chloroethoxy) Methane	ug/L	-	0	0	0	0	-	-
bis(2-Chloroethyl) Ether	ug/L	-	0	0	0	0	-	-
bis(2-Chloroisopropyl) Ether	ug/L	-	0	0	0	0	-	-
4-Bromophenyl Phenyl Ether	ug/L	-	0	0	0	0	-	-
2-Chloronaphthalene	ug/L	-	0	0	0	0	-	-
4-Chlorophenyl Phenyl Ether	ug/L	-	0	0	0	0	-	-
4-Chloroaniline	ug/L	-	0	0	0	0	-	-
Chrysene	ug/L	-	0	0	0	0	-	-
Dibenzo(a,h)anthracene	ug/L	-	0	0	0	0	-	-
1,2-Dichlorobenzene	ug/L	-	0	0	0	0	-	-
1,3-Dichlorobenzene	ug/L	-	0	0	0	0	-	-
1,4-Dichlorobenzene	ug/L	-	0	0	0	0	-	-
3,3-Dichlorobenzidine	ug/L	-	0	0	0	0	-	-
Dibenzofuran	ug/L	-	0	0	0	0	-	-
2,4-Dinitrotoluene	ug/L	-	0	0	0	0	-	-
2,6-Dinitrotoluene	ug/L	-	0	0	0	0	-	-
Fluoranthene	ug/L	-	0	0	0	0	-	-
Fluorene	ug/L	-	0	0	0	0	-	-
Hexachlorobenzene	ug/L	-	0	0	0	0	-	-
Hexachlorobutadiene	ug/L	-	0	0	0	0	-	-
Hexachloroethane	ug/L	-	0	0	0	0	-	-
Indeno(1,2,3-c,d)pyrene	ug/L	-	0	0	0	0	-	-
Isophorone	ug/L	-	0	0	0	0	-	-
2-Methylnaphthalene	ug/L	-	0	0	0	0	-	-
Naphthalene	ug/L	-	0	0	0	0	-	-
2-Nitroaniline	ug/L	-	0	0	0	0	-	-
3-Nitroaniline	ug/L	-	0	0	0	0	-	-
4-Nitroaniline	ug/L	-	0	0	0	0	-	-
Nitrobenzene	ug/L	-	0	0	0	0	-	-
N-Nitrosodimethylamine	ug/L	-	0	-	0	0	-	-
N-Nitrosodi-n-propylamine	ug/L	-	0	0	0	0	-	-
N-Nitrosodiphenylamine	ug/L	-	0	0	0	0	-	-
Phenanthrene	ug/L	-	0	0	0	0	-	-
Pyrene	ug/L	-	0	0	0	0	-	-
1,2,4-Trichlorobenzene	ug/L	-	0	0	0	0	-	-
Hexachlorocyclopentadiene	ug/L	-	0	0	0	0	-	-
cis-1,2-Dichloroethene	ug/L	-	0	-	0	0	-	-
2-Hexanone	ug/L	-	0	-	0	0	-	-
Methyl tert-butyl Ether	ug/L	-	0	-	0	0	-	-
4-Methyl-2-pentanone (MIBK)	ug/L	-	0	-	0	0	-	-
Vinyl Acetate	ug/L	-	0	-	0	0	-	-

Table 2.3.4-5. Average Water Quality for Stations SW-1 through SW-7 Grouped by Basin or Water Body Type
(Continued, Page 5 of 5)

Analyte	Units	South Prong Alafia River			Payne Creek/ Little Payne Creek		Lake and Mine Cut	
		SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-7
Xylenes	ug/L	-	0	-	0	0	-	-
2-Butanone (MEK)	ug/L	-	0	-	0	0	-	-
Carbon Disulfide	ug/L	-	0	-	0	0	-	-
Benzidine	ug/L	-	0	-	0	0	-	-
1,2-Diphenylhydrazine	ug/L	-	0	-	0	0	-	-
Dibromomethane	ug/L	-	0	-	0	0	-	-

Note: umhos/cm = micrograms per centimeter.

V = volt.

meq/L = milliequivalents per liter.

Unless otherwise noted, all concentrations represent the total concentration.

Source: ECT, 1992.

Table 2.3.4-6. Statistical Summary--Surface Water Quality: SW-1

Analyte	Units	Class III Standard	Mean	Maximum	Minimum	Standard Deviation	No.
In Situ Measurements							
Temperature	°C		26.2	28.6	20.1	3.1	5
Specific Conductance	umhos/cm		143	169	113	18	5
Hydrogen Ion Activity (pH)	su	from 6-8.5	5.2	6.7	4.5	—	5
Dissolved Oxygen (DO)	mg/L	≥ 5.0	4.9	6.4	3.3	1.2	5
DO Saturation	%		59	80	41	14	5
Oxidation-Reduction Potential	V		0.103	0.139	0.082	0.023	4
Classical							
Alkalinity, Total as CaCO ₃	mg/L	≥ 20	10	17	3	4	5
Alkalinity, Bicarbonate	mg/L		10	17	3	4	5
Alkalinity, Carbonate	mg/L		0	—	—	—	6
Acidity, Total	mg/L		10	18	5	4	6
Hardness, Total as CaCO ₃	mg/L		44	52	38	5	6
Color	Pt-Co		144	350	60	100	6
Solids, Total	mg/L		122	180	92	28	6
Solids, Total Dissolved	mg/L		111	160	83	25	6
Solids, Total Suspended	mg/L		4.8	10	0.0	5	6
Turbidity	NTU	≤ 29	2.4	5.9	1.4	1.6	6
Chloride	mg/L		15	21	12	3	6
Fluoride, Soluble	mg/L	≤ 10	0.44	0.61	0.38	0.08	6
Sulfate	mg/L		21.2	29.0	15.0	5.0	6
Sodium	mg/L		7	8	6	1	6
Calcium	mg/L		11	15	10	2	6
Magnesium	mg/L		3.1	3.4	2.7	0.2	6
Total Anions	meq/L		0.85	1.25	0.51	0.22	6
Total Cations	meq/L		1.11	1.40	0.98	0.15	6
Ammonia (un-ionized)	mg/L	≤ 0.02	0	—	—	—	6
Nitrogen, Nitrate	mg/L		0	—	—	—	6
Nitrogen, Nitrite	mg/L		0	—	—	—	6
Nitrogen, Total Organic	mg/L		0.68	1.00	0.43	0.20	6
Nitrogen, Kjeldahl	mg/L		0.72	1.10	0.50	0.21	6
Phosphorus, Total	mg/L		0.82	0.94	0.67	0.09	6
Surfactants	mg/L	≤ 0.5	0.02	0.08	0	0.03	6
5-day BOD	mg/L		2.33	7	0	3	6
Chemical Oxygen Demand	mg/L		51	110	25	32	5
Hydrogen Sulfide	mg/L		0.15	0.3	0	0.2	2
Other Metals							
Iron	mg/L	≤ 1.0	0.30	0.6	0	0.2	6
Lead	ug/L	≤ 0.9-1.4*	1.50	9	0	3	6
Manganese	mg/L		0	—	—	—	6
Silver	ug/L	≤ 0.07	0.01	0.06	0	0.02	6
Zinc	mg/L	≤ 0.05-0.06*	0.01	0.03	0	0.01	6
Radioactive Substances							
Radium 226	pCi/L	≤ 5	0	—	—	—	6
Radium 228	pCi/L	≤ 5	0	—	—	—	6
Gross Alpha	pCi/L	≤ 15	1.6	6.3	0.0	2.6	6

Note: Zero is used to compute mean value for <MDL.

Analytes not detected during the monitoring program are not included in the table.

*Standard range is calculated using the hardness from each sampling period at the station from data collected by Tampa Electric Company.

Source: ECT, 1992.

Table 2.3.4-7. Statistical Summary--Surface Water Quality: SW-2

Analyte	Units	Class III Standard	Mean	Maximum	Minimum	Standard Deviation	No.
In Situ Measurements							
Temperature	°C		25.5	29.4	19.4	3.4	6
Specific Conductance	umhos/cm		351	398	323	28	6
Hydrogen Ion Activity (pH)	su	from 6-8.5	6.7	7.4	6.2	—	6
Dissolved Oxygen (DO)	mg/L	≥ 5.0	5.4	7.5	2.6	1.7	6
DO Saturation	%		65	81	33	18	6
Oxidation-Reduction Potential	V		0.033	0.085	-0.010	0.043	4
Classical							
Alkalinity, Total as CaCO ₃	mg/L	≥ 20	75	81	69	5	5
Alkalinity, Bicarbonate	mg/L		75	81	69	5	5
Alkalinity, Carbonate	mg/L		0	—	—	—	6
Acidity, Total	mg/L		5	6	2	1	6
Hardness, Total as CaCO ₃	mg/L		138	150	120	12	6
Color	Pt-Co		77	120	30	30	6
Solids, Total	mg/L		252	280	220	21	6
Solids, Total Dissolved	mg/L		228	250	210	13	6
Solids, Total Suspended	mg/L		10.3	30	0	9	6
Turbidity	NTU	≤ 29	4.5	9.6	2.0	2.7	6
Chloride	mg/L		15	17	14	1	6
Fluoride, Soluble	mg/L	≤ 10	1.57	2.00	1.00	0.39	6
Sulfate	mg/L		61.2	79.0	50.0	8.7	6
Sodium	mg/L		14	16	12	1	6
Calcium	mg/L		32	36	29	3	6
Magnesium	mg/L		15.0	22.0	11.0	3.4	6
Total Anions	meq/L		2.06	3.30	1.60	0.58	6
Total Cations	meq/L		3.46	4.20	3.00	0.38	6
Ammonia (un-ionized)	mg/L	≤ 0.02	0	—	—	—	6
Nitrogen, Nitrate	mg/L		0.60	2.2	0	0.9	6
Nitrogen, Nitrite	mg/L		0.01	0.03	0	0.01	6
Nitrogen, Total Organic	mg/L		0.93	1.37	0.60	0.29	6
Nitrogen, Kjeldahl	mg/L		0.97	1.40	0.60	0.32	6
Phosphorus, Total	mg/L		1.17	1.70	0.77	0.31	6
Surfactants	mg/L	≤ 0.5	0.02	0.08	0.00	0.03	6
5-day BOD	mg/L		2.33	6	0.00	2	6
Chemical Oxygen Demand	mg/L		41	53	25	9	5
Hydrogen Sulfide	mg/L		0	0.3	0	0.2	2
Other Metals							
Iron	mg/L	≤ 1.0	0	—	—	—	6
Lead	ug/L	≤ 4.0-5.3*	2	12	0	4	6
Manganese	mg/L		0	—	—	—	6
Silver	ug/L	≤ 0.07	0.01	0.06	0	0.02	6
Zinc	mg/L	≤ 0.12-0.15*	0.01	0.03	0	0.01	6
Radioactive Substances							
Radium 226	pCi/L	≤ 5	0.3	1.1	0	0.5	6
Radium 228	pCi/L	≤ 5	1.0	5.7	0	2.3	6
Gross Alpha	pCi/L	≤ 15	1.9	6.5	0	2.6	6

Note: Zero is used to compute mean value for <MDL.

Analytes not detected during the monitoring program are not included in the table.

*Standard range is calculated using the hardness from each sampling period at the station from data collected by Tampa Electric Company.

Source: ECT, 1992.

Table 2.3.4-8. Statistical Summary--Surface Water Quality: SW-3

Analyte	Units	Class III Standard	Mean	Maximum	Minimum	Standard Deviation	No.
In Situ Measurements							
Temperature	°C		26.4	30.4	19.6	3.4	6
Specific Conductance	umhos/cm		383	428	329	40	6
Hydrogen Ion Activity (pH)	su	from 6-8.5	6.5	7.6	6.0	--	6
Dissolved Oxygen (DO)	mg/L	≥ 5.0	4.3	5.5	2.8	1.1	6
DO Saturation	%		52	67	35	12	6
Oxidation-Reduction Potential	V		0.110	0.220	0.030	0.071	4
Classical							
Alkalinity, Total as CaCO ₃	mg/L	≥ 20	84	100	70	10	5
Alkalinity, Bicarbonate	mg/L		84	100	70	10	5
Alkalinity, Carbonate	mg/L		0	--	--	--	6
Acidity, Total	mg/L		8	12	5	3	6
Hardness, Total as CaCO ₃	mg/L		153	170	130	14	6
Color	Pt-Co		89	150	40	39	6
Solids, Total	mg/L		287	390	260	47	6
Solids, Total Dissolved	mg/L		245	270	230	13	6
Solids, Total Suspended	mg/L		31	120	0	41	6
Turbidity	NTU	≤ 29	4.3	7.0	1.9	1.5	6
Chloride	mg/L		15	17	12	2	6
Fluoride, Soluble	mg/L	≤ 10	1.85	2.20	1.40	0.30	6
Sulfate	mg/L		68.7	79.0	54.0	8.7	6
Sodium	mg/L		15	17	13	1	6
Calcium	mg/L		35	39	29	4	6
Magnesium	mg/L		16.2	22.0	11.0	3.4	6
Total Anions	meq/L		2.29	3.80	1.80	0.68	6
Total Cations	meq/L		3.73	4.30	3.00	0.44	6
Ammonia (un-ionized)	mg/L	≤ 0.02	0	--	--	--	6
Nitrogen, Nitrate	mg/L		0.22	1.3	0	0.5	6
Nitrogen, Nitrite	mg/L		0.28	1.60	0	0.59	6
Nitrogen, Total Organic	mg/L		0.97	1.40	0.41	0.34	6
Nitrogen, Kjeldahl	mg/L		1.14	1.50	0.41	0.36	6
Phosphorus, Total	mg/L		1.28	1.60	0.97	0.24	6
Surfactants	mg/L	≤ 0.5	0.03	0.09	0	0.03	6
5-day BOD	mg/L		4.00	10	0	3	6
Chemical Oxygen Demand	mg/L		49	68	41	10	5
Hydrogen Sulfide	mg/L		0.15	0.3	0	0.2	2
Other Metals							
Iron	mg/L	≤ 1.0	0.18	0.4	0	0.2	6
Lead	ug/L	≤ 4.4-6.3*	1.83	11	0	4	6
Manganese	mg/L		0	--	--	--	6
Silver	ug/L	≤ 0.07	0.01	0.07	0	0.03	6
Zinc	mg/L	≤ 0.13-0.17*	0.00	0.02	0	0.01	6
Radioactive Substances							
Radium 226	pCi/L	≤ 5	0.6	1.4	0	0.6	6
Radium 228	pCi/L	≤ 5	0.9	5.3	0	2.2	6
Gross Alpha	pCi/L	≤ 15	3.3	9.4	0	3.6	6

Note: Zero is used to compute mean value for <MDL.

Analytes not detected during the monitoring program are not included in the table.

*Standard range is calculated using the hardness from each sampling period at the station from data collected by Tampa Electric Company.

Source: ECT, 1992.

Table 2.3.4-9. Statistical Summary--Surface Water Quality: SW-4

Analyte	Units	Class III Standard	Mean	Maximum	Minimum	Standard Deviation	No.
In Situ Measurements							
Temperature	°C		25.6	30.1	19.4	3.2	6
Specific Conductance	umhos/cm		201	278	126	55	6
Hydrogen Ion Activity (pH)	su	from 6-8.5	6.5	7.8	6.0	—	6
Dissolved Oxygen (DO)	mg/L	≥ 5.0	0.9	2.4	0.0	0.8	6
DO Saturation	%		12	29	0	9	6
Oxidation-Reduction Potential	V		0.068	0.138	0.031	0.041	4
Classical							
Alkalinity, Total as CaCO ₃	mg/L	≥ 20	66	93	26	26	5
Alkalinity, Bicarbonate	mg/L		66	93	26	26	5
Alkalinity, Carbonate	mg/L		0	—	—	—	6
Acidity, Total	mg/L		18	26	10	5	6
Hardness, Total as CaCO ₃	mg/L		81	110	40	23	6
Color	Pt-Co		263	400	130	103	6
Solids, Total	mg/L		167	230	120	39	6
Solids, Total Dissolved	mg/L		145	210	110	35	6
Solids, Total Suspended	mg/L		17	60	0	21	6
Turbidity	NTU	≤ 29	2	4.5	0	1.4	6
Chloride	mg/L		12	23	5	6	6
Fluoride, Soluble	mg/L	≤ 10	0.71	1.00	0.48	0.16	6
Sulfate	mg/L		0.83	5.0	0	1.9	6
Sodium	mg/L		7	13	3	4	6
Calcium	mg/L		15	20	7	5	6
Magnesium	mg/L		10.6	14.0	5.2	3.3	6
Total Anions	meq/L		0.67	2.40	0.22	0.78	6
Total Cations	meq/L		2.00	3.00	0.69	0.90	6
Ammonia (un-ionized)	mg/L	≤ 0.02	0	—	—	—	6
Nitrogen, Nitrate	mg/L		0	—	—	—	6
Nitrogen, Nitrite	mg/L		0	—	—	—	6
Nitrogen, Total Organic	mg/L		1.34	1.68	1.10	0.21	6
Nitrogen, Kjeldahl	mg/L		1.38	1.70	1.10	0.19	6
Phosphorus, Total	mg/L		0.71	1.20	0.17	0.34	6
Surfactants	mg/L	≤ 0.5	0.02	0.03	0	0.02	6
5-day BOD	mg/L		3.83	8	0	2	6
Chemical Oxygen Demand	mg/L		82	96	56.00	14	5
Hydrogen Sulfide	mg/L		0.25	0.5	0	0.3	2
Other Metals							
Iron	mg/L	≤ 1.0	1.2	1.7	0.6	0.4	6
Lead	ug/L	≤ 1.0-4.0*	2.3	14	0	5	6
Manganese	mg/L		0.01	0.07	0	0.03	6
Silver	ug/L	≤ 0.07	0.01	0.08	0	0.03	6
Zinc	mg/L	≤ 0.05-0.11*	0.00	—	—	—	6
Radioactive Substances							
Radium 226	pCi/L	≤ 5	0	—	—	—	6
Radium 228	pCi/L	≤ 5	0.9	5.5	0.0	2.2	6
Gross Alpha	pCi/L	≤ 15	1.2	2.9	0.0	1.4	6

Note: Zero is used to compute mean value for <MDL.

Analytes not detected during the monitoring program are not included in the table.

*Standard range is calculated using the hardness from each sampling period at the station from data collected by Tampa Electric Company.

Source: ECT, 1992.

Table 2.3.4-10. Statistical Summary--Surface Water Quality: SW-5

Analyte	Units	Class III Standard	Mean	Maximum	Minimum	Standard Deviation	No.
In Situ Measurements							
Temperature	°C		27.0	30.3	21.0	3.4	6
Specific Conductance	umhos/cm		377	432	308	45	6
Hydrogen Ion Activity (pH)	su	from 6-8.5	6.3	7.7	6.0	—	6
Dissolved Oxygen (DO)	mg/L	≥ 5.0	4.9	7.2	2.2	1.8	6
DO Saturation	%		60	90	29	21	6
Oxidation-Reduction Potential	V		0.082	0.122	0.053	0.026	4
Classical							
Alkalinity, Total as CaCO ₃	mg/L	≥ 20	92	97	87	3	5
Alkalinity, Bicarbonate	mg/L		92	97	87	3	5
Alkalinity, Carbonate	mg/L		0	—	—	—	6
Acidity, Total	mg/L		11	15	5	3	6
Hardness, Total as CaCO ₃	mg/L		117	140	100	17	6
Color	Pt-Co		43	75	30	15	6
Solids, Total	mg/L		242	280	220	20	6
Solids, Total Dissolved	mg/L		227	270	190	27	6
Solids, Total Suspended	mg/L		5	20	0	8	6
Turbidity	NTU	≤ 29	3.7	5.7	2.5	1.1	6
Chloride	mg/L		13	14	12	1	6
Fluoride, Soluble	mg/L	≤ 10	1.83	2.60	1.50	0.38	6
Sulfate	mg/L		63.0	81.0	42.0	12.8	6
Sodium	mg/L		29	33	23	3	6
Calcium	mg/L		26	33	21	5	6
Magnesium	mg/L		12.3	15.0	10.0	1.7	6
Total Anions	meq/L		2.49	6.70	1.20	1.90	6
Total Cations	meq/L		3.45	4.20	2.00	0.74	6
Ammonia (un-ionized)	mg/L	≤ 0.02	0	—	—	—	6
Nitrogen, Nitrate	mg/L		0	—	—	—	6
Nitrogen, Nitrite	mg/L		0.23	1.20	0.02	0.44	6
Nitrogen, Total Organic	mg/L		1.01	1.28	0.68	0.21	6
Nitrogen, Kjeldahl	mg/L		1.37	1.80	0.79	0.30	6
Phosphorus, Total	mg/L		0.49	0.61	0.37	0.07	6
Surfactants	mg/L	≤ 0.5	0.01	0.04	0	0.02	6
5-day BOD	mg/L		7	11	4	2	6
Chemical Oxygen Demand	mg/L		40	53	31	7	5
Hydrogen Sulfide	mg/L		0.10	0.2	0	0.1	2
Other Metals							
Iron	mg/L	≤ 1.0	0	—	—	—	6
Lead	ug/L	≤ 3.2-4.9*	2.33	14	0	5	6
Manganese	mg/L		0	—	—	—	6
Silver	ug/L	≤ 0.07	0.01	0.07	0	0.03	6
Zinc	mg/L	≤ 0.11-0.14*	0.00	0.02	0	0.01	6
Radioactive Substances							
Radium 226	pCi/L	≤ 5	0.3	1.0	0	0.5	6
Radium 228	pCi/L	≤ 5	0.6	3.4	0	1.4	6
Gross Alpha	pCi/L	≤ 15	2.3	5.2	0	2.0	6

Note: Zero is used to compute mean value for <MDL.

Analytes not detected during the monitoring program are not included in the table.

*Standard range is calculated using the hardness from each sampling period at the station from data collected by Tampa Electric Company.

Source: ECT, 1992.

Table 2.3.4-11. Statistical Summary--Surface Water Quality: SW-6

Analyte	Units	Class III Standard	Mean	Maximum	Minimum	Standard Deviation	No.
In Situ Measurements							
Temperature	°C		27.5	32.6	21.2	3.8	5
Specific Conductance	umhos/cm		307	328	269	21	5
Hydrogen Ion Activity (pH)	su	from 6-8.5	8.5	9.4	7.9	—	5
Dissolved Oxygen (DO)	mg/L	≥ 5.0	9.3	12.7	4.7	2.7	5
DO Saturation	%		115	159	64	34	5
Oxidation-Reduction Potential	V		0.044	0.063	0.017	0.017	4
Classical							
Alkalinity, Total as CaCO ₃	mg/L	≥ 20	82	91	75	6	5
Alkalinity, Bicarbonate	mg/L		60	91	31	24	5
Alkalinity, Carbonate	mg/L		22	50	1	17	6
Acidity, Total	mg/L		1	5	1	2	6
Hardness, Total as CaCO ₃	mg/L		104	110	94	6	6
Color	Pt-Co		48	67	35	10	6
Solids, Total	mg/L		227	260	190	24	6
Solids, Total Dissolved	mg/L		198	220	180	15	6
Solids, Total Suspended	mg/L		23	50	0	16	6
Turbidity	NTU	≤ 29	9.2	18	5.7	4.3	6
Chloride	mg/L		16	17	13	2	6
Fluoride, Soluble	mg/L	≤ 10	1.97	2.90	1.40	0.45	6
Sulfate	mg/L		38.2	45.0	30.0	5.2	6
Sodium	mg/L		20	21	19	1	6
Calcium	mg/L		23	26	21	2	6
Magnesium	mg/L		12.2	14.0	11.0	1.1	6
Total Anions	meq/L		1.65	2.70	1.10	0.52	6
Total Cations	meq/L		2.89	3.30	1.90	0.47	6
Ammonia (un-ionized)	mg/L	≤ 0.02	0.00	0.02	0	0.01	6
Nitrogen, Nitrate	mg/L		0	—	—	—	6
Nitrogen, Nitrite	mg/L		0	—	—	—	6
Nitrogen, Total Organic	mg/L		1.64	2.80	0.78	0.71	6
Nitrogen, Kjeldahl	mg/L		1.75	2.80	0.80	0.63	6
Phosphorus, Total	mg/L		0.47	0.81	0.25	0.19	6
Surfactants	mg/L	≤ 0.5	0.01	0.03	0	0.01	6
5-day BOD	mg/L		9	10	8	1	6
Chemical Oxygen Demand	mg/L		58	70	47	8	5
Hydrogen Sulfide	mg/L		0	0.2	0	0.1	2
Other Metals							
Iron	mg/L	≤ 1.0	0	—	—	—	6
Lead	ug/L	≤ 2.9-3.6*	2.17	13	0	5	6
Manganese	mg/L		0	—	—	—	6
Silver	ug/L	≤ 0.07	0.01	0.07	0	0.03	6
Zinc	mg/L	≤ 0.10-0.11*	0	—	—	—	6
Radioactive Substances							
Radium 226	pCi/L	≤ 5	1.2	7.1	0	2.9	6
Radium 228	pCi/L	≤ 5	0	—	—	—	6
Gross Alpha	pCi/L	≤ 15	1.6	4.0	0	1.9	6

Note: Zero is used to compute mean value for <MDL.

Analytes not detected during the monitoring program are not included in the table.

*Standard range is calculated using the hardness from each sampling period at the station from data collected by Tampa Electric Company.

Source: ECT, 1992.

Table 2.3.4-12. Statistical Summary—Surface Water Quality: SW-7

Analyte	Units	Class III Standard	Mean	Maximum	Minimum	Standard Deviation	No.
In Situ Measurements							
Temperature	°C		27.6	33.2	21.9	3.8	5
Specific Conductance	umhos/cm		333	363	279	35	5
Hydrogen Ion Activity (pH)	su	from 6-8.5	8.4	9.4	8.0	—	5
Dissolved Oxygen (DO)	mg/L	≥ 5.0	11.2	14.5	8.5	2.2	5
DO Saturation	%		140	164	104	22	5
Oxidation-Reduction Potential	V		0.013	0.071	-0.054	0.044	4
Classical							
Alkalinity, Total as CaCO ₃	mg/L	≥ 20	67	84	39	16	5
Alkalinity, Bicarbonate	mg/L		55	80	33	15	5
Alkalinity, Carbonate	mg/L		10	26	0	9	6
Acidity, Total	mg/L		4	15	0	5	6
Hardness, Total as CaCO ₃	mg/L		108	120	89	11	6
Color	Pt-Co		111	150	75	23	6
Solids, Total	mg/L		270	290	240	19	6
Solids, Total Dissolved	mg/L		230	260	200	20	6
Solids, Total Suspended	mg/L		33	50	13	14	6
Turbidity	NTU	≤ 29	22	27	15	4.6	6
Chloride	mg/L		14	16	12	1	6
Fluoride, Soluble	mg/L	≤ 10	1.58	4.00	0.88	1.12	6
Sulfate	mg/L		58.0	68.0	42.0	7.9	6
Sodium	mg/L		25	27	23	1	6
Calcium	mg/L		22	26	17	4	6
Magnesium	mg/L		13.5	15.0	12.0	1.0	6
Total Anions	meq/L		2.02	2.40	1.70	0.22	6
Total Cations	meq/L		3.14	3.60	1.80	0.63	6
Ammonia (un-ionized)	mg/L	≤ 0.02	0.09	0.32	0	0.12	6
Nitrogen, Nitrate	mg/L		0.55	1.70	0	0.78	6
Nitrogen, Nitrite	mg/L		0.24	1.40	0	0.52	6
Nitrogen, Total Organic	mg/L		2.73	3.40	2.18	0.46	6
Nitrogen, Kjeldahl	mg/L		2.97	4.10	2.20	0.73	6
Phosphorus, Total	mg/L		4.52	6.10	1.80	1.58	6
Surfactants	mg/L	≤ 0.5	0.01	0.03	0	0.01	6
5-day BOD	mg/L		14	20	9	4	6
Chemical Oxygen Demand	mg/L		72	83	59	8	5
Hydrogen Sulfide	mg/L		0.1	0.2	0	0.1	2
Other Metals							
Iron	mg/L	≤ 1.0	0	—	—	—	6
Lead	ug/L	≤ 2.7-4.0*	2	13	0	5	6
Manganese	mg/L		0	—	—	—	6
Silver	ug/L	≤ 0.07	0.01	0.06	0	0.02	6
Zinc	mg/L	≤ 0.10-0.12*	0	—	—	—	6
Radioactive Substances							
Radium 226	pCi/L	≤ 5	0.4	2.4	0	1.0	6
Radium 228	pCi/L	≤ 5	0.6	3.5	0	1.4	6
Gross Alpha	pCi/L	≤ 15	1.3	3.4	0	1.5	6

Note: Zero is used to compute mean value for <MDL.

Analytes not detected during the monitoring program are not included in the table.

*Standard range is calculated using the hardness from each sampling period at the station from data collected by Tampa Electric Company.

Source: ECT, 1992.

Table 2.3.4-13. Surface Water Quality Statistics for South Prong of the Alafia River (FDER/PSES Intensive Survey, 1984-1985)

Parameter	Units	S9 (SW-2)					S3 (Upstream of PPS)					S6 (SW-3)				
		Mean	Max.	Min.	Std.	No.	Mean	Max.	Min.	Std.	No.	Mean	Max.	Min.	Std.	No.
Time	LMT		1120	925		12		1210	1014		9		1200	1040		4
Water Temperature	C	21.0	27.2	8.7	5.4	12	20.1	26.3	7.1	6.1	9	22.3	27.5	14.2	5.0	4
Hydrogen Ion Activity (pH)	su	6.8	7.8	6.2		12	6.8	7.6	6.5		9	6.7	7.6	6.4		4
Specific Conductivity	umhos/cm	392	492	280	73	12	511	639	372	75	9	498	562	391	65	4
Dissolved Oxygen	mg/L	7.6	10.5	4.0	1.8	12	5.1	11.6	0.7	3.0	9	5.1	8.8	1.3	2.7	4
Total-Phosphorus	mg/L	3.05	8.20	1.34	2.10	12	6.88	16.40	3.98	3.85	8	3.59	3.92	3.26	0.33	2
Ortho-Phosphorus	mg/L	2.70	7.39	1.29	1.82	12	6.06	14.10	3.82	3.31	8	3.75	4.10	3.40	0.35	2
Total Kjeldahl Nitrogen	mg/L	0.65	1.26	0.38	0.25	12	1.01	1.33	0.75	0.21	8	1.08	1.42	0.73	0.35	2
Ammonia (as N)	mg/L	0.06	0.10	0.02	0.02	12	0.03	0.05	0.01	0.01	8	0.04	0.05	0.03	0.01	2
Organic Nitrogen	mg/L	0.59	1.17	0.36	0.23	12	0.98	1.32	0.73	0.22	8	1.04	1.37	0.70	0.34	2
Nitrite+Nitrate	mg/L	0.72	1.52	0.00	0.37	12	0.05	0.35	0.00	0.11	8	0.01	0.01	0.00	0.01	2
Carbonaceous BOD 5-day	mg/L	2.20	9.70	0.40	2.63	10	1.82	4.00	0.80	1.07	6	0.90	1.20	0.60	0.30	2
Corrected Chlorophyll-a	ug/L	1.42	2.20	0.60	0.57	5	8.09	32.90	0.60	11.17	6	3.55	4.30	2.80	0.75	2
Phaeophytin	ug/L	5.34	10.50	0.40	4.11	7	6.08	10.20	0.50	3.52	4	4.70	9.20	0.20	4.50	2
Alkalinity	mg/L	90	109	77	9	12	101	123	79	16	8	87	96	78	9	2
Fluoride	mg/L	2.49	3.91	1.28	0.99	12	5.79	6.72	4.28	0.81	8	5.04	6.07	4.01	1.03	2
Chloride	mg/L	17	20	15	2	12	24	33	19	5	8	28	34	21	7	2
Sulfate	mg/L	95	139	64	22	12	140	176	106	27	8	146	189	103	43	2
Cadmium	ug/L	ND	ND	ND	ND	4	ND	ND	ND	ND	3	ND	ND	ND	ND	1
Copper	ug/L	ND	ND	ND	ND	4	ND	ND	ND	ND	3	ND	ND	ND	ND	1
Chromium	ug/L	ND	ND	ND	ND	4	ND	ND	ND	ND	3	ND	ND	ND	ND	1
Iron	ug/L	245	367	71	122	4	122	202	51	62	3	537	537	537	0	1
Zinc	ug/L	ND	ND	ND	ND	4	ND	ND	ND	ND	3	ND	ND	ND	ND	1
Silver	ug/L	ND	ND	ND	ND	4	ND	ND	ND	ND	3	ND	ND	ND	ND	1
Arsenic	ug/L	ND	ND	ND	ND	4	ND	ND	ND	ND	3	ND	ND	ND	ND	1
Aluminum	ug/L	ND	ND	ND	ND	4	ND	ND	ND	ND	3	ND	ND	ND	ND	1
Nickel	ug/L	ND	ND	ND	ND	4	ND	ND	ND	ND	3	ND	ND	ND	ND	1
Selenium	ug/L	ND	ND	ND	ND	4	ND	ND	ND	ND	3	ND	ND	ND	ND	1
Lead	ug/L	ND	ND	ND	ND	4	ND	ND	ND	ND	3	ND	ND	ND	ND	1
Mercury	ug/L	0.06	0.23	0.00	0.10	4	ND	ND	ND	ND	3	ND	ND	ND	ND	1

Note: ND = none detected.

Sources: FDER/PSES, 1989.
ECT, 1992.

Table 2.3.4-14. Surface Water Quality Statistics for South Prong of the Alafia River at Bethlehem Road (EPA STORET Data Collected from 1981 to 1985)

Parameter	Unit	Mean	Max	Min	No.
Time	LMT		1443	910	56
Water Temperature	°C	24.1	30.0	11.8	55
Field Turbidity	FTU	5	14	1	55
Color	Pt-Co	50	140	15	56
Field Conductivity	umhos/cm	390	950	120	25
Specific Conductivity	umhos/cm	680	1178	200	30
Dissolved Oxygen (DO)	mg/L	6.8	11.3	2.1	56
DO Saturation	%	79	116	26	55
5-day Biochemical Oxygen Demand	mg/L	1.4	7.1	0.1	56
Field Hydrogen Ion Activity (pH)	su	7.2	8.0	6.6	24
Total Solids	mg/L	255	585	167	49
Total Dissolved Solids	mg/L	251	584	163	49
Total Suspended Solids	mg/L	4	20	1	53
Total Nitrogen	mg/L	1.50	3.25	0.74	54
Total Organic Nitrogen	mg/L	0.81	2.87	0.10	53
Total Ammonia + Ammonium	mg/L	0.19	1.25	0.03	52
Un-ionized Ammonia	mg/L	0.0038	0.025	0.0001	52
Total Kjeldahl Nitrogen	mg/L	0.91	2.95	0.26	55
Total Nitrite + Nitrate	mg/L	0.01	0.02	0.01	22
Dissolved Nitrite + Nitrate	mg/L	0.6	1.6	0.1	34
Total Phosphorus	mg/L	2.81	6.44	0.31	56
Dissolved (ortho) Phosphorus	mg/L	2.11	4.40	0.80	9
Total Organic Carbon	mg/L	13.0	28.8	1.1	50
Total Chloride	mg/L	16	32	6	54
Total Sulfate	mg/L	87	153	49	51
Dissolved Fluoride	mg/L	2.48	5.81	0.20	51
Total Coliform	#/100 mL	752	5500	100	56
Fecal Coliform	#/100 mL	191	2000	100	56
Chlorophyll a	ug/L	4.3	25.9	1.4	56
Chlorophyll b	ug/L	1.7	15.1	0.1	56
Chlorophyll c	ug/L	5.5	40.4	0.5	56
Total Chlorophyll	ug/L	10.4	30.6	2.6	55

Note: LMT = local military time.
FTU = field turbidity unit.

Sources: EPA, 1991.
ECT, 1992.

Table 2.3.4-15. Surface Water Quality Statistics for Payne Creek near Bowling Green
(EPA STORET Data Collected from 1979 to 1983)

Parameter	Units	Mean	Max.	Min.	No.
Time	LMT		1639	900	25
Water Temperature	°C	21.7	27.5	11.0	25
Field Turbidity	FTU	2.7	4.8	1.0	3
Color	Pt-Co	80	140	20	3
Specific Conductivity	umhos/cm	286	400	188	25
Dissolved Oxygen (DO)	mg/L	7.8	9.8	5.7	25
DO Saturation	%	87	100	70	25
5-day Biochemical Oxygen Demand	mg/L	0.9	1.4	0.4	5
Hydrogen Ion Activity (pH)	su	6.8	7.9	6.1	24
Carbon Dioxide	mg/L	4.8	4.8	4.8	1
Total Alkalinity as CaCO ₃	mg/L	62	62	62	1
Bicarbonate	mg/L	75	75	75	1
Total Dissolved Solids	mg/L	195	195	195	1
Total Suspended Solids	mg/L	3.4	9.0	0.2	3
Total Volatile Suspended Solids	mg/L	3	5	1	3
Total Nitrogen	mg/L	2.15	2.42	1.88	2
Total Organic Nitrogen	mg/L	1.2	1.4	1.0	2
Total Ammonia + Ammonium	mg/L	0.09	0.21	0.02	3
Un-ionized Ammonia	mg/L	0.0008	0.0010	0.0006	3
Total Nitrite	mg/L	0.01	0.02	0.01	3
Total Nitrate	mg/L	0.81	0.96	0.65	2
Total Kjeldahl Nitrogen	mg/L	1.07	1.45	0.55	3
Total Nitrite + Nitrate	mg/L	1.12	1.71	0.67	3
Total Phosphorus	mg/L	0.70	0.75	0.60	3
Ortho Phosphorus	mg/L	0.65	0.75	0.48	3
Total Organic Carbon	mg/L	11.5	16.0	7.8	7
Total Chloride	mg/L	13	17	8	3
Total Sulfate	mg/L	42	59	30	3
Dissolved Fluoride	mg/L	1.1	1.3	0.9	3
Beta-D as Cs 137	pCi/L	2.3	2.3	2.3	2
Alpha-D as U	ug/L	4.7	5.6	3.7	2
Beta-D as Sr 90	pCi/L	2.2	2.2	2.2	2
Alpha-S as U	pCi/L	0.6	0.6	0.6	1
Beta-S as Cs 137	pCi/L	0.4	0.4	0.4	1
Alpha-S as U	ug/L	0.9	0.9	0.9	1
Beta-S as Sr 90	pCi/L	0.4	0.4	0.4	1

Sources: EPA, 1991.
ECT, 1992.

Hardness

Water *hardness*, although somewhat inexact in definition, is an important parameter for a number of reasons. Power plant design, especially water pre-treatment systems, often rely on the degree of hardness of the proposed plant supply water. Because Tampa Electric Company intends to obtain most plant process water from groundwater, the hardness of surface waters is less important from an engineering standpoint. Nevertheless, certain water quality standards are based on the degree of hardness--usually the natural log of hardness expressed as mg/L of calcium carbonate (CaCO_3).

According to Tampa Electric Company monitoring data, the mean water hardness for SW-2 and SW-3 was 138 and 153 mg/L, respectively. Sporadic hardness data collected by USGS between 1985 and 1991 downstream of SW-2 support these observations. Water within the South Prong Alafia River is considered *hard* using the classification scheme developed by Durfor and Becker (1964). Water from the unnamed tributary to the South Prong Alafia River (SW-1) has a mean value of 44 mg/L and is classified as *soft*. This is not surprising given that the stream is short and is most likely supplied by runoff with little groundwater input.

The waters of Payne Creek (SW-4) and Little Payne Creek (SW-5), with mean hardness values of 81 and 117 mg/L, respectively, are classified as *moderately hard* according to Durfor and Becker (1964). The maximum hardness measured at these two stations was 140 mg/L at station SW-5 on Little Payne Creek.

SW-6 and SW-7 had similar hardness values with means of 104 and 108 mg/L, respectively. This water would be considered *moderately hard* by Durfor and Becker (1964).

Temperature

Tampa Electric Company intends to discharge water from the proposed cooling reservoir to the reclaimed lake (SW-6) located to the east of the reservoir which flows to the Little Payne Creek system. Although the reservoir is designed to prevent

significant thermal impacts, water temperature and its fluctuation still remain important for evaluating biological data and stresses on aquatic systems. The 5 years of data from EPA STORET (EPA, 1991) show that temperature on the South Prong Alafia River at Bethlehem Road (Tampa Electric Company monitoring station SW-2) ranges from 11.8 to 30.0 degrees Celsius ($^{\circ}\text{C}$) with a mean value of 24.1°C (Figure 2.3.4-8). The mean temperature data for Tampa Electric Company monitoring stations SW-1 through SW-3 at the South Prong Alafia River, are generally about 1.0°C higher than the historical data at Bethlehem Road. This higher mean temperature is most likely the result of temperature anomaly during the monitoring period. The lowest temperature observed by Tampa Electric Company's monitoring program was 19.4°C at Station SW-4 (Payne Creek), and the maximum temperature was 30.4°C at SW-3. The temperature statistics for SW-2, based on long-term data, are probably representative of SW-3 because of their close proximity.

According to the EPA STORET data (EPA, 1991), temperature has ranged from 11.0 to 27.5°C in Payne Creek near Bowling Green, Florida. The mean temperature was 21.7°C . Mean temperatures measured at Tampa Electric Company monitoring stations SW-4 (Payne Creek) and SW-5 (Little Payne Creek) were 25.6 and 27.0°C , respectively. Maximum temperatures of about 30°C were recorded at both stations.

Temperature data collected from Payne Creek and South Prong Alafia during 1981 through 1983 are presented in Figure 2.3.4-8. A comparison of the two streams during this period show similar seasonal variations; however, water temperature at the Payne Creek station during this period was generally cooler than at the Little Payne Creek station.

The temperatures at SW-6 and SW-7 were quite similar, having mean values of 27.5°C and 27.6°C , respectively, according to the monitoring data. The temperature fluctuations in these two impoundments are relatively small, with a recorded range of less than 1.4°C during the monitoring period.

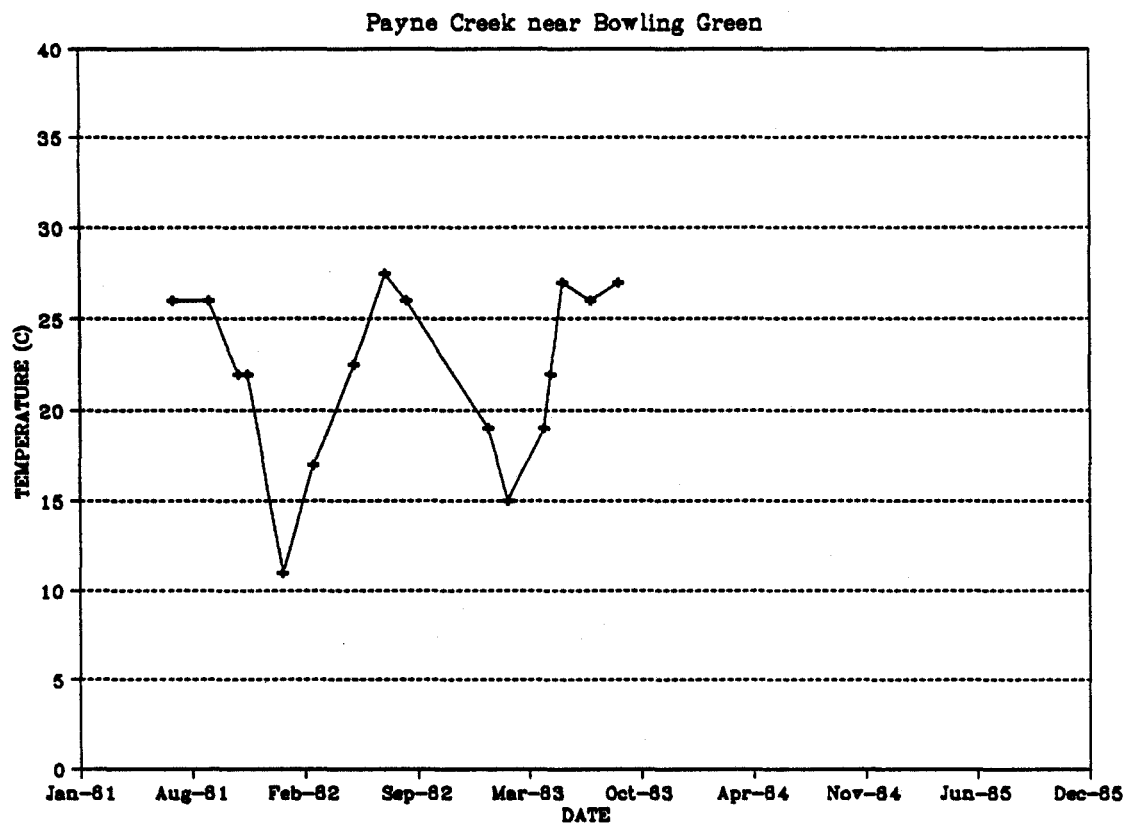
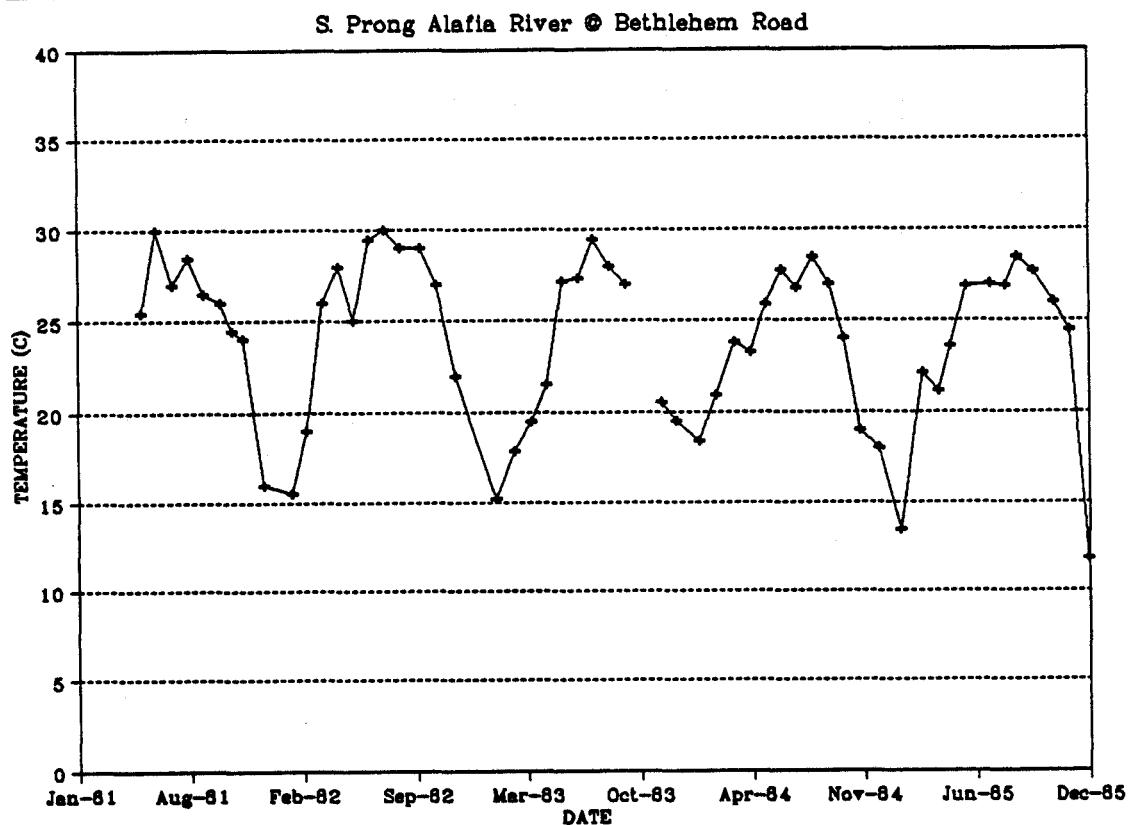


FIGURE 2.3.4-8.

HISTORICAL WATER TEMPERATURE DATA FOR
SOUTH PRONG ALAFIA RIVER AND PAYNE CREEK

Source: EPA, 1991. ECT, 1992.



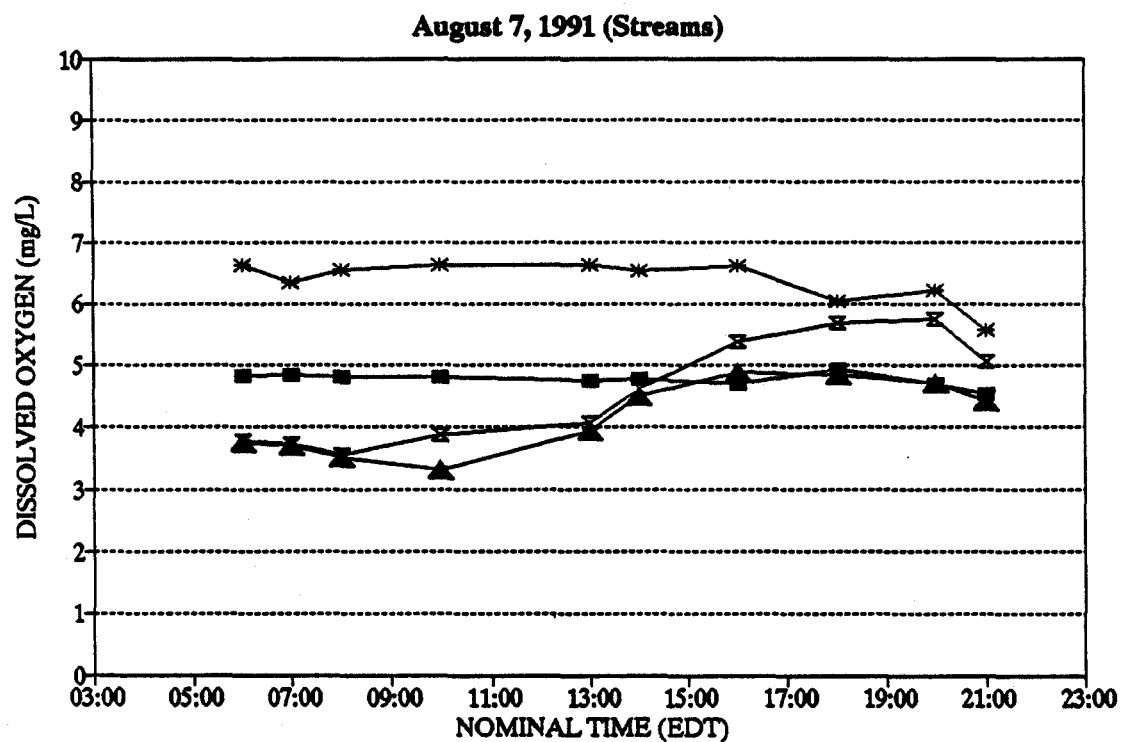
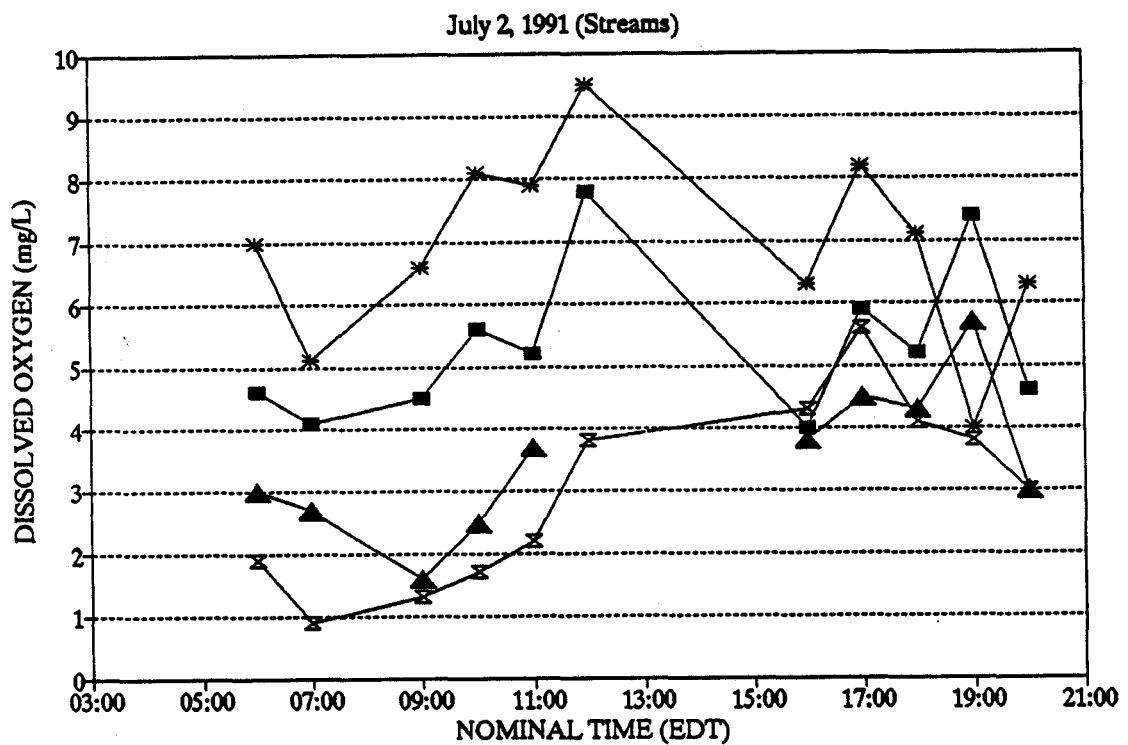
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Dissolved Oxygen

DO concentration is often used as an indicator of the overall *health* of a water body. According to Class III water quality standards, DO concentrations shall not be less than 5 mg/L. DO was measured once at each station during each field trip. Because DO concentration is a function not only of temperature but photosynthetic and respiratory activity, the time of measurement is as important as the time of year. To quantify this variation, Tampa Electric Company conducted diurnal sampling during July and August 1991. This diurnal sampling commenced before sunrise and concluded after sunset to obtain the envelopes of the daily maximum and minimum concentrations.

The results of the diurnal surveys for all Tampa Electric Company monitoring stations for July and August are presented in Figures 2.3.4-9 and 2.3.4-10. Because flowing streams and ponded waters exhibit different characteristics of the fluctuations in DO concentration, the results have been segregated into *streams* (Figure 2.3.4-9) and *ponded water* or with minimal observed flow (Figure 2.3.4-10) to aid in comparing similar types of water bodies. Although SW-4 is technically a stream, being in the headwaters of Payne Creek, the water was ponded at the time of the sampling. Therefore, the data for SW-4 are presented with the data from other ponded water stations (SW-6 and SW-7) located in impoundment.

The diurnal DO concentration at SW-2 on July 2, 1991, ranged from 4.0 to 7.8 mg/L in the South Prong Alafia River, while DO concentrations at SW-3 ranged from 1.5 to 4.5 mg/L. The DO values at SW-1 were the highest among the stream stations with average values of 6.92 mg/L on July 2, 1991, and 6.38 mg/L on August 7, 1991. The high DO concentrations at SW-1 were probably due to the shallow depths (less than 6 inches). The DO fluctuation in stream stations on August 7, 1991, was significantly less than that of July data. The DO concentrations remained at 4.8 mg/L most of the day at SW-2, and DO concentrations ranged from 3.2 to 4.8 mg/L at SW-3 on August 7, 1991. Super saturation of DO was recorded at stations SW-6 and SW-7 because of significant photosynthesis activities due to



* SW-1 ■ SW-2 ▲ SW-3 ✕ SW-5

FIGURE 2.3.4-9.

DIURNAL DO CONCENTRATIONS AT SW-1, SW-2, SW-3, AND SW-5 (JULY, AUGUST 1991)

Source: ECT, 1992.



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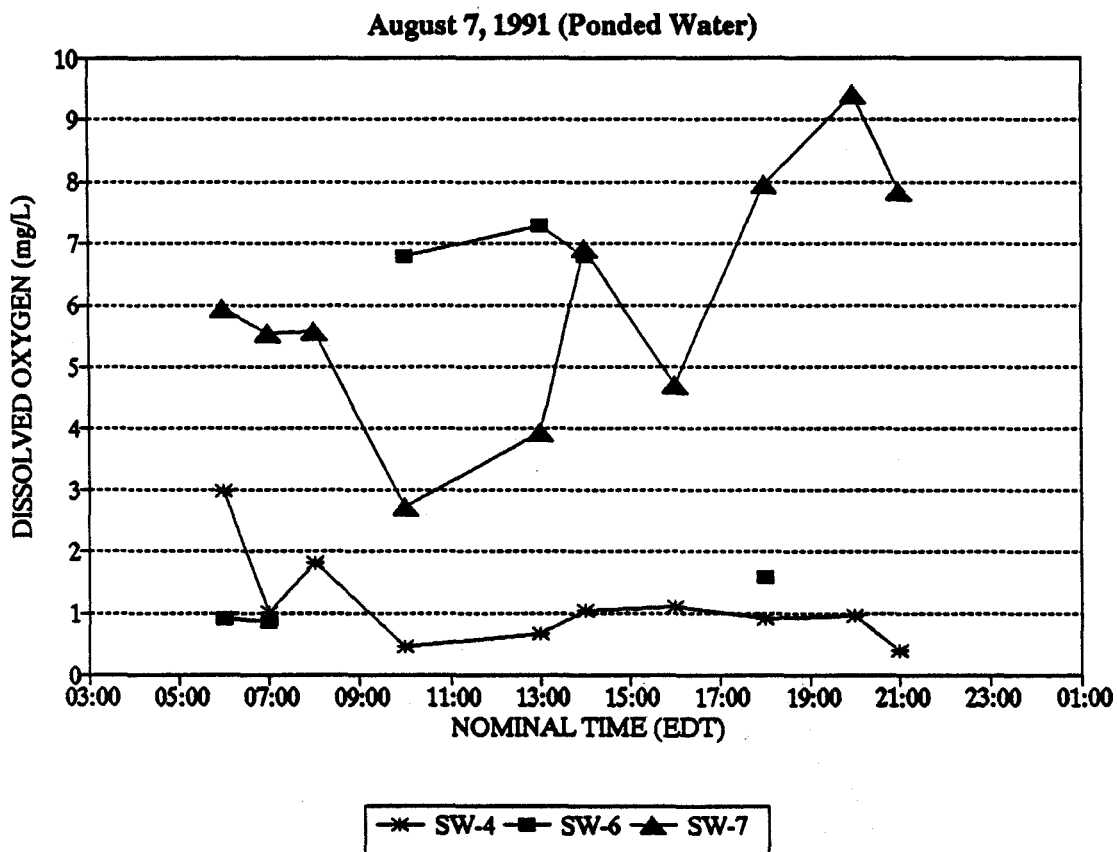
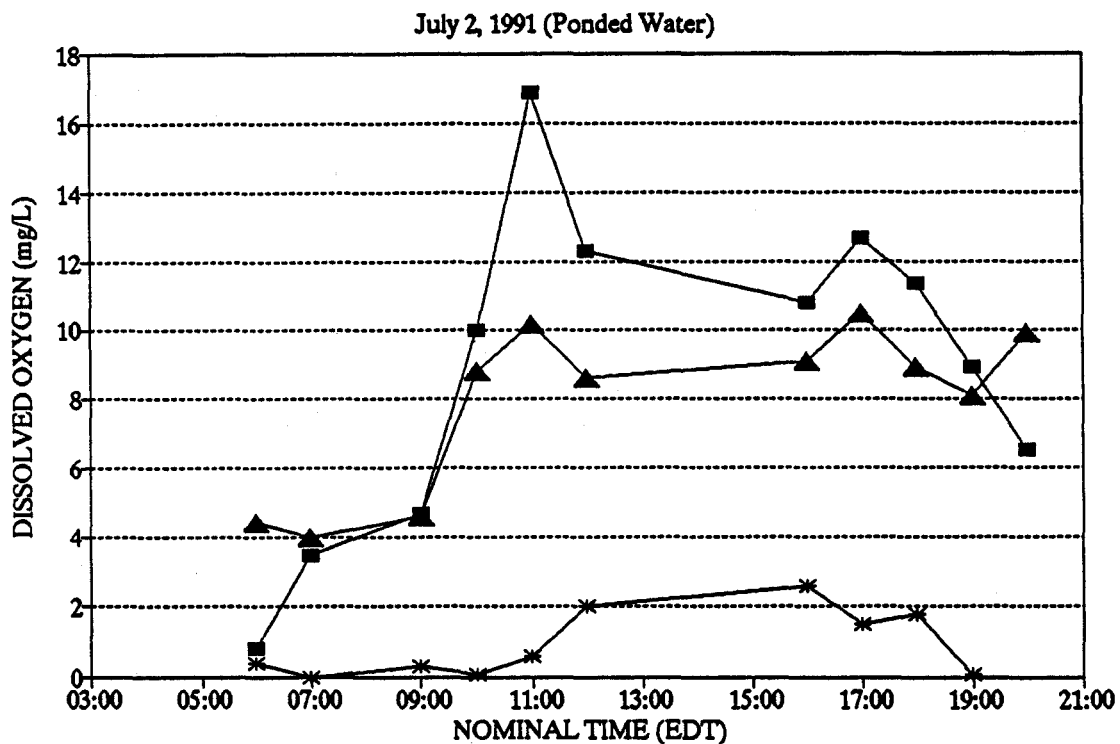


FIGURE 2.3.4-10.

**DIURNAL DO CONCENTRATIONS AT SW-4, SW-6,
AND SW-7 (JULY, AUGUST 1991)**

Source: ECT, 1992.



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abundant aquatic communities in the mine cut and reclaimed lake. The summary of the DO diurnal data is shown in Table 2.3.4-16.

The ponding of Payne Creek at SW-4 near its headwaters and the high organic content, evident from water color, probably account for the lowest DO concentrations recorded during Tampa Electric Company water quality monitoring. There are periods during which Payne Creek is essentially anoxic. The mean DO concentration at SW-4 was 0.9 mg/L corresponding to a mean saturation of only 12 percent. DO concentrations in the flowing Little Payne Creek (SW-5) are considerably higher with a mean value of 4.9 mg/L. The diurnal variation in DO at SW-4 is about 2 mg/L; at SW-5, the variation was as much as 4.7 mg/L (0.9 to 5.6 mg/L) on July 2, 1991.

Monthly data at SW-6 and SW-7 showed high concentration with mean values of 9.3 mg/L and 11.2 mg/L, respectively. The plots of diurnal DO variation reveal many similarities between the water bodies.

Historical DO data from STORET (EPA, 1991) for the South Prong Alafia River at Bethlehem Road and Payne Creek near Bowling Green are presented in Figure 2.3.4-11. Similar to water temperature, DO concentration exhibits a seasonal trend with lower concentrations occurring during the summer when higher water temperatures decrease oxygen solubility in water. The historical data for the South Prong Alafia River exhibit much greater variability with DO concentrations ranging from about 2 to over 11 mg/L. Figure 2.3.4-11 showed that the DO concentration in Payne Creek near Bowling Green was relatively higher than South Prong Alafia River. The DO range at South Prong Alafia River was about 2 to 10 mg/L from June 1981 through August 1983, while the DO range at Payne Creek was about 5.7 to 9.4 mg/L. Moreover, although DO concentrations below 5 mg/L were observed ten times on the South Prong Alafia River, no DO values below 5 mg/L were observed in Payne Creek.

Table 2.3.4-16. Summary of DO Diurnal Data (mg/L)

Station	July 2, 1991			August 7, 1991		
	Average	Minimum	Maximum	Average	Minimum	Maximum
SW-1	6.92	4.0	9.5	6.38	5.58	6.64
SW-2	5.35	4.0	7.8	4.77	4.54	4.94
SW-3	3.48	1.6	5.7	4.16	3.33	4.88
SW-4	0.96	0.0	2.6	1.13	0.46	2.98
SW-5	3.04	0.9	5.6	4.55	3.55	5.75
SW-6	9.07	0.8	16.9	3.67	0.92	7.30
SW-7	8.09	4.0	10.5	6.06	2.73	9.42

Source: ECT, 1992.

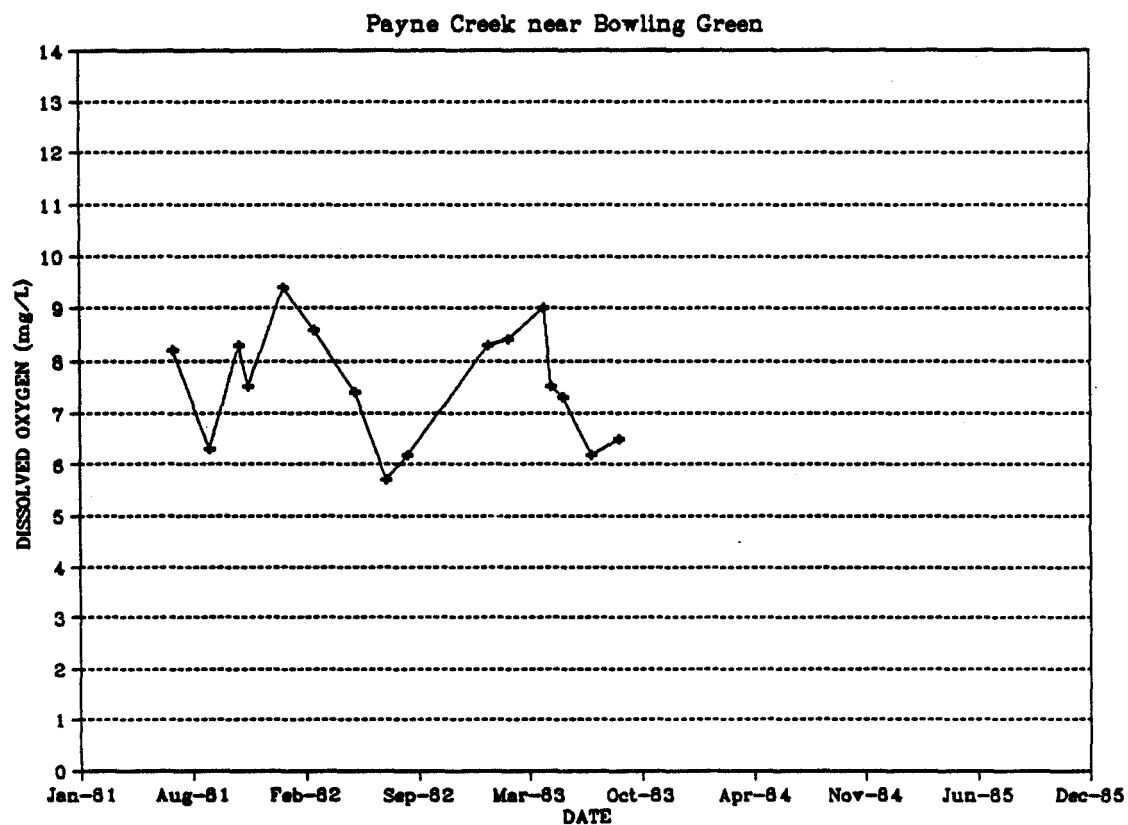
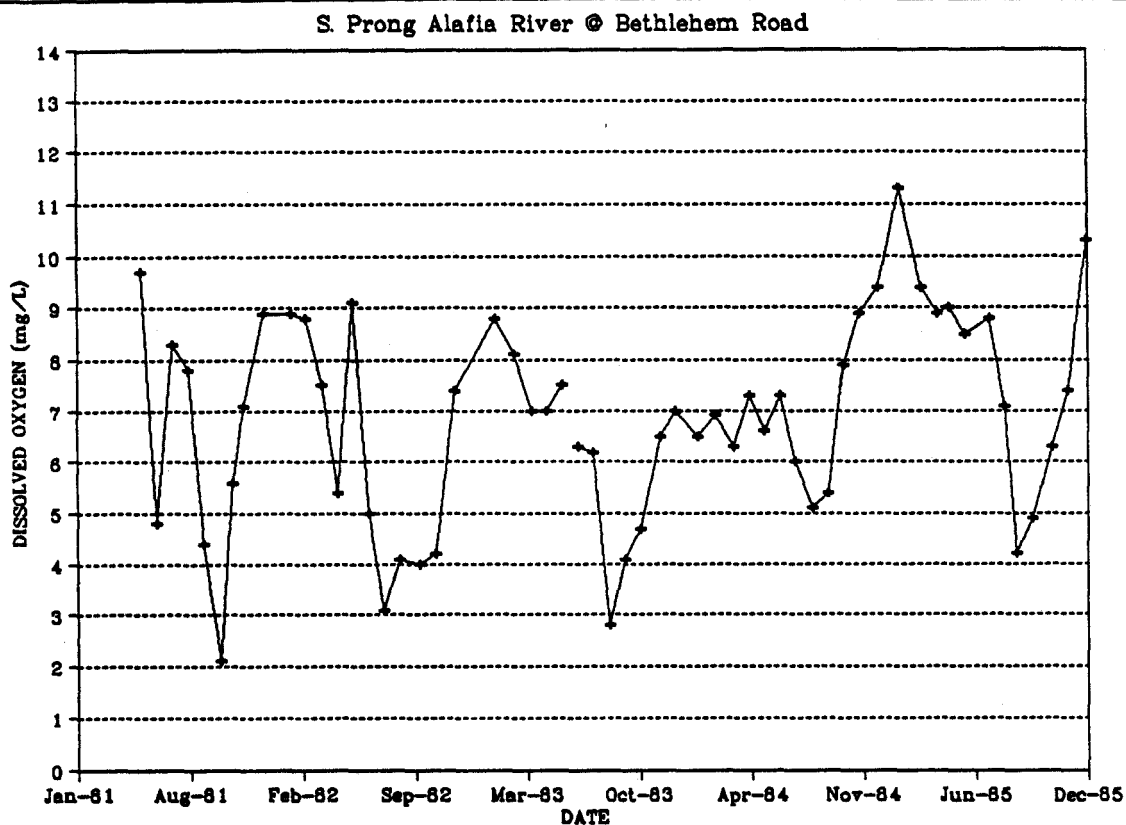


FIGURE 2.3.4-11.

HISTORICAL DO CONCENTRATIONS FOR THE SOUTH PRONG ALAFIA RIVER AND PAYNE CREEK

Source: EPA, 1991. ECT, 1992.



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Biochemical and Chemical Oxygen Demand

In addition to respiration, biochemical oxygen demand (BOD) can decrease DO concentrations. BOD is a measure of the quantity of DO required by microbes to decompose natural or anthropogenic organic matter. The higher the BOD, the poorer the water quality. According to FDER (1989), the median BOD for Florida streams is 1.5 mg/L. The 5-day BOD data for Tampa Electric Company monitoring stations SW-1 through SW-7 are summarized in Tables 2.3.4-6 through 2.3.4-12.

At SW-1 and SW-2, the mean 5-day BOD levels of 2 mg/L are near FDER's reported median value for streams. The mean 5-day BOD at SW-3, 4 mg/L, falls into the 90th percentile for Florida streams. Maximum 5-day BODs for the South Prong Alafia River ranged from 7 mg/L (SW-2) to 10 mg/L (SW-3). FDER/PSES reported maximum values for SW-2 and SW-3 of 9.7 and 1.2 mg/L, respectively. The lower value of 1.2 mg/L, however, is based on only two samples. EPA (1991) reported a maximum BOD of 7.1 mg/L on the South Prong Alafia River at Bethlehem Road (Tampa Electric Company station SW-2). These historical data suggest that Tampa Electric Company's monitoring data are representative.

BOD alone probably does not account for the low DO concentrations measured in Payne Creek at SW-4. The mean 5-day BOD at SW-4 of 4 mg/L (Table 2.3.4-9), while in the 90th percentile for Florida streams (FDER, 1989), is only in the middle of the range of BODs observed by Tampa Electric Company. The highest color and acidity levels were observed at SW-4, which would inhibit photosynthesis. The observed high chemical oxygen demand (COD) also would contribute to the low DO concentrations. Although the mean 5-day BOD in Little Payne Creek at SW-5 of 7 mg/L was higher than the mean BOD at SW-4, the mean DO concentration of 4.9 mg/L was considerably higher. Little Payne Creek at SW-5, however, is a flowing stream with the lowest mean color and lower acidity and COD values and, therefore, higher DO concentrations.

Mean 5-day BOD levels were considerably higher at SW-7 (14 mg/L) than at SW-6 (9 mg/L). The maximum BOD at SW-7 (20 mg/L), and in fact the highest 5-day BOD observed at any station, was twice as high as the maximum observed at SW-6. CODs were also higher at SW-7 with a mean of 72 mg/L compared with SW-6 (58 mg/L).

Hydrogen Ion Activity (pH)

Dissolved gases such as CO₂ can affect hydrogen ion activity or pH. During daylight hours when photosynthesis is greatest, CO₂, dissolved in the water as carbonic acid, is low because of uptake by plants. The pH, consequently, is relatively high. Conversely, during the evening, as plants in addition to the animals begin to respire, more CO₂ is added to the water which caused the pH to be lowered. The pH of water in the South Prong Alafia River ranged between 6.0 and 7.6 standard units. The unnamed tributary to the South Prong typically had lower pH values, ranging between 4.5 and 6.7.

Because pH represents the common log of the concentration of the hydrogen ion, the mean must be calculated from the anti-log of the individual pHs. Using this approach, the mean pH for SW-2 and SW-3 was 6.7 and 6.5, respectively; the mean pH for SW-1 was 5.2. Although the pH values measured at SW-1 are lower than 6.0 (the minimum numerical FDER Class III standard for pH) 40 percent of the time, it could be demonstrated that the natural background pH is best represented by the mean value of 5.2. Therefore, a violation of the standard would occur only when pH was <5.2 based on Tampa Electric Company's monitoring data. According to FDER (1989), pH values between 4 and 5 are not unusual in Florida's blackwater streams, as exhibited by SW-1. These low pH values result from the decomposition of organic matter to form the so-called humic acids or complex organic acids.

On the Payne Creek (SW-4) and Little Payne Creek (SW-5), the mean pH was 6.5 and 6.3, respectively. The observed pH values consistently fell within the range of 6.0 to 8.5. This was not the case at stations SW-6 and SW-7 where maximum pH

values of 9.4 were observed at both stations. The mean pH values, however, were 8.5 and 8.4 for stations SW-6 and SW-7, respectively.

Alkalinity

Alkalinity can be defined as the capacity for solutes in water to react with and neutralize acid. Normally alkalinity is reported in terms of the equivalent amount of calcium carbonate (mg/L as CaCO_3). Except for waters with high pH values, i.e., greater than 9.5, or unusual waters, the alkalinity of water can be considered the result of dissolved bicarbonate and carbonate.

The lowest alkalinity values were measured on the unnamed tributary to the South Prong Alafia River (SW-1). Alkalinity at this station ranged between 3 and 17 mg/L as CaCO_3 with a mean value of 10 mg/L. All five measurements at SW-1 were lower than the Class III standard of ≥ 20 mg/L as CaCO_3 . Alkalinity values at all of the remaining stations were above the Class III standard. The mean alkalinity values at the two South Prong Alafia River stations SW-2 and SW-3 were 72 and 84 mg/L, respectively.

Payne Creek (SW-4) alkalinity values ranged between 26 and 93 mg/L with a mean value of 66 mg/L. Little Payne Creek (SW-5) had higher alkalinity values with a mean of 92 mg/L.

The mean alkalinity values in the reclaimed lake (SW-6) and the old mine cut (SW-7) were 82 and 67 mg/L, respectively.

Color

The decomposition of organic matter contributes to the color of many of Florida's surface waters. Color, and associated high organic content, and its impact on DO concentration was briefly discussed previously. The median color in Florida's streams is 70 Pt-Co color units; color in excess of about 140 Pt-Co units occurs 20 percent of the time (FDER, 1989). Mean color at SW-2 and SW-3 was 77 and 89 Pt-Co units,

respectively. The mean color of 144 Pt-Co units at SW-1 falls within the 80th percentile. This color is probably the result of organic decomposition and some limited agricultural activity.

The highest mean color (263 Pt-Co units) and maximum color (400 Pt-Co units) values were observed in the headwaters of Payne Creek at SW-4 indicating a high organic content at SW-4. These values are well above the median color (140 Pt-Co units) reported for Florida's streams by FDER (1989). Conversely, SW-5, along with SW-6 discussed below, had the lowest color values observed. The mean and maximum color values for SW-5 were 43 and 75 Pt-Co units, respectively. These low color values indicate relatively low organic content which, given the fact that these waters drain from mined out areas, is expected.

Color was significantly different between stations SW-6 and SW-7. SW-7 was more colored with a mean color of 111 Pt-Co units compared with SW-6 with a mean color of 48 Pt-Co units. This suggests that there was more organic material in the waters of the old mine cut (SW-7).

Total Suspended Solids

According to FDER (1990), total suspended solids have been identified as a problem in the South Prong Alafia River. Moreover, during construction, total suspended solids concentration, without mitigative measures, could be affected. Based on the data collected by Tampa Electric Company, it is apparent that, although total suspended solids were usually below about 40 mg/L, concentrations as high as 120 mg/L were observed. The highest total suspended solids concentration was observed at station SW-3 located on the South Prong Alafia River.

FDER (1990) data indicate that suspended solids are not a problem for Payne Creek and Little Payne Creek. The mean values observed by Tampa Electric Company, 17 and 5 mg/L for SW-4 and SW-5, respectively, support this assessment. Nevertheless,

the value for SW-4 is in the 80th percentile for Florida's streams (FDER, 1989) and the mean value for SW-5 is in the 40th percentile.

The mean total suspended solids concentrations of 23 and 33 mg/L for SW-6 and SW-7 were higher than some of the other Tampa Electric Company stations. The maximum of 50 mg/L at these stations, however, was well below the maximum value of 120 mg/L observed by Tampa Electric Company at SW-3.

Nutrients and Chlorophyll

Nutrients are mentioned consistently by FDER (1990) as contributing to water quality problems in surface waters near the Polk Power Station site, including the South Prong Alafia River and Payne Creek systems. According to 5 years of STORET data (EPA, 1991) for the South Prong Alafia River at Bethlehem Road (Tampa Electric Company station SW-2), the mean total nitrogen concentration, which includes organic nitrogen, nitrates, nitrites, and ammonia, was 1.50 mg/L which falls within the 65th percentile for Florida streams (FDER, 1989). According to the EPA STORET data and Tampa Electric Company's data, nitrates or nitrates plus nitrites and total organic nitrogen were the primary nitrogen species present. Mean nitrate concentrations at SW-2 and SW-3 were 0.6 and 0.2 mg/L, respectively. Although there was very little nitrogen measured as nitrite at SW-2, nitrite was a major component at SW-3 with a mean concentration of 0.28 mg/L. Time series plots of total organic nitrogen and ammonia for the South Prong Alafia River are presented in Figure 2.3.4-12.

Given the phosphate mining in the vicinity of the South Prong Alafia River, total phosphorus concentrations are expectedly high. Mean concentrations measured by Tampa Electric Company range from 0.82 (SW-1) to 1.28 mg/L (SW-3). These values fall within the 90th percentile of FDER's data (FDER, 1989). The median values reported by FDER for Florida streams was 0.11 mg/L. Total phosphorus concentrations considerably higher than the maximum recorded by Tampa Electric Company, 1.70 mg/L (SW-2), have been reported by EPA (1991) as shown in

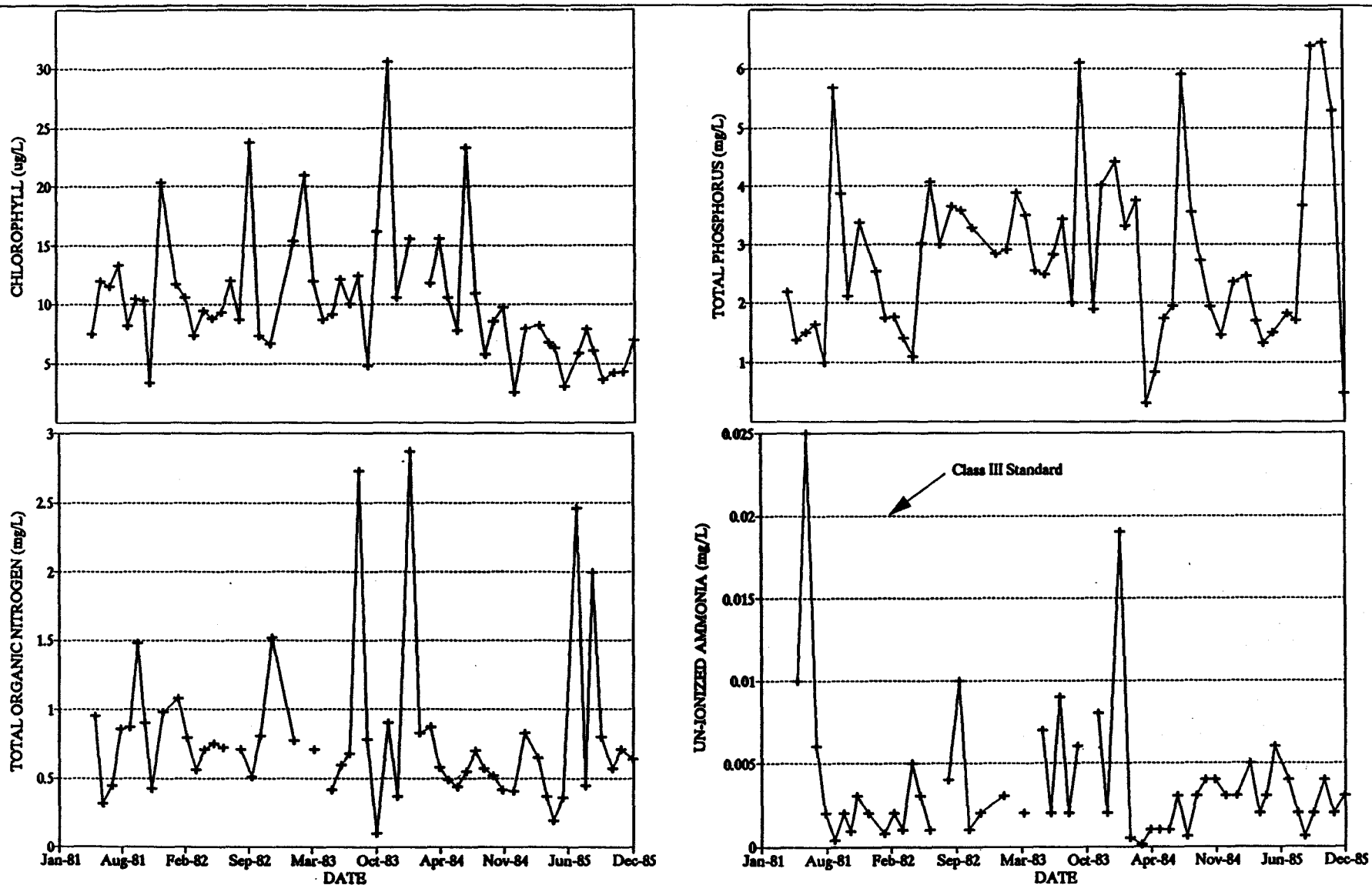


FIGURE 2.3.4-12.

HISTORICAL CHLOROPHYLL AND NUTRIENT (TOTAL ORGANIC NITROGEN, UN-IONIZED AMMONIA, AND TOTAL PHOSPHORUS) CONCENTRATIONS ON THE SOUTH PRONG ALAFIA RIVER AT BETHLEHEM ROAD

Source: EPA, 1991. ECT, 1992.



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Figure 2.3.4-12 and Table 2.3.4-13, and FDER/PSES as shown in Table 2.3.4-14. In fact the highest concentration reported by FDER/PSES--16.4 mg/L, is nearly an order of magnitude higher than total phosphorus reported by Tampa Electric Company for the South Prong Alafia River (SW-2).

Chlorophyll was not measured by Tampa Electric Company. Given the very spotty nature of chlorophyll data, longer-term historical data provide a better characterization of chlorophyll concentrations. According to STORET data (EPA, 1991), based on 56 water samples, the mean chlorophyll *a* concentration in the South Prong Alafia River at Bethlehem Road was 4.3 micrograms per liter ($\mu\text{g/L}$); the mean total chlorophyll concentration was 10.4 $\mu\text{g/L}$. FDER/PSES reports a lower mean chlorophyll *a* value of 1.42 $\mu\text{g/L}$ at this same location; however, this mean is based on only five samples. Just upstream at FDER/PSES Station S3, which is upstream of the Polk Power Station site, chlorophyll *a* values as high as 32.90 $\mu\text{g/L}$ were reported. A time-series plot of total chlorophyll, along with selected nutrients, is presented in Figure 2.3.4-12.

The mean total phosphorus concentration on Payne Creek at SW-4 (0.71 mg/L) was about twice as high as the mean for the Little Payne Creek station SW-5 (0.49 mg/L). Mean total organic nitrogen values for SW-4 and SW-5 were 1.34 and 1.01 mg/L, respectively. These values are consistent with the STORET data (EPA, 1991) with mean total phosphorus and organic nitrogen concentrations for Payne Creek near Bowling Green of 0.70 and 1.2 mg/L, respectively. These means, however, are based on only three and two samples, respectively.

The most significant difference between SW-7 and SW-6 and, for that matter, any of the other Tampa Electric Company monitoring stations, is seen in the nutrient concentrations as demonstrated by total organic nitrogen and total phosphorus. The mean total organic nitrogen concentration for SW-7 of 2.73 mg/L is 1.5 times greater than the next highest mean concentration of 1.64 mg/L (SW-6). The difference in total phosphorus concentration is even more pronounced with the mean

concentration at SW-7 of 4.52 mg/L over 3.5 times higher than the next highest mean total phosphorus concentration (SW-3). No historical data have been identified for comparison.

The only violations of the nutrient concentration standards were for ammonia at SW-7 where there were three exceedances of the Class III water quality standards.

Metals

For the most part, metals were below the method detection limits; however, there were occasional exceptions. For example, iron, which was generally below the method detection limit at most of the stations, was occasionally above the method detection limit at SW-1 and SW-3 (Tables 2.3.4-6 and 2.3.4-8), but well below the Class III water quality standard of 1.0 mg/L.

Of the trace metals, only lead and silver were observed above the method detection limits at stations SW-1, SW-2, and SW-3 (Table 2.3.4-6 through 2.3.4-8). The Class III standard for lead was exceeded at all stations at least one time. The maximum silver concentrations at stations SW-1 through SW-3 were either at or just below the Class III standard for silver (0.07 µg/L).

Unlike the other Tampa Electric Company stations, iron was always above the method detection limit at the Payne Creek station, SW-4 (Table 2.3.4-9). Normally, iron precipitates readily in the presence of oxygen; however, given the low DO concentrations and high acidity and color, iron is more soluble. The high organic content of the water at SW-4, as indicated by high color, would tend to stabilize this soluble iron. At SW-5 (Little Payne Creek), iron was consistently below the method detection limits. Manganese was observed only at SW-4 and only once in March 1991 (0.07 mg/L).

Like the South Prong Alafia River stations (SW-1 through SW-3), lead and silver were the only trace metals observed in Payne Creek and Little Payne Creek (SW-4

and SW-5). Lead was observed at these stations, and all other stations, only during March; silver only during February. Primarily their appearance is an artifact of analysis rather than an indication of their actual distribution. During the months in question, the method detection limits were significantly lower than the standard. There were violations of the lead standard at both stations. At SW-4 in February, silver was above the Class III standard of $0.07 \mu\text{g/L}$. This was the only time at any station that silver exceeded the Class III standard.

Iron was below the method detection limits at stations SW-6 and SW-7. Like the other Tampa Electric Company stations, silver and lead were above the method detection limit only during February and March, respectively. Lead exceeded the Class III standard at SW-6 and SW-7.

Other Priority Pollutants, Organic Compounds, and Pesticides

Other than the aforementioned trace metals, all other priority pollutants at all Tampa Electric Company stations were below the method detection limits. A special sampling was conducted in March 1992 to sample surface waters for cyanide. The analytical technique used incorporated the latest sampling and analysis methods outlined by FDER. According to the results from this sampling, cyanide was below the method detection limit of 0.02 mg/L . Organics such as phenols, phthalates, polychlorinated biphenyls (PCBs), and pesticides also were below the method detection limits.

Bacteria

Like chlorophyll, bacteria data are notoriously limited. Therefore, Tampa Electric Company relied on longer-term historical data to characterize bacteria. The geometric mean concentration for total and fecal coliform bacteria on the South Prong Alafia River at Bethlehem Road is 752 and 191 counts per 100 milliliters (mL) (Table 2.3.4-14). Compared with coliform data for streams provided by FDER (1989), the total and fecal coliform values lie between the 50th and 60th percentiles and the 60th and 70th percentiles, respectively.

Radioactive Substances

The mean values for Radium 226 ranged from 0.5 to 1.4 pCi/L, for Radium 228 1.0 to 1.3 pCi/L, and for gross alpha 1.7 to 3 pCi/L. The Radium 226 standard was exceeded one time at SW-6. The standard for Radium 228 was exceeded once at SW-2, SW-3, and SW-4. There were no violations of the gross alpha standard.

2.3.4.2 Measurement Programs

The surface water field program was described in the environmental licensing plan of study which was reviewed by the statutory agencies including FDER and EPA (ECT, 1991). The number, locations, and conditions of surface water stations, as well as detailed information on data collection methods, data analyses, and results are provided in the following paragraphs.

Seven surface water stations were established for field monitoring. These stations, shown in Figure 2.3.4-3, were located to ensure that the maximum amount of representative data were collected from the streams and other water bodies that may be affected by plant construction and operation. Station SW-1, was located on an unnamed tributary to the South Prong Alafia River. This tributary will receive some runoff from the reclaimed lands on the site to the west of SR 37. This stream is also representative of other small first order tributaries in the area. Hydrologic and water quality data from this station are used to characterize baseline conditions in this stream and to assess the potential impacts associated with intermittent flows from the reclaimed areas. Stations SW-2 and SW-3 were located to characterize the South Prong Alafia River. SW-3 was located so that it was downstream of the IMC Fertilizer Brewster Mine discharge, but upstream of runoff associated with Agrico's mining activities. Data from station SW-2, located downstream of the site, were used to characterize the river downstream of the Polk Power Station site.

Other surface water bodies that may potentially be affected either by construction or operation of the proposed plant include Little Payne Creek and Payne Creek. Both of these streams have been substantially modified as a result of mining activities. In

order to characterize regional baseline surface water conditions and provide the necessary information to assess potential impacts associated with the proposed plant location, surface water stations were located along these water bodies. Station SW-4 was located near the headwaters of Payne Creek at the point where SR 37 crosses Payne Creek. Station SW-5 was located where Fort Green Road crosses the drainage canal that now represents the headwaters of Little Payne Creek.

In addition to the streams that surround the Polk Power Station site, mine cuts and a reclaimed lake are located on the site. Surface water stations were located in both the recently reclaimed lake and the old unreclaimed mine cut lake. These stations, designated SW-6 and SW-7, respectively, were used to characterize water quality in these two distinct types of water bodies.

Continuous stage recorders were installed at stations SW-2, SW-5, and SW-6 for 6 months beginning in late February and continuing through August 1991. This period encompasses central Florida's normal dry and wet seasons. The locations of these stations and the rationale for selecting these stations were presented previously.

Continuous stage was recorded using Leupold & Stevens Type A water level recorders. A typical installation is shown in Figure 2.3.4-13. These water level recorders were serviced monthly. A staff gauge was attached to the platform of each recorder. This staff gauge provided an independent check of water level that was compared to the actual chart record. This check is essential for detecting problems such as plugged outlet holes and slipped float cables.

To convert stage to discharge, instantaneous flows at stations SW-2, SW-5, and SW-6 were measured using a Teledyne-Gurley pygmy current meter and standard USGS techniques. Instantaneous flow measurements were made across the stream, if flowing water was present, at the location of the continuous stage recorder on a monthly basis over the 6-month monitoring period. The stage, as indicated by the recorder and the staff gauge, was measured prior to, and immediately following, the instan-

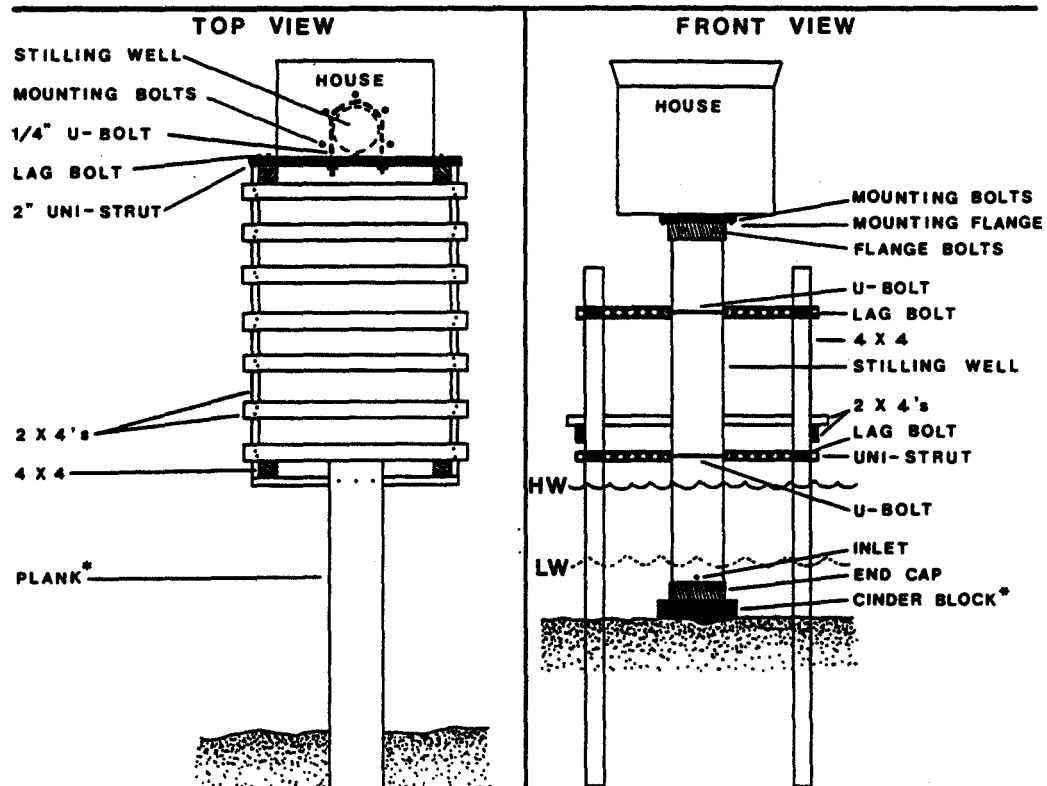
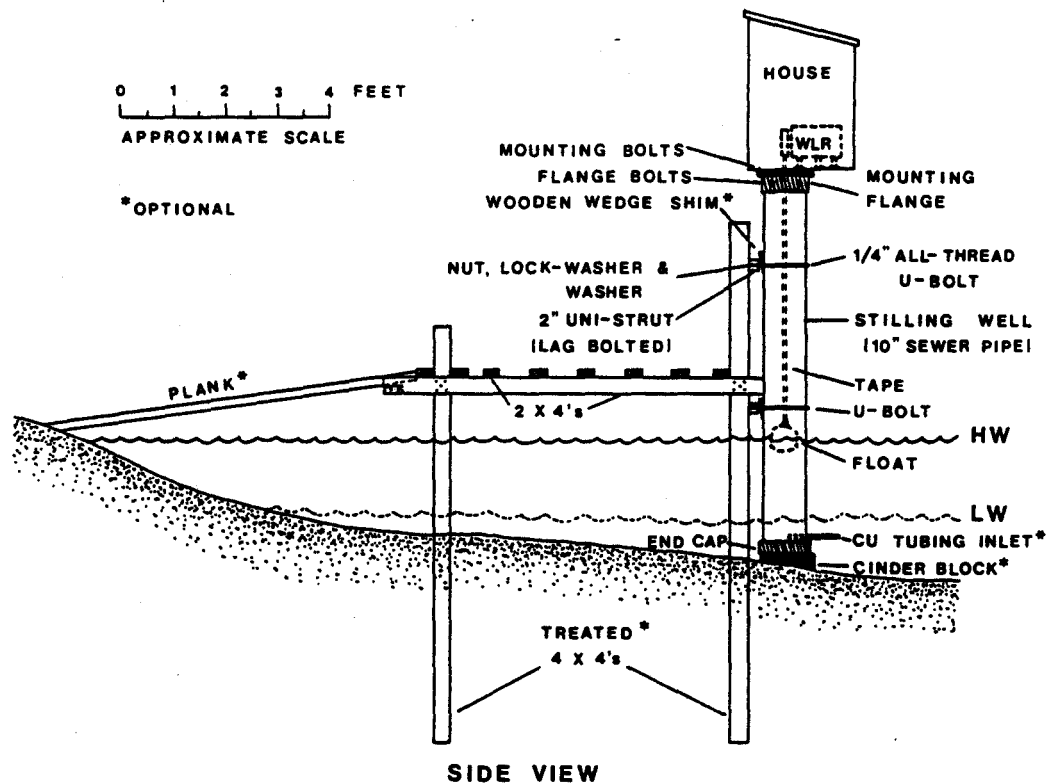


FIGURE 2.3.4-13.

TYPICAL STAGE (WATER LEVEL) RECORDER INSTALLATION

Source: ECT, 1992.



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taneous flow measurement. The reduced flow data were then plotted against the stage data from the water level recorder to produce a stage-discharge curve. Using this curve, continuous discharges from the continuous stage data were determined.

In addition, monthly instantaneous flows were measured at stations SW-1, SW-3, and SW-4. Flow measurements were not applicable at station SW-7 since the unreclaimed mine cut is not normally a flowing system. These measurements were made during the monthly sampling efforts whenever there was water flowing at these stations. From the instantaneous flow data, streamflow at these locations for a variety of conditions was characterized.

Concurrent with discharge data collection, water quality samples were collected monthly at the seven surface water monitoring stations. These samples were analyzed for the parameters listed in Table 2.3.4-17. This list is based on the Class III standards presented in Chapters 17-302.510 and 17-302.560, F.A.C. Additional analytes were included because they are either essential for describing an aquatic system or for adequately interpreting water quality conditions in these surface water bodies. The parameters in this table have been grouped into *in situ* measurements, classical analytes, other metals, radioactive substances, pesticides, and organics. The latter two categories were sampled less frequently but encompassed the dry and wet periods. All other parameters were measured during each of the six water quality sampling trips. At stations SW-2 and SW-4, two priority pollutant scans were conducted; once during the dry season and a second time during the wet season. These scans identified any such pollutants that may exist in the South Prong Alafia River and Payne Creek. Single priority pollutant scans also were conducted at SW-3 (South Prong Alafia River) and SW-5 (Little Payne Creek) during May and August 1991, respectively.

In addition to the *in situ* measurements associated with the monthly water quality sampling, diurnal (i.e., daytime) DO measurements were made twice during the 6-month sampling period. During these sampling events, DO concentration was

Table 2.3.4-17. Tampa Electric Company Surface Water Quality Analytes and Number of Analyses per Location

Analyte	Units	No. of Analyses						
		SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-7
General Observations								
Date	1991							
Time	LMT							
Discharge	cfs	6	6	6	6	6	0	0
In Situ Measurements								
Temperature	C	5	6	6	6	6	5	5
Specific Conductance	umhos/cm	5	6	6	6	6	5	5
Hydrogen Ion Activity (pH)		5	6	6	6	6	5	5
Dissolved Oxygen (DO)	mg/L	5	6	6	6	6	5	5
DO Saturation	%	5	6	6	6	6	5	5
Oxidation-Reduction Potential	V	4	4	4	4	4	4	4
Classical								
Alkalinity, Total as CaCO3	mg/L	5	5	5	5	5	5	5
Alkalinity, Bicarbonate	mg/L	5	5	5	5	5	5	5
Alkalinity, Carbonate	mg/L	6	6	6	6	6	6	6
Acidity, Total	mg/L	6	6	6	6	6	6	6
Hardness, Total as CaCO3	mg/L	6	6	6	6	6	6	6
Color	Pt-Co	6	6	6	6	6	6	6
Solids, Total	mg/L	6	6	6	6	6	6	6
Solids, Total Dissolved	mg/L	6	6	6	6	6	6	6
Solids, Total Suspended	mg/L	6	6	6	6	6	6	6
Turbidity	NTU	6	6	6	6	6	6	6
Chloride	mg/L	6	6	6	6	6	6	6
Fluoride, Soluble	mg/L	6	6	6	6	6	6	6
Sulfate	mg/L	6	6	6	6	6	6	6
Cyanide	mg/L	1	1	1	1	1	1	1
Sodium	mg/L	6	6	6	6	6	6	6
Calcium	mg/L	6	6	6	6	6	6	6
Magnesium	mg/L	6	6	6	6	6	6	6
Arsenic	ug/L	6	6	6	6	6	6	6
Selenium	ug/L	6	6	6	6	6	6	6
Total Anions	meq/L	6	6	6	6	6	6	6
Total Cations	meq/L	6	6	6	6	6	6	6
Ammonia (un-ionized)	mg/L	6	6	6	6	6	6	6
Nitrogen, Nitrate	mg/L	6	6	6	6	6	6	6
Nitrogen, Nitrite	mg/L	6	6	6	6	6	6	6
Nitrogen, Total Organic	mg/L	6	6	6	6	6	6	6
Nitrogen, Kjeldahl	mg/L	6	6	6	6	6	6	6
Phosphorus, Total	mg/L	6	6	6	6	6	6	6
Total Rec. Oil & Grease	mg/L	6	6	6	6	6	6	6
Surfactants	mg/L	6	6	6	6	6	6	6
5-day BOD	mg/L	6	6	6	6	6	6	6
Chemical Oxygen Demand	mg/L	5	5	5	5	5	5	5
Hydrogen Sulfide	mg/L	2	2	2	2	2	2	2
Other Metals								
Antimony	mg/L	1	3	2	2	1	1	1
Barium	mg/L	6	6	6	6	6	6	6

Table 2.3.4-17. Tampa Electric Company Surface Water Quality Analytes and Number of Analyses per Location
(Continued, Page 2 of 5)

Analyte	Units	No. of Analyses						
		SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-7
Beryllium	ug/L	6	6	6	6	6	6	6
Cadmium	ug/L	6	6	6	6	6	6	6
Chromium	mg/L	6	6	6	6	6	6	6
Chromium, Hexavalent	mg/L	4	4	4	4	4	4	4
Copper	mg/L	6	6	6	6	6	6	6
Iron	mg/L	6	6	6	6	6	6	6
Lead	ug/L	6	6	6	6	6	6	6
Manganese	mg/L	6	6	6	6	6	6	6
Mercury	ug/L	6	6	6	6	6	6	6
Nickel	mg/L	6	6	6	6	6	6	6
Silver	ug/L	6	6	6	6	6	6	6
Thallium	mg/L	1	3	2	2	1	1	1
Vanadium	mg/L	2	2	2	2	2	2	2
Zinc	mg/L	6	6	6	6	6	6	6
Radioactive Substances								
Radium 226	pCi/L	6	6	6	6	6	6	6
Radium 228	pCi/L	6	6	6	6	6	6	6
Gross Alpha	pCi/L	6	6	6	6	6	6	6
Organics (Phenols, Phthalates, PCBs)								
Phenol	ug/L	6	6	6	6	6	6	6
2-Chlorophenol	ug/L	6	6	6	6	6	6	6
2-Nitrophenol	ug/L	6	6	6	6	6	6	6
4-Nitrophenol	ug/L	6	6	6	6	6	6	6
2-Methylphenol	ug/L	0	2	1	2	1	0	0
4-Methylphenol	ug/L	0	2	1	2	1	0	0
2,4-Dimethylphenol	ug/L	6	6	6	6	6	6	6
2,4-Dichlorophenol	ug/L	6	6	6	6	6	6	6
4-Chloro-3-methylphenol	ug/L	6	6	6	6	6	6	6
2,4,5-Trichlorophenol	ug/L	0	2	1	2	1	0	0
2,4,6-Trichlorophenol	ug/L	6	6	6	6	6	6	6
2,4-Dinitrophenol	ug/L	6	6	6	6	6	6	6
2-Methyl-4,6-dinitrophenol	ug/L	6	6	6	6	6	6	6
Pentachlorophenol	ug/L	6	6	6	6	6	6	6
Di-n-butyl Phthalate	ug/L	3	4	4	4	3	3	3
bis(2-Ethyl hexyl) Phthalate	ug/L	3	4	4	4	3	3	3
Di-n-octyl Phthalate	ug/L	3	4	4	4	3	3	3
Butyl Benzyl Phthalate	ug/L	3	4	4	4	3	3	3
Diethyl Phthalate	ug/L	3	4	4	4	3	3	3
Dimethyl Phthalate	ug/L	3	4	4	4	3	3	3
PCB-1016	ug/L	3	4	4	4	3	3	3
PCB-1221	ug/L	3	4	4	4	3	3	3
PCB-1232	ug/L	3	4	4	4	3	3	3
PCB-1242	ug/L	3	4	4	4	3	3	3
PCB-1248	ug/L	3	4	4	4	3	3	3
PCB-1254	ug/L	3	4	4	4	3	3	3
PCB-1260	ug/L	3	4	4	4	3	3	3

Table 2.3.4-17. Tampa Electric Company Surface Water Quality Analytes and Number of Analyses per Location
(Continued, Page 3 of 5)

Analyte	Units	No. of Analyses						
		SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-7
Pesticides								
Aldrin	ug/L	3	4	4	4	3	3	3
Dieldrin	ug/L	3	4	4	4	3	3	3
Chlordane	ug/L	3	4	4	4	3	3	3
4,4-DDT	ug/L	3	4	4	4	3	3	3
4,4-DDD	ug/L	0	2	1	2	1	0	0
4,4-DDE	ug/L	0	2	1	2	1	0	0
Demeton	ug/L	3	3	3	3	3	3	3
Endosulfan	ug/L	3	3	3	3	3	3	3
Endosulfan I	ug/L	0	2	1	2	1	2	0
Endosulfan II	ug/L	0	2	1	2	1	2	0
Endosulfan Sulfate	ug/L	0	2	1	2	1	2	0
Endrin	ug/L	3	4	4	4	3	3	3
Endrin Aldehyde	ug/L	0	2	1	2	1	2	0
Guthion	ug/L	3	3	3	3	3	3	3
Heptachlor	ug/L	3	4	4	4	3	3	3
Heptachlor Epoxide	ug/L	0	2	1	2	1	2	0
a-BHC	ug/L	0	2	1	2	1	2	0
b-BHC	ug/L	0	2	1	2	1	2	0
g-BHC	ug/L	0	1	1	1	0	0	0
d-BHC	ug/L	0	2	1	2	1	0	0
Lindane	ug/L	3	3	3	3	3	3	3
Malathion	ug/L	3	3	3	3	3	3	3
Methoxychlor	ug/L	3	3	3	3	3	3	3
Mirex	ug/L	3	3	3	3	3	3	3
Parathion	ug/L	3	3	3	3	3	3	3
Toxaphene	ug/L	3	4	4	4	3	3	3
Other Priority Pollutants								
Acrolein	ug/L	0	2	1	2	1	0	0
Acrylonitrile	ug/L	0	2	1	2	1	0	0
Benzene	ug/L	0	2	1	2	1	0	0
Bromodichloromethane	ug/L	0	2	1	2	1	0	0
Bromoform	ug/L	0	2	1	2	1	0	0
Bromomethane	ug/L	0	2	1	2	1	0	0
Carbon Tetrachloride	ug/L	0	2	1	2	1	0	0
Chlorobenzene	ug/L	0	2	1	2	1	0	0
Chloroethane	ug/L	0	2	1	2	1	0	0
2-Chloroethylvinyl Ether	ug/L	0	2	1	2	1	0	0
Chloroform	ug/L	0	2	1	2	1	0	0
Chloromethane	ug/L	0	2	1	2	1	0	0
Dibromochloromethane	ug/L	0	2	1	2	1	0	0
1,1-Dichloroethane	ug/L	0	2	1	2	1	0	0
1,2-Dichloroethane	ug/L	0	2	1	2	1	0	0
1,1-Dichloroethylene	ug/L	0	2	1	2	1	0	0
trans-1,2-Dichloroethylene	ug/L	0	2	1	2	1	0	0
1,2-Dichloropropane	ug/L	0	2	1	2	1	0	0
cis-1,3-Dichloropropene	ug/L	0	2	1	2	1	0	0
trans-1,3-Dichloropropene	ug/L	0	2	1	2	1	0	0
Ethyl Benzene	ug/L	0	2	1	2	1	0	0

Table 2.3.4-17. Tampa Electric Company Surface Water Quality Analytes and Number of Analyses per Location
(Continued, Page 4 of 5)

Analyte	Units	No. of Analyses						
		SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-7
Methylene Chloride	ug/L	0	2	1	2	1	0	0
1,1,2,2-Tetrachloroethane	ug/L	0	2	1	2	1	0	0
Tetrachloroethylene	ug/L	0	2	1	2	1	0	0
Toluene	ug/L	0	2	1	2	1	0	0
1,1,1-Trichloroethane	ug/L	0	2	1	2	1	0	0
1,1,2-Trichloroethane	ug/L	0	2	1	2	1	0	0
Trichloroethylene	ug/L	0	2	1	2	1	0	0
Trichlorofluoromethane	ug/L	0	2	1	2	1	0	0
Vinyl Chloride	ug/L	0	2	1	2	1	0	0
Acenaphthene	ug/L	0	3	1	2	1	0	0
Acenaphthylene	ug/L	0	3	1	2	1	0	0
Anthracene	ug/L	0	3	1	2	1	0	0
Benzoic Acid	ug/L	0	2	1	2	1	0	0
Benzo(a)anthracene	ug/L	0	3	1	2	1	0	0
Benzo(a)pyrene	ug/L	0	3	1	2	1	0	0
Benzo(b)fluoranthene	ug/L	0	3	1	2	1	0	0
Benzo(k)fluoranthene	ug/L	0	3	1	2	1	0	0
Benzo(g,h,i)perylene	ug/L	0	3	1	2	1	0	0
Benzyl Alcohol	ug/L	0	2	1	2	1	0	0
bis(2-Chloroethoxy) Methane	ug/L	0	3	1	2	1	0	0
bis(2-Chloroethyl) Ether	ug/L	0	3	1	2	1	0	0
bis(2-Chloroisopropyl) Ether	ug/L	0	3	1	2	1	0	0
4-Bromophenyl Phenyl Ether	ug/L	0	3	1	2	1	0	0
2-Chloronaphthalene	ug/L	0	3	1	2	1	0	0
4-Chlorophenyl Phenyl Ether	ug/L	0	3	1	2	1	0	0
4-Chloroaniline	ug/L	0	2	1	2	1	0	0
Chrysene	ug/L	0	3	1	2	1	0	0
Dibenzo(a,h)anthracene	ug/L	0	3	1	2	1	0	0
1,2-Dichlorobenzene	ug/L	0	2	1	2	1	0	0
1,3-Dichlorobenzene	ug/L	0	2	1	2	1	0	0
1,4-Dichlorobenzene	ug/L	0	2	1	2	1	0	0
3,3-Dichlorobenzidine	ug/L	0	3	1	2	1	0	0
Dibenzofuran	ug/L	0	2	1	2	1	0	0
2,4-Dinitrotoluene	ug/L	0	3	1	2	1	0	0
2,6-Dinitrotoluene	ug/L	0	3	1	2	1	0	0
Fluoranthene	ug/L	0	3	1	2	1	0	0
Fluorene	ug/L	0	3	1	2	1	0	0
Hexachlorobenzene	ug/L	0	3	1	2	1	0	0
Hexachlorobutadiene	ug/L	0	3	1	2	1	0	0
Hexachloroethane	ug/L	0	3	1	2	1	0	0
Indeno(1,2,3-c,d)pyrene	ug/L	0	3	1	2	1	0	0
Isophorone	ug/L	0	3	1	2	1	0	0
2-Methylnaphthalene	ug/L	0	2	1	2	1	0	0
Naphthalene	ug/L	0	3	1	2	1	0	0
2-Nitroaniline	ug/L	0	2	1	2	1	0	0
3-Nitroaniline	ug/L	0	2	1	2	1	0	0
4-Nitroaniline	ug/L	0	2	1	2	1	0	0
Nitrobenzene	ug/L	0	3	1	2	1	0	0
N-Nitrosodimethylamine	ug/L	0	2	0	1	1	0	0
N-Nitrosodi-n-propylamine	ug/L	0	3	1	2	1	0	0

Table 2.3.4-17. Tampa Electric Company Surface Water Quality Analytes and Number of Analyses per Location
(Continued, Page 5 of 5)

Analyte	Units	No. of Analyses						
		SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-7
N-Nitrosodiphenylamine	ug/L	0	3	1	2	1	0	0
Phenanthrene	ug/L	0	3	1	2	1	0	0
Pyrene	ug/L	0	3	1	2	1	0	0
1,2,4-Trichlorobenzene	ug/L	0	3	1	2	1	0	0
Hexachlorocyclopentadiene	ug/L	0	3	1	2	1	0	0
cis-1,2-Dichloroethene	ug/L	0	1	0	1	1	0	0
2-Hexanone	ug/L	0	1	0	1	1	0	0
Methyl tert-butyl Ether	ug/L	0	1	0	1	1	0	0
4-Methyl-2-pentanone (MIBK)	ug/L	0	1	0	1	1	0	0
Vinyl Acetate	ug/L	0	1	0	1	1	0	0
Xylenes	ug/L	0	1	0	1	1	0	0
2-Butanone (MEK)	ug/L	0	1	0	1	1	0	0
Carbon Disulfide	ug/L	0	1	0	1	1	0	0
Benzidine	ug/L	0	1	0	1	1	0	0
1,2-Diphenylhydrazine	ug/L	0	1	0	1	1	0	0
Dibromomethane	ug/L	0	1	0	1	1	0	0

Source: ECT, 1992.

measured *in situ* from about 1 hour before sunrise to 2 hours after sunrise. It is during this period that the highest and lowest DO concentrations are expected. Temperature was measured concurrently with DO in order to determine DO saturation.

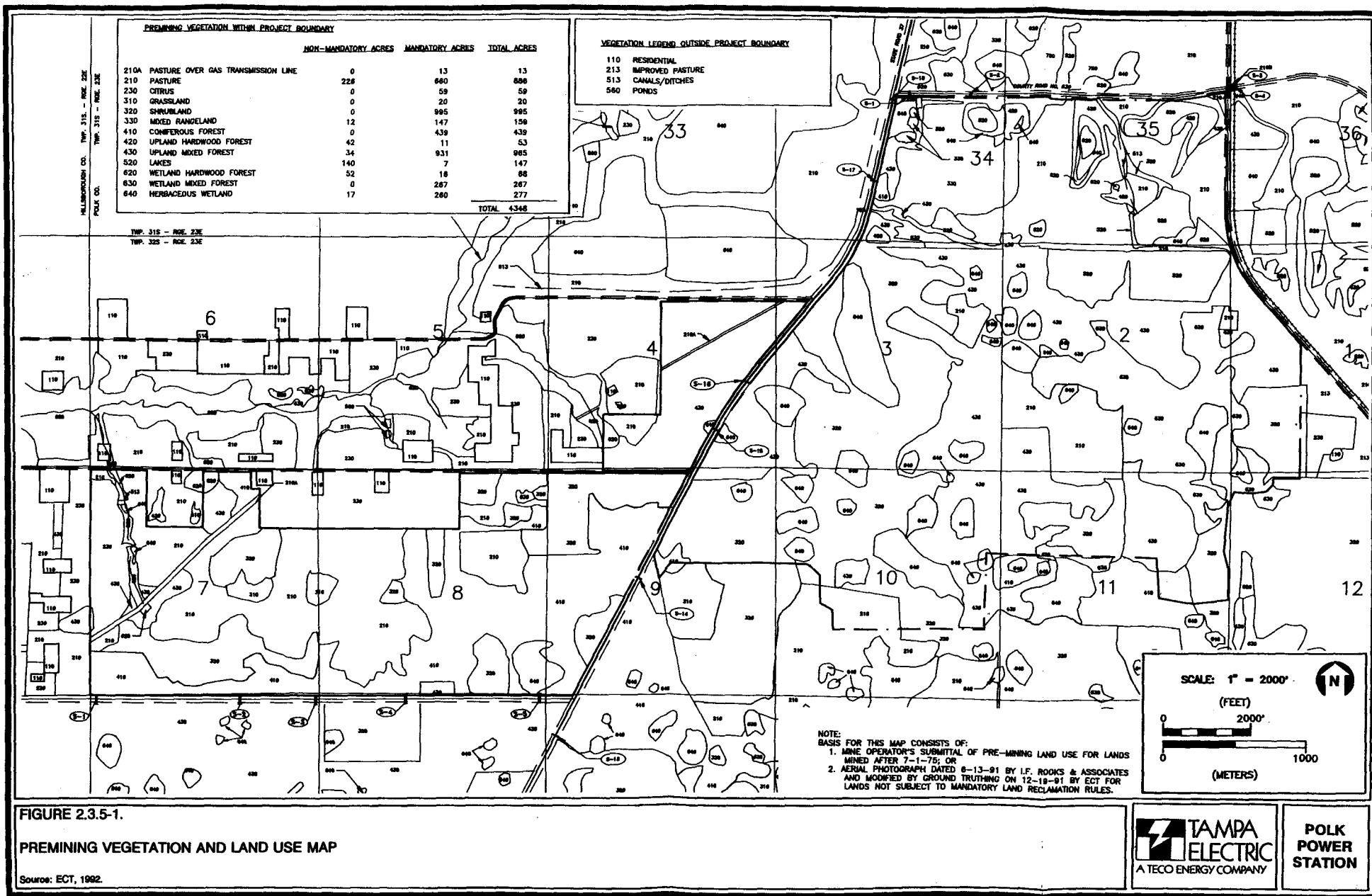
The detailed results of the surface water quality monitoring program for the Polk Power Station are provided in Appendix 11.8.8.

2.3.5 VEGETATION/LAND USE

The majority of the Polk Power Station site has been or is in the process of being mined or disturbed by phosphate mining activities. Consequently, most of the original flora on the site has been drastically altered. As a result of past and ongoing mining activities, only small, portions of relatively undisturbed terrestrial, wetland and aquatic habitats still remain on the site. Major land uses and vegetation represented on the site consist of mined land; developed land (e.g., transmission lines, a pipeline, and a small industrial site); uplands (e.g., pasture, shrub and brushland, overgrown spoil, old fields, orange grove, mixed oak/pine woods, palmetto rangeland, pine flatwoods, and oak hammock); remaining wetlands (e.g., hardwood swamp and marsh); and open water systems (e.g., ditches, canals, mine cut and reclaimed lakes, and an intermittent stream). Threatened and endangered species and other important species, as well as the site status of unique and sensitive habitats, are discussed in Section 2.3.6. Potential impacts to these species from site development are discussed in Section 4.4.

Vegetation cover/land use existing on the Polk Power Station site prior to mining operations since mid-1975 is shown in Figure 2.3.5-1. These site conditions are generally referred to as pre-mining conditions in this SCA. As indicated on the figure, the majority (65 percent) of the site was covered with primarily three upland vegetation types: pasture, shrub and brushland, and mixed forest. Coniferous forest (pine flatwoods) also covered 10 percent of the site. Wetlands primarily associated with the headwater area of Little Payne Creek comprised 759 acres (17 percent) of the site.

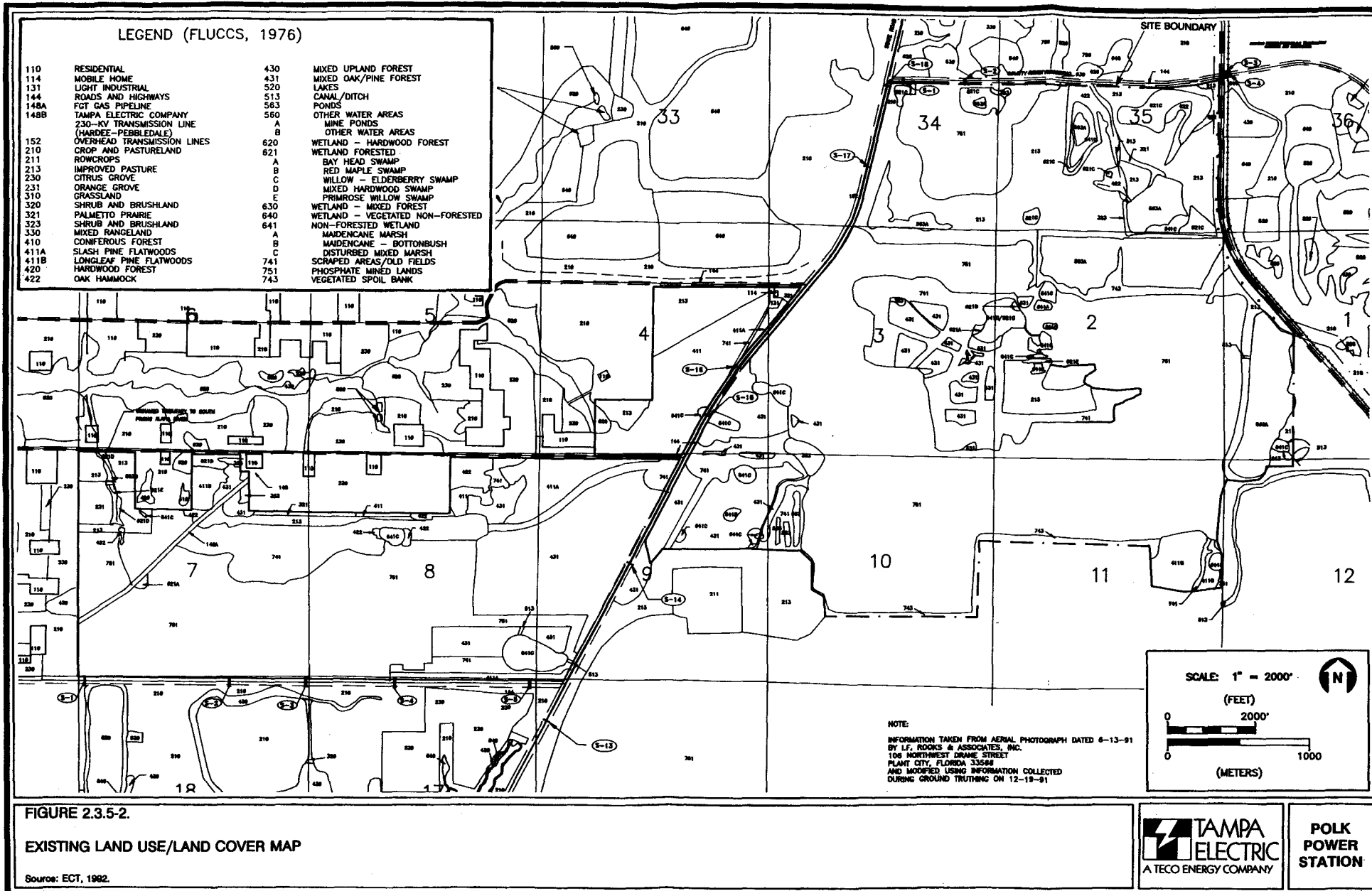
Phosphate mining activities have significantly affected the acreages of vegetation communities on the property as described in the remainder of this section and in Section 2.3.6. Some old-mined areas (i.e., prior to 1950) have revegetated. However, the majority of the site (i.e., more than 2,500 acres) reflect more recent mining disturbance and are essentially non-vegetated. The three upland vegetation types on the site in pre-mining conditions now only comprise 23 percent of the site. Wetland



areas have been reduced from 17 to 8 percent in areal extent on the site. Although all other communities have generally been significantly reduced in acreage, no community types have been eliminated.

Figure 2.3.5-2 shows the existing land use and cover types associated with and adjacent to the site. The following provides a description of the vegetation on the Tampa Electric Company Polk Power Station site based on ecological surveys conducted in the field during wet and dry season events in 1991. Scientific names for plant species identified in the text are found in Appendix 11.10.1. A more detailed description of current vegetation communities is provided in Section 2.3.6.2.

The Polk Power Station site consists of two main tracts. The eastern tract is bounded by SR 37 on the west; the Tampa Electric Company 230-kV Hardee-Pebble-dale transmission line/Fort Green Road on the east; CR 630 on the north; mined land and clay settling areas on the south; and citrus grove, pasture, and a private residence on the southeast. This tract consists primarily of recently mined areas with water-filled mine cuts between overburden spoil piles surrounding a central, unmined parcel of land. The primary power plant facilities (i.e., power block and fuel storage) will be located on this unmined parcel. This parcel mostly contains remnant oak/pine woods, with smaller areas of shrub and brushland, old fields, pasture, scraped-over areas, disturbed marsh, and hardwood swamp. The oak/pine forests were historically pine flatwoods. Due to the lack of periodic fires, the former sub-climax, pine-dominated woods have succeeded to a mixed forest association with a significant component of oaks in the canopy. The shrub, brushland, and old field associations are a result of opportunistic, pioneer species invading newly scraped-over areas. Old fields are herb-dominated uplands that result after clearings in pine flatwoods and other upland associations on the site. Typical species associated with old fields include common ragweed, little bluestem, hairy indigo, beardgrass, foxtail grass, rabbit's tobacco, dog fennel, bushy goldenrod, and goldenrod. Shrub and brushland is an overgrown shrubby association that also results after the former vegetation is removed. This shrubby association is dominated by a mixture of weedy



shrubs such as wax myrtle and groundsel bush. Remnant pasture is also situated on the tract. This open, grassy upland community is usually dominated by one or two species such as bahia grass and beardgrass. Marshland on the tract consists of herbaceous wetlands dominated by maidencane, rushes, sedges, and other aquatic macrophytes; most show evidence of disturbance. Forested wetlands on the tract are dominated by one or more wetland trees and/or shrubs such as red maple, swamp redbay, sweet bay, loblolly bay, dahoon holly, willow, elderberry, and primrose willow. These freshwater swamps on the site have also been altered to various degrees by prior activities or exist as a result of mining activities.

Two smaller, unmined areas are also located on the southeastern and southwestern corners of the eastern tract. The southwestern corner contains mostly oak/pine woods with small areas of marsh, shrub and brushland, and old fields. The marshes on the southwestern area consist mostly of disturbed assemblages of herbaceous hydrophytes and a small, relatively undisturbed maidencane-buttonbush wetland located in the center of the parcel. The majority of the approximate 33-acre southeastern corner area contains pine flatwoods together with smaller areas of old field and marsh. The pine flatwoods on this parcel is characterized by a shrub layer dominated by saw palmetto and an overstory of longleaf pines. With the absence of fire, this community will eventually succeed to a mixed oak/pine woods. In addition, the eastern tract includes a previously mined and unreclaimed parcel which contains some naturally reclaimed, stabilized terrestrial habitat. This northern portion of the tract contains lakes/ponds, a drainage ditch system, marsh, shrub swamp, pasture, oak hammock, and shrub and brushland. The oak hammock in this area is dominated by live oak and laurel oak.

The western tract is bounded by SR 37 on the east, Albritton and Bethlehem Roads on the north, citrus groves, oak/pine woods and pasture on the west and SR 674 (Wimauma Road) on the south. Most of this tract has recently been or will be mined. The mined area will ultimately be reclaimed into a series of lakes, wetlands, and uplands and used for water management and retention purposes. Currently, portions

of unmined areas are dominated by oak/pine woods and pine flatwoods. Other plant associations in the areas to be mined include pasture, palmetto prairie, old field, oak hammock, and marsh. An approximately 98-acre northwestern portion of the western tract which lies west of an existing FGT pipeline (i.e., Sarasota lateral) is not scheduled for mining. This parcel contains pine flatwoods, hardwood swamp, shrub and brushland, mixed oak/pine woods, oak hammock, old field, marsh, and an orange grove. A floodplain forest situated along an unnamed tributary to the South Prong Alafia River is also present. The forested wetlands in this northwestern corner of the western tract consist of: (1) mixed hardwood swamp along the floodplain reaches of the intermittent tributary and at another location east of the creek along Albritton Road, (2) a shrubby swamp area in the center of the unnamed tributary at a disturbed crossing, and (3) an isolated bayhead situated on the southern edge of the pipeline corridor.

The mined portions of the site consist of spoil piles, ditches, canals, berms, and lakes in varying degrees of vegetative recovery. The mined lands exhibit various stages of early to mid-successional species depending on time lapsed since mining and also include some areas planted as part of reclamation. Berms and spoil piles exhibit such species as wax myrtle, southern fox grape, laurel oak, water oak, Virginia creeper, and poison ivy. Along the shallow edges of mine pits, red maple, willow, primrose willow, wax myrtle, groundsel bush, and cattail occur.

As stated previously, most of the historical wetlands which existed within the site boundary have been disturbed by past mining activities. Less than twenty-five acres of wetlands have been permitted for disturbance since the promulgation of wetland protection rules by FDER and USACE in the late 1970s.

Wetland systems remaining onsite fall within three categories:

1. Small isolated ponds and the upper tip of one forested stream system to be left undisturbed;

2. Reclaimed wetlands and other lakes and wetland remnants left from mining activities prior to 1930; and
3. Open phosphate mine cuts which have re-established some degree of wetland form and function even though they are still subject to the FDNR mandatory reclamation requirements of Chapter 16C-16, F.A.C.

Based on the disturbed nature of the site under FDNR jurisdiction and existing FDER permits with mitigation requirements, FDER has determined that a formal FDER Jurisdictional Declaratory Statement determination will not be required (see Appendix 11.1.2, correspondence with FDER, April 20, 1992). FDER jurisdiction will be confirmed on a case by case basis if development or reclamation activities encroach on Waters of the State as defined by current rules and methodology.

The existing policy of USACE defines Waters of the United States as any wetland system, man-made or otherwise, which contains water and vegetation to the extent that it exhibits, in form and function, the characteristics of wetlands. In the case of phosphate mining excavations, wetland jurisdiction is a subjective interpretation of the degree of vegetation re-establishment and wildlife utilization.

USACE visited the site on March 17, 1992, and confirmed that all wetlands and water bodies with established vegetation would be considered jurisdictional. Exempted from USACE jurisdiction would be the active mining areas nominally less than 2 years old. This would include all areas west of SR 37 and approximately 100 acres of the last area to be mined east of SR 37. A map showing the exact limits of USACE jurisdiction is provided in Appendix 11.1.2 with the Joint Permit Application for Works in Waters of Florida and the United States.

SWFWMD has also confirmed in a site visit on June 29, 1992, that wetlands located on old phosphate-mined land proposed to be developed for this project are under SWFWMD's jurisdiction. A letter and map confirming their jurisdiction is also provided in Appendix 11.1.2.

2.3.6 ECOLOGY

2.3.6.1 Species-Environmental Relationships

Aquatic Systems

Little Payne Creek, Payne Creek and the unnamed tributary to the South Prong Alafia River are the aquatic systems located on or in the vicinity of the Tampa Electric Company Polk Power Station site. Wetlands associated with the onsite drainage basins of Little Payne Creek and Payne Creek have been drastically altered due to past and current mining activity on the property. An old, unreclaimed mine-cut lake and a reclaimed lake are situated in the east-central area of the eastern tract within the former headwater area of Little Payne Creek.

In the site vicinity, the Little Payne Creek system consists primarily of a man-made ditch which connects to the reclaimed lake on the site and runs along the western side of Fort Green Road. This ditch crosses Fort Green Road in an easterly direction at a point approximately 1.5 miles south of the Polk Power Station site and eventually discharges into a remnant portion of Little Payne Creek. The headwaters and only remaining relatively undisturbed portion of Payne Creek are located 1 mile south of the property boundary on the western side of SR 37. Culverts direct the water under SR 37 into a canal which proceeds south and then east. The unnamed tributary to the South Prong Alafia River is located in the northwestern corner of the western tract. This tributary is relatively undisturbed and consists of a small, incised creekbed within a narrow, floodplain forest. Figure 2.3.6-1 presents the locations of the aquatic sampling stations on and off the property where fisheries and macroinvertebrate sampling was conducted for this study. The following sections describe the results of these sampling efforts.

Fisheries

Table 2.3.6-1 provides the results of the wet and dry season sampling for fisheries within the seven aquatic ecology sampling stations. Overall, fisheries sampling during the dry season event (April 1991) yielded greater numbers of individuals and greater species diversity. The stagnant station (AE-1) sampled during the dry season was the

2.3.6-2

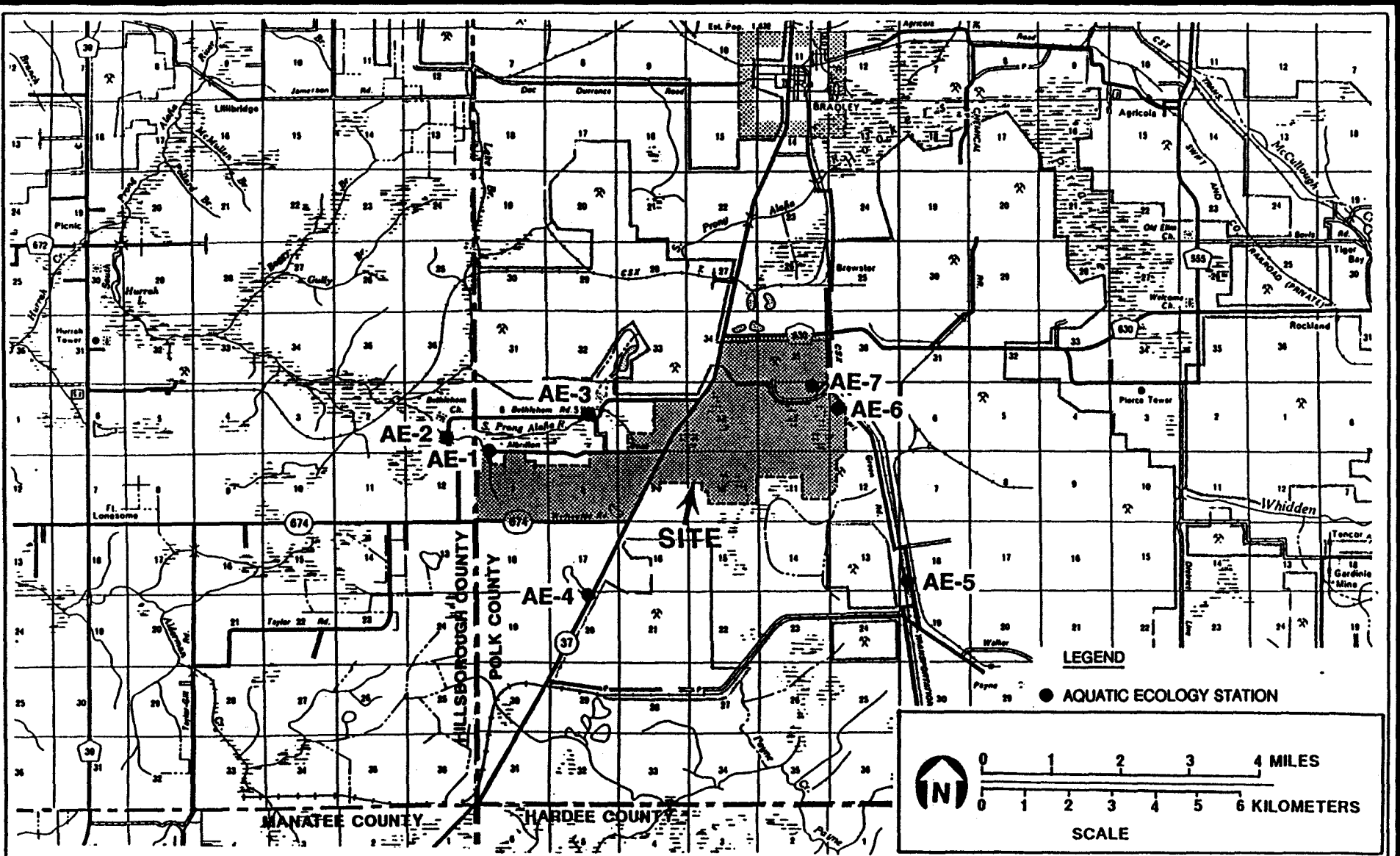


FIGURE 2.3.6-1.

AQUATIC ECOLOGY MONITORING STATIONS

Source: FDOT Map, FL; ECT, 1992.



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Table 2.3.6-1. Number of Taxa of Fish Collected from the Tampa Electric Company Polk Power Station Site, April and August 1991

Family	Common Name	Scientific Name	Sampling Stations						
			AE-1	AE-2	AE-3	AE-4	AE-5	AE-6	AE-7
<u>April 1991</u>									
Cyprinidae	Golden Shiner	<u>Notemigonus crysoleucas</u>	1						
Cyprinodontidae	Seminole killifish	<u>Fundulus seminolis</u>		3	6	18			17
	Bluefin killifish	<u>Lucania goodei</u>			4			1	
	Least killifish	<u>Heterandria formosa</u>						2	
Poeciliidae	Mosquitofish	<u>Gambusia affinis</u>		6		58	5	107	49
	Sailfin molly	<u>Poecilia latipinna</u>							12
Atherinidae	Brook silverside	<u>Labidesthes sicculus</u>		6	5			17	
Centrarchidae	Bluegill	<u>Lepomis macrochirus</u>		3		3	5	37	1
	Banded pygmy sunfish	<u>Elassoma zonatum</u>				18			
	Largemouth bass	<u>Micropterus salmoides</u>						40	
	Redear sunfish	<u>Lepomis microlophus</u>						1	
<u>August 1991</u>									
Lepisosteidae	Florida spotted gar	<u>Lepisosteus platyrhincus</u>		1		*			
Clupeidae	Threadfin shad	<u>Dorsoma petenense</u>							7
Cyprinidae	Taillight shiner	<u>Notropis maculatus</u>			8				
Cyprinodontidae	Seminole killifish	<u>Fundulus seminolis</u>		1					
Poeciliidae	Mosquitofish	<u>Gambusia affinis</u>	4			5		11	12
Centrarchidae	Bluegill	<u>Lepomis macrochirus</u>			2		3	1	1
	Largemouth bass	<u>Micropterus salmoides</u>					1	4	

*Numerous individuals observed, none actually caught.

Source: ECT, 1992.

exception. Since the sampling methodology remained consistent for both dry and wet season events, the difference in numbers of taxa and species diversity can be mostly attributed to seasonal migration except perhaps at Stations AE-6 and AE-7 which correspond to a reclaimed and an old mine-cut lake, respectively. In the deeper stream stations (AE-2 and AE-3), fish more than likely moved further upstream in the wet season.

In the reclaimed lake station (AE-6), the numerous largemouth bass caught in the spring were quite young. It is likely that many of these fish were occupying deeper habitats offshore as they matured (i.e., they were less common in the lake-edge habitat sampled in August 1991).

There were occasions when some fish species were observed, but none were actually caught during the sampling events. During the dry season event, numerous fish in the family Cichlidae were observed in the stream channel at Station AE-5. These fish were believed to be Mozambique Tilapia, also known as Nile perch (Tilapia mossambica), but could not be positively identified without closer examination. Similarly, numerous Florida spotted gar were identified near the sampling station at Station AE-4. Due to restrictive site conditions (steep banks, deep pools, snags, and abundant vegetation), no Florida spotted gars were captured during sampling. Although not collected, no specimens were needed of this distinctive fish for a positive species identification.

The results of the fisheries sampling showed Station AE-1 to have the lowest number of individuals and species diversity. This is not surprising since Station AE-1 is an intermittent stream with very reduced accessibility to fish. Mosquitofish comprised the sole species captured at AE-1 during April 1991. Mosquitofish are a highly invasive and adaptive species which give birth to their young live thereby reducing mortality associated with limited oxygen and water availability to eggs.

The results from Stations AE-2 and AE-3 were similar to one another; both stations yielded five different species and the number of individuals were similar. Although more opportunistic species (i.e., mosquitofish) were more evident of Station AE-2, differences between the two stations were insignificant.

Station AE-4 yielded five different species. Although species diversity did not appear very high, the representation by different families was high relative to other stations sampled. Station AE-4 is a popular fishing spot, by both humans and small alligators. The presence of both sometimes interfered with sampling.

Station AE-5 is essentially a ditch, with rock forming the substrate under a railroad crossing. Water flow at Station AE-5 was normally brisk. High flow and the abundance of floating/submerged vegetation tended to allow the easy escape of Nile perch during sampling.

Stations AE-6 and AE-7 were rather dissimilar in appearance and fisheries. The reclaimed lake (Station AE-6) has a gradually sloping shoreline and native aquatic vegetation. Station AE-6 had the largest population density of all the stations sampled and the highest species diversity. The old mine-cut (Station AE-7) has sheer limerock walls which rapidly drop to an unknown depth. Vegetation at Station AE-7 was dominated by both nuisance and exotic species. Fish obtained in sampling probably represented only those species occupying the narrowly, vegetated edge of the lake. These fish were dominated by opportunistic species and baitfish (i.e., threadfin shad). The larger fish and the predatory species were difficult to capture, as they could quickly dive and seek refuge in the numerous limestone crevices.

Benthic Macroinvertebrates

Benthic macroinvertebrate samples were collected with artificial substrates (Hester-Dendy samples) and a ponar grab. Hester-Dendy samples specifically collected epifauna, i.e., the organisms that live *on* the substrate. Ponar grabs collected not only the epifauna living on the surface of the sediment, but also those organisms that

live *in* the sediment, i.e., infauna. Both methods were used at all seven stations. During the Polk Power Station study, 198 taxa were identified. A total of 132 taxa was identified from artificial substrate samples and 137 taxa were identified from the Ponar grab samples (Appendix 11.9, Table 1). Individual species collected in each sample and their counts are shown in Appendix 11.9, Tables 2 through 29.

Different species groups dominated the two sample types. The artificial substrate samples collected mostly insects (81 percent composition), while the Ponar grab collected mostly (53 percent) annelids (segmented worms). However, insects were still abundant (39 percent) within the sediment samples (Table 2.3.6-2). Insects were overwhelmingly dominated by the family Chironomidae, the nonbiting midge flies. The annelids were primarily tubificid worms, although leeches were abundant at one station (AE-5). The species on the artificial substrate samplers were those that are typically found on vegetation, sticks, and other woody substrates. The species in Ponar grab samples were those that live on or burrow into the substrate (infauna). Less mobile organisms are generally collected by the Ponar grab. At stations where a layer of sticks and detritus cover the substrate, many species that are typically found on artificial substrates (epifauna) will also be collected by the Ponar grab.

The taxonomic composition, density, and diversity of macroinvertebrate populations in the present study were similar to those from Payne Creek reported in the SCA for the Hardee Power Station (TECO Power Services, Tampa Electric Company, Seminole Electric Cooperative, Inc., 1990). Densities and diversities of macroinvertebrates in the reclaimed streams of the South Prong Alafia River from the Brewster Phosphate monitoring study were much lower than those collected in the present study at stations in the South Prong Alafia River and tributary stream (Aurora, Inc., 1988 and 1989). The same invertebrates collected from Horse Creek and several associated sloughs in DeSoto County in a continuing monitoring study of the Consolidated Minerals, Inc., property were also collected in the present study (ECT unpublished, 1991).

Table 2.3.6-2. Percent Composition of the Macroinvertebrate Populations Collected from the Tampa Electric Company Polk Power Station Site, March and August 1991

Stations	<u>Annelida</u>		<u>Crustacea</u>		<u>Chironomid</u>		<u>Other Insects</u>		<u>Mollusca</u>	
	M	A	M	A	M	A	M	A	M	A

<u>Artificial Substrates</u>										
AE-1	0	1	22	15	51	65	8	10	19	8
AE-2	2	0	1	<1	90	81	7	17	<1	2
AE-3	<1	2	<1	2	91	77	8	19	<1	<1
AE-4*	0	19	13	9	66	63	31	9	0	0
AE-5	17	<1	48	<1	26	96	9	3	0	0
AE-6	5	82	9	<1	87	13	5	2	2	17
AE-7	1	<1	4	0	95	100	<1	0	0	0
Meant†	9		9		72		9		3	

<u>Ponar Samples</u>										
AE-1	14	27	4	1	72	94	7	3	2	28
AE-2	3	84	1	16	94	9	1	0	1	9
AE-3	40	32	1	2	48	19	3	7	8	38
AE-4	57	89	10	0	33	11	0	0	0	0
AE-5	44	47	14	1	32	50	<1	<1	2	7
AE-6	86	81	5	1	5	11	3	2	0	4
AE-7	31	90	15	<1	54	10	0	<1	0	0
Meant†	53		5		39		2		7	

Note: M = March 1991.

A = August 1991.

* Data from the artificial substrates at Station AE-4 were obtained from Hester-Dendy samplers collected in October 1991 rather than in August 1991 due to vandalism.

† Mean of all stations from both sampling episodes.

Source: ECT, 1992.

Densities--Densities of macroinvertebrates collected by station, sample type, and sampling episode are shown in Figure 2.3.6-2. Average density collected over the course of the study is shown in Table 2.3.6-3 by station and sample type. Densities of epifaunal invertebrates ranged from a low of 59 organisms per square meter (organisms/m²) at Station AE-4 in March 1991 to a high of 85,482 organisms/m² at Station AE-5 in August 1991 (Figure 2.3.6-2 and Appendix 11.9, Tables 2 through 29). These highest and lowest densities were both collected on artificial substrate samplers.

Epifaunal Densities On Artificial Substrate Samples--Greatest invertebrate densities during the study were found on artificial substrate samplers at Station AE-5 and averaged 56,506 organisms/m² (Figure 2.3.6-2 and Table 2.3.6-3). The invertebrate densities at this station are indicative of an enriched water body although flow at this station was high, in-stream vegetation abundant, and DO not depleted. DO is often low in areas experiencing such enrichment. DO is often a limiting factor, depending on the species present. Many invertebrate species cannot tolerate conditions when DO falls below a critical concentration. Since the samplers at Station AE-5 were suspended in the water column where DO was great, the populations were able to proliferate because of the high quantities of food available.

Epifaunal densities were high at Stations AE-6 and AE-7, averaging 20,412 and 30,064 organisms/m², respectively. These stations are located in old mine cuts, and the high densities reflect the enriched conditions in these lakes.

Lowest densities of epifauna occurred at Station AE-4, where an average of 70 organisms/m² was collected during the year of study. This station, located on SR 37, is in the remnant headwaters of Payne Creek. This station is an extremely popular fishing spot, and the samplers were frequently disturbed during their incubation period with samplers vandalized in August, redeployed, and vandalized again in September. Another group of samplers redeployed in September were finally collected in an undisturbed condition in late October. Repeated disturbance

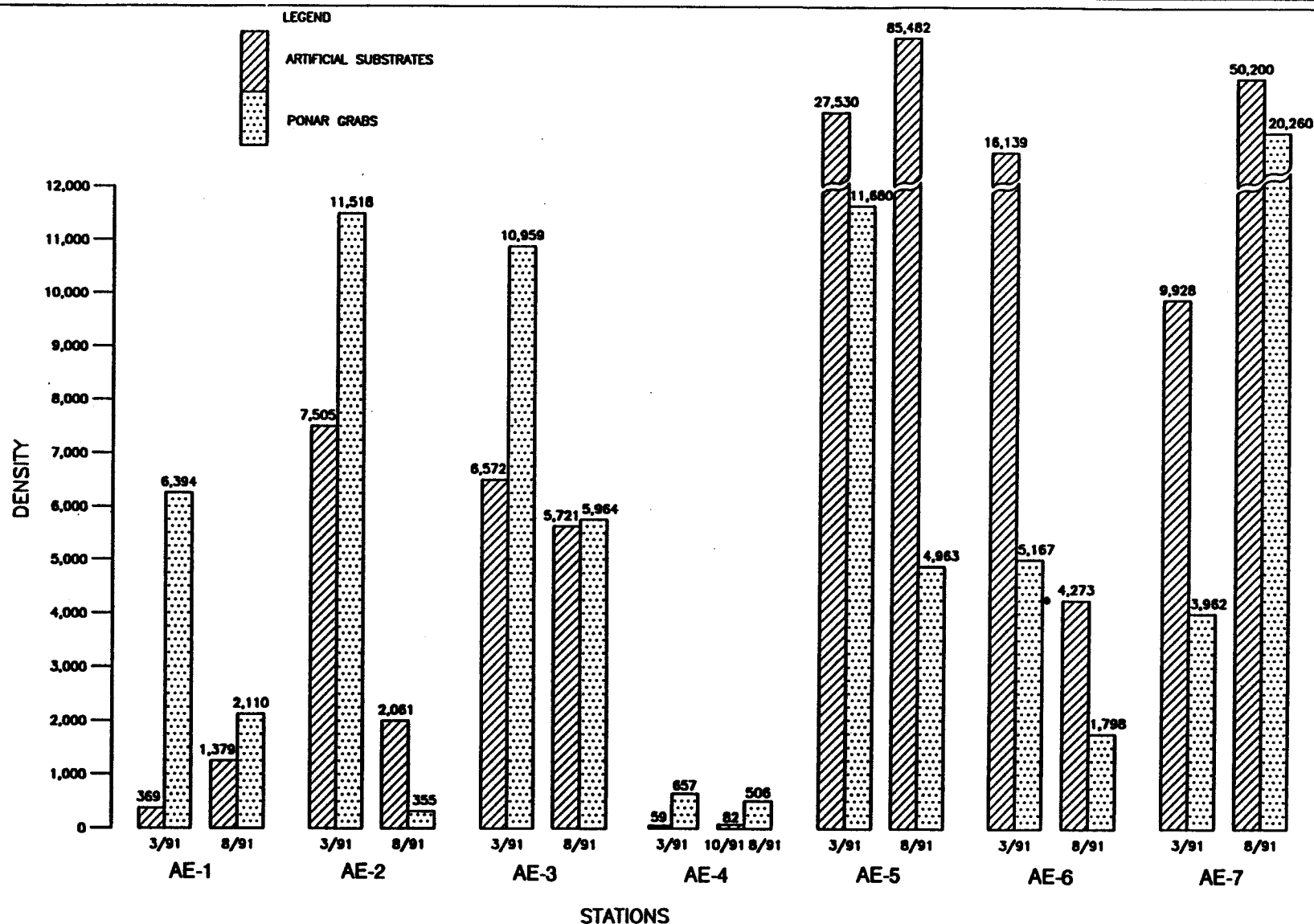


FIGURE 2.3.6-2.

MACROINVERTEBRATE DENSITY (NO./m²) FROM ARTIFICIAL SUBSTRATE AND PONAR GRAB SAMPLES, COLLECTED FROM THE SEVEN AQUATIC SAMPLING STATIONS (MARCH, AUGUST 1991)

Source: ECT, 1992.



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Table 2.3.6-3. Mean Density, Diversity, and Number of Macroinvertebrate Taxa Collected from the Tampa Electric Company Polk Power Station Site, March and August 1991

Station	Artificial Substrates			Ponar Grab		
	Mean Density*	Number of Taxa	Diversity (d)	Mean Density*	Number of Taxa	Diversity (d)
AE-1	874	34	3.74	4,252	40	4.12
AE-2	4,783	40	3.48	5,936	22	2.47
AE-3	3,189	44	3.65	8,462	34	3.29
AE-4	70	10	2.63	582	10	2.69
AE-5	56,506	19	1.94	8,322	24	3.14
AE-6	20,412	24	1.77	3,482	18	2.09
AE-7	30,064	12	0.92	12,111	18	2.48

Note: (d) = Shannon-Weaver diversity index.

*Mean number of organisms per square meter.

Source: ECT, 1992.

of this location by fishermen, etc., may partially account for the low densities. Other reasons for the low densities at this site are related to stream order, low DO, and low flow. Headwater streams often have a depauperate macroinvertebrate fauna partially due to limited recruitment potential from upstream areas. Station AE-4 was enriched, as evidenced by the deep layers of anaerobic muck in the substrate. Because of negligible flow, enrichment, and lentic (ponded) conditions, DO levels may have been too low to support stable macroinvertebrate populations.

Epifaunal densities at Station AE-1 also were relatively low, although not nearly as low as at Station AE-4. An average of 874 organisms/m² were collected at Station AE-1 during the year of study (Table 2.3.6-3). This station was located in the upper reaches of a tributary stream to the South Prong Alafia River. This stream was intermittent and during the March collecting period, a large part of it was pooled. The low densities at Station AE-1 are a reflection of the pooled conditions, small size, and limited recruitment potential of this portion of the stream.

Stations AE-2 and AE-3 had moderate densities of epifauna that averaged 8,765 and 3,189 organisms/m², respectively. The moderate densities are a reflection of the fair water quality in the streams. The environmental conditions and habitat at Stations AE-2 and AE-3 were suitable for supporting stable macroinvertebrate populations.

Densities On Ponar Grab Samples--Macroinvertebrate densities were lower in Ponar samples than in artificial substrate samples. Similar to artificial substrate samples, lowest infaunal and epifaunal densities were collected at Station AE-4 and averaged 582 organisms/m². Highest densities were collected at Station AE-7 and averaged 12,111 organisms/m². In Ponar samples, densities at enriched Stations AE-5 and AE-6 were similar to those stations not suffering from high enrichment (Stations AE-1, AE-2, and AE-3).

Seasonal Fluctuations--Invertebrate densities in Ponar samples decreased in August, except at Station AE-7 where densities increased to five times the March concentrations (Figure 2.3.6-2). In general, no seasonal trend was apparent for densities on artificial substrate samples. A considerable decrease in densities occurred at Station AE-2 in August in both ponar and Hester-Dendy samples. This decrease could be attributable to water quality degradation associated with surface water runoff between sampling events just upstream of the station or elevated water temperatures and subsequent decreases in DO concentration. However, the exact cause of this decrease in macroinvertebrate population parameters is unknown at the time of this report preparation.

At most stations, fewer taxa were collected in August compared to March (Figure 2.3.6-3). This decrease was generally slight except for Station AE-2, where a large drop in the number of taxa and the species diversity index occurred. This was especially evident in Ponar samples. At other stations the diversity index did not show any clear seasonal trends.

Taxonomic Compositions--Percent composition of major macroinvertebrate groups is listed in Table 2.3.6-2 by station, sample type and sampling episode.

Taxonomic Composition on Hester-Dendy Samples--The Hester-Dendy artificial substrate suspended in the water column provides excellent habitat for chironomids. Most chironomids feed on algae, periphyton, or detritus that is scraped from the substrate or filtered from the water (Oliver, 1971). Periphyton grows well on the samplers and provides a ready food source for scrapers. Other species that construct tubes to catch detritus and microorganisms find that these samplers provide a stable substrate for attachment. At clean water stations, these samplers usually collect many different species; whereas, at stations having high organic enrichment, these samplers may contain very high densities of a few tolerant or opportunistic species.

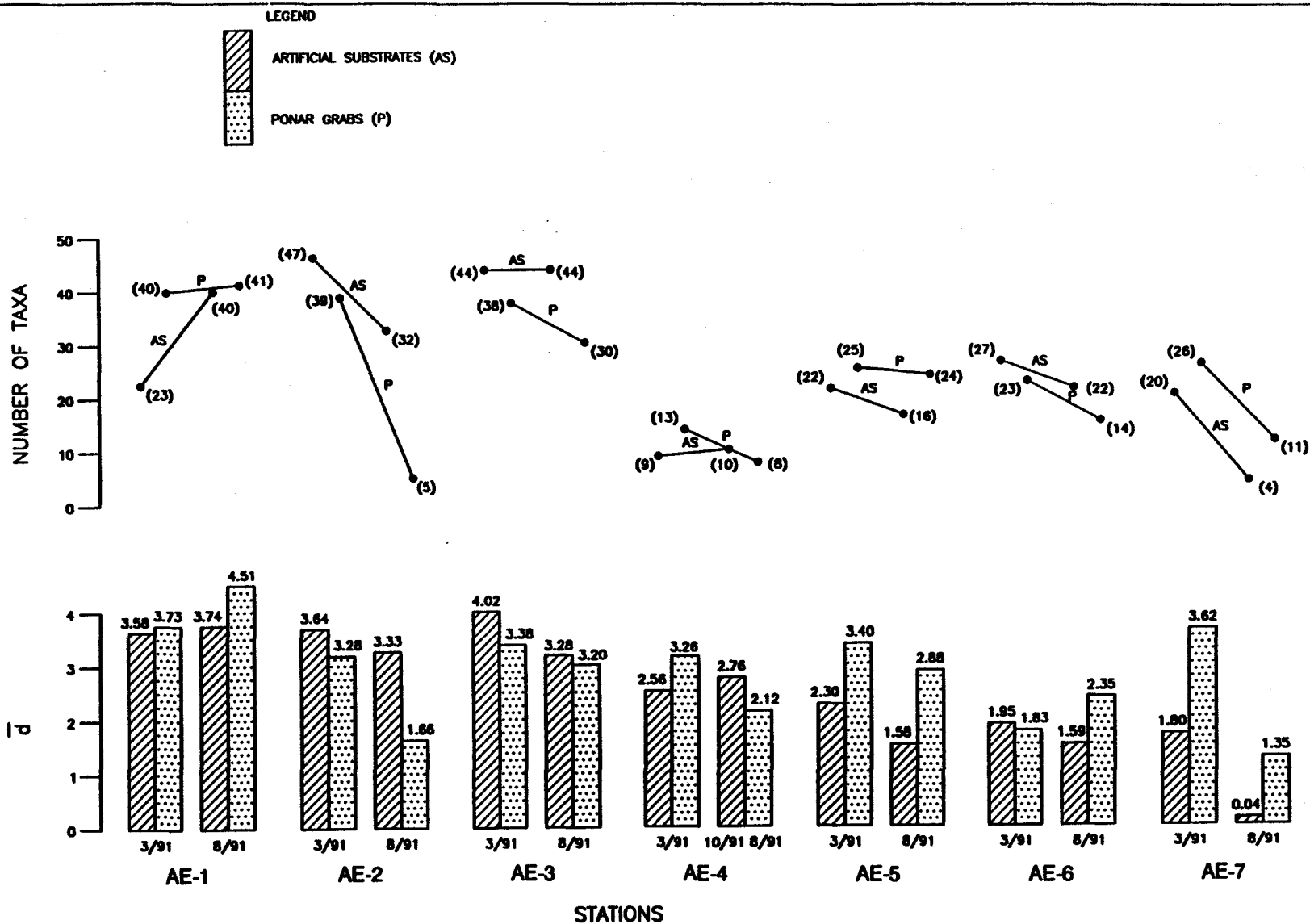


FIGURE 2.3.6-3.

MACROINVERTEBRATE DIVERSITY ($\bar{d}$) AND TOTAL NUMBER OF TAXA FROM ARTIFICIAL SUBSTRATE AND PONAR GRAB SAMPLES, COLLECTED FROM THE SEVEN AQUATIC SAMPLING STATIONS (MARCH, AUGUST, 1991)

Source: ECT, 1992.



POLK
POWER
STATION

Diptera (true flies) comprised 72 percent of the epifauna. These Diptera were primarily one family, the Chironomidae. Sixty-eight chironomid taxa were collected on artificial substrates. Dominant species fluctuated by station and sampling period and included the following taxa: Tanytarsus spp., Polypedilum spp., Glyptotendipes lobiferous, Cladotanytarsus spp., Goeldichironomus spp., Corynoneura sp., Thienemanniella spp., Rheotanytarsus exiguus, Paratanytarsus sp., and Rheocricotopus robacki (Appendix 11.9, Tables 2-8 and Tables 16-22). The dominant taxa listed above have different environmental requirements. Some taxa are tolerant of high organics and associated low DO regimes, other taxa can tolerate only moderate organic enrichment when oxygen levels do not fall below 5.0 mg/L, while still other taxa are characteristic of clean-water streams (Beck, 1977; Simpson and Bode, 1980; Roback, 1974; and Rudolph and Strom, 1990).

The environmental requirements of the dominant species reflected the prevailing environmental conditions of the stations at which they were found to dominate. Dominant chironomids at Stations AE-1, AE-2, and AE-3 included Tanytarsus spp., Paratanytarsus sp., Rheotanytarsus exiguus, Cladotanytarsus spp., Thienemanniella spp., Rheocricotopus robacki, and Cricotopus bicinctus. Most of these midges are considered to be characteristic of clean water habitats; however, they are capable of tolerating moderate amounts of organic enrichment if oxygen concentrations remain above 5.0 mg/L, and pH and water temperature are not adversely altered. Corynoneura spp., also occurring in high densities at these stations, is considered sensitive to organic pollution. These chironomid species are generally restricted to areas of moderate to high flow.

One chironomid species, Glyptotendipes lobiferous, dominated the epifauna at the enriched stations (AE-4 through AE-7). This species is well-known to tolerate high organic enrichment. It was abundant at Station AE-7 comprising 95 percent of the epifauna (Appendix 11.9, Tables 8 and 15). Beck (1977) reported that this species prefers standing water and is common in both polluted and clean water. Simpson and Bode (1980) found that this species became dominant in areas polluted by

sewage. Other common species at these stations were Goeldichironomus spp., Dicrotendipes spp., and Endochironomus group. These midges often occur in high densities in areas of low flow and high organic enrichment. Stations AE-4, AE-6, and AE-7 had virtually no flow; whereas, Station AE-5 had considerable flow.

Annelids, crustaceans, and insects other than chironomids each comprised 9 percent of the fauna on artificial substrates (Table 2.3.6-2). The majority of annelids on the artificial substrate samplers were either naidid worms or the leech, Helobdela stagnalis. Most naidid worms were species of Dero and Pristina. Annelids were collected from the more enriched stations (Stations AE-4 through AE-6). Although Station AE-7 was also highly enriched, comparatively few annelids were collected here. Leeches occurred in extremely high densities at Station AE-5 in March.

A species of crustacean, Hyalella azteca, was common throughout the study area. This species was collected in extremely high densities (more than 13,000 organisms/m²) in epifauna at Station AE-5 in March 1991. Such high densities of this organism reflect enriched conditions where dissolved oxygen was not severely reduced. Crustaceans were also an important component of the fauna on artificial substrates at Station AE-1. The important crustacean at Station AE-1 was Lirceus sp., but this taxa did not occur in extremely high densities.

Other insects commonly collected on artificial substrates included Stenelmis sp., Cheumatopsyche sp., Caenis diminuta, Baetis spp., and Corydalus corneutus. In general, other insects were more common at less enriched sites (Stations AE-1, AE-2, and AE-3) and their presence indicated the station had better environmental conditions than sites where few or no other insect taxa were present. The high percent composition of other insects at Station AE-4 in March 1991 resulted when several beetles and a true bug (order Hemiptera) was collected in conjunction with low total densities. Adult beetles and true bugs are highly mobile and can breath atmospheric oxygen; therefore, the presence of these species is not indicative of good environmental conditions at this site.

Taxonomic Composition on Ponar Grab Samples--Annelidas were the dominant benthic organisms (53 percent) collected by the Ponar grab (Table 2.3.6-2). Most of these annelids were tubificid worms; only five taxa were collected. The dominant taxon was immature tubificids without capiliform setae. These were most likely all Limnodrilus hoffmeisteri. These tubificids are well-known for their ability to tolerate low DO conditions typically found associated with organic pollution (Brinkhurst and Cook, 1974).

Dipteran families, Chironomidae, Ceratopogonidae, Chaoboridae, Empididae, Psychodidae, and Simuliidae comprised 39 percent of the infauna and were represented by 63 taxa. Fifty-six of these taxa were chironomids. Species collected by the Ponar grab were generally more tolerant of high organics and the associated low DO levels than those collected on artificial substrate samplers.

Mollusks and insects other than Dipterans were rarely collected in Ponar samples comprising only 7 and 2 percent of the infauna, respectively. These groups were generally present only in samples from Stations AE-1, AE-2, and AE-3 where environmental conditions were better. The dominant mollusk species was the Asiatic clam, Corbicula fluminea. This clam is an introduced species which often becomes a biotic and economic problem. This species frequently occurs in extremely high densities out-competing the native fauna; it is also a well-known biofouling organism. Corbicula was very abundant only at Station AE-3, occurring in all samples collected at that station. Elliptio buckleyi, a freshwater mussel, was also collected in Ponar grab samples from Station AE-3. These mussels do not live in severely stressed systems and their presence indicate conditions may be enriched but not grossly polluted (Fuller, 1974). High densities of the fingernail clam, Sphaerium spp., were also collected in August 1991 from Station AE-1.

Crustaceans were collected throughout the stations but in low numbers. Except for Stations AE-1, AE-2, and AE-3, crustaceans were only represented by the tolerant Hyalella azteca.

Diversity--The Shannon Weaver diversity index (d) and number of taxa are shown by station, sample type, and sample episode in Figure 2.3.6-3. Diversity ranged from a low of 0.04 in samples collected by artificial substrates at Station AE-7 in August to a high of 4.51 in samples collected by the Ponar grab at Station AE-1 in August.

Diversity is influenced both by the number of taxa collected and the distribution of organisms among the taxa. The fewest number of taxa (4) were collected on artificial substrates at Station AE-7 in August. The greatest number of taxa (47) were found on artificial substrates from Station AE-2 in March. Diversity and number of taxa were generally lower at Stations AE-4, AE-5, AE-6, and AE-7 than at Stations AE-1, AE-2, and AE-3 in both infaunal and epifaunal samples. An exception occurred in Ponar samples at Station AE-2 in August, where only 5 taxa were collected and diversity was 1.66. Another exception occurred at Station AE-5 where ponar samples had high diversities averaging 3.14 during the study. Conditions were enriched at Station AE-5 as indicated by many population parameters already discussed; however, optimum habitat was created by the high flow conditions and abundant vegetation. This resulted in high diversities within the infauna.

Table 2.3.6-3 lists the average of all diversity values and number of taxa by station and sample type. During the study, the lowest mean diversities were found on artificial substrate samples at Stations AE-5, AE-6, and AE-7 and averaged 1.94, 1.77, and 0.92, respectively. Fewest taxa were collected at Station AE-4, where an average of 10 taxa per sample was found.

Wilhm and Dorris (1968) proposed a relationship between diversity and the pollutional status of the sampling stations. They rate stations with diversity values above 3 as having clean water, values from 1 to 3 as moderately polluted, and values less than 1 as heavily polluted. These guidelines were based on data from a variety of clean-water and polluted streams. Based on these guidelines, Stations AE-1, AE-2, and AE-3 would be considered to generally have better water quality than Stations

AE-4 through AE-7. This is further supported by Tampa Electric Company's water quality data in Section 2.3.4.1.

Stations segregate into three distinct groups based on the total number of taxa collected at each station by all sampling methods and during all sampling episodes (Appendix 11.9, Table 1). Only 27 taxa were collected at Station AE-4 during the study. Fifty to 55 taxa were taken from Stations AE-5, AE-6, and AE-7; whereas, 85 to 90 taxa were collected at Stations AE-1, AE-2, and AE-3. Upon evaluating total taxa alone, the following assessment can be made: (1) Station AE-4 is undergoing most stress and is least stable; (2) Stations AE-5, AE-6, and AE-7 are moderately stressed through enrichment; and (3) Stations AE-1, AE-2, and AE-3 are generally less polluted with respect to nutrients.

Terrestrial Systems--Flora

The majority of the 4,348-acre Tampa Electric Company Polk Power Station has been or will be disturbed by phosphate mining activities and only relatively small, remnant areas of undisturbed, native vegetation exist on the site. Vegetation within the site has been separated into 14 major groupings based upon the FLUCCS. Table 2.3.6-4 provides the FLUCCS Level III legend, acreages and percentages for the land use and cover map of the site (Figure 2.3.5-2). A plant species inventory of the site by plant community type is presented in Appendix 11.10.2. Taxonomic identification of plant species follows that of Wunderlin (1982).

The following descriptions of plant community types are based upon qualitative and quantitative vegetation field surveys conducted from March to December 1991 and January to March in 1992. A discussion of potential impacts to these habitat types resulting from power plant development is provided in Section 4.4.

The developed uses on the property are not included in the following vegetative descriptions (i.e., FLUCCS Codes 131, 148, and 152). However, improved pasture

Table 2.3.6-4. Current Acreages and Percentages of Land Use/Cover on the Tampa Electric Company Polk Power Station Site*

Land Use/ Cover Code	Type	Acres	Percentage
131	Light Industrial	3	0.1
148	Gas Transmission Pipeline	13	0.3
152	Electrical Transmission Line	27	0.6
213	Improved Pasture	453	10.4
231	Orange Grove	17	0.4
321	Palmetto Rangeland	5	0.1
323	Shrub and Brushland	18	0.4
411	Pine Flatwoods	118	2.7
422	Oak Hammock	78	1.8
431	Mixed Oak/Pine Woods	530	12.2
513	Canals and Ditches	1	0.1
563	Ponds and Lakes	200	4.6
621	Freshwater Swamp	66	1.5
641	Freshwater Marsh	101	2.3
741	Scraped Over Areas	472	10.9
743	Spoil Banks	60	1.4
751	Phosphate Mined Land	2,186	50.2
	Total	4,348	100

*Current acreages as of December 19, 1991. It should also be noted that 94.6 percent of the entire site has been previously or will be mined or disturbed through mining operations. Current acreages reflect unmined areas and mined areas that are still disturbed and unreclaimed, but have revegetated since mining. Therefore, for this table, Category 751 includes only those areas currently disturbed and not revegetated.

Source: ECT, 1992.

is the dominant vegetative cover represented underneath the electrical transmission line (152) and over the gas transmission line (148) on the site.

Improved Pasture--213

Approximately 453 acres (or 10.4 percent) of the site is pasture. Improved pasture/old fields are located in scattered localities on the site, but these grasslands mostly occur along the edges of property boundaries. Improved pasture located on the site consists of mostly native pine flatwoods that was cleared in the past of all the vegetative strata and seeded with forage grasses (bahia grass) and legumes (tick trefoil, hairy indigo) for cattle production. The pastureland still remaining on the site can be characterized as remnant, old field, or reclaimed. Remnant pasture consists of pastureland that has remained in continuous use for cattle. Old field consists of abandoned pastureland that has: (1) increased in species diversity by the invasion of weedy vegetation, and (2) become overgrown with the lack of maintenance by cattle grazing. Reclaimed pasture consists of recently reclaimed land that has been seeded with forage grasses and legumes for cattle. Reclaimed pasture only occurs at the northeastern corner of the property on the eastern tract. Pasture occupies a variety of poorly drained to somewhat poorly drained soils on the property. Generally, these soils have a seasonal high water table within 1 ft of the ground surface for 1 to 4 months out of the year. Organic content is typically 1 to 5 percent.

Orange Grove--231

One citrus grove on approximately 17 acres (0.4 percent) is present on the northwestern corner of the western tract of the site. This citrus grove is planted with Valencia orange trees. Common weedy opportunistic plant species associated with the grove on the property include soda apple, Caesar's weed, smutgrass, sida, pokeweed, and painted leaf. The orange grove on the site is on Tavares fine sand. Typically, this soil type occurs in uplands and knolls within flatwoods. The seasonal high water table is at a depth of 40 to 80 inches beneath the ground surface for several months in most normal rainfall years. Organic content is low, from 0.5 to 2 percent.

Palmetto Rangeland--321

Approximately 5 acres (0.1 percent) of palmetto rangeland or prairie occurs at two separate locations as narrow strips of land along property boundaries in the western tract of the site. Palmetto rangeland was pine flatwoods before the land was logged and cattle were presumably introduced. Palmetto rangeland is remnant on the site and is not currently being utilized for cattle production. Palmetto rangeland can be characterized as an open prairie dominated by a dense shrub layer of saw palmetto. Although rangeland has no true tree stratum, a few remnant pines and oaks are scattered throughout the association. Scattered woody shrub associates of the rangeland on the site include gallberry, wax myrtle, fetterbush, and dwarf huckleberry. Due to the dense growth of the shrubby layer, few herb species are present within rangeland on the property. Palmetto rangeland occupies the same poorly drained soils as described for pine flatwoods.

Shrub and Brushland--323

Almost 18 acres (0.4 percent) of the property contains shrub and brushland. This plant association can be characterized as highly disturbed areas dominated by weedy shrub and herb species. Typically, shrub and brushland results after opportunistic plants invade and proliferate on areas disturbed through earth moving activities. Common species associated with shrub and brushland on the property include groundsel bush, low senna, shrub verbena, wax myrtle, and shiny sumac. Shrub and brushland typically occurs on soils resulting from mining or other man-induced activities.

Pine Flatwoods--411

Approximately 118 acres (2.7 percent) of the property contains pine flatwoods. Pine flatwoods are distributed along the northern property boundary, as a large area between Bethlehem Road and Albritton Road on the western tract, and as a small isolated area at the southeastern corner of the eastern tract. Pine flatwoods are open to dense woods dominated by an overstory of pines. Longleaf pine occurs on the drier sites; slash pine is frequently found along wetter areas. Portions of the

flatwoods located on the western tract also contain planted slash pines. Shrub layers are dominated by saw palmetto and other associated woody vegetation (e.g., gallberry, wax myrtle, dwarf huckleberry, and fetterbush). Pine flatwoods is a sub-climax community that is maintained in an open woodland state through the periodic occurrence of ground fires. In the absence of fire, woody taxa form a sub-canopy layer. The two stands of longleaf pine-dominated woods located on the northwestern corner of the western tract and the southeastern corner of the eastern tract are good examples of flatwoods with established hardwoods in the understory due to fire suppression. Pine flatwoods occupy poorly drained soils such as Smyrna and Myakka fine sands and Ona fine sand on the property. The soils exhibit a seasonal high water table within 12 inches of the surface for 1 to 4 months in most normal rainfall years.

Oak Hammock--422

Less than 2 percent (78 acres) of the site supports stands of upland hardwoods or oak hammock. From an ecological perspective, the term *hammock* refers to any broad-leaved evergreen forest characterized by a closed canopy of hardwoods and/or palms. The hammocks on the property are dominated by a canopy of live oaks. Other arboreal associates of the oak hammock include laurel oak, water oak, cabbage palm, persimmon, and black cherry. Oak hammocks occur on somewhat poorly drained, sandy soils with thin (less than 3 percent) organic layers. Due to the closed canopy, the oak hammocks on the property have a cool, moist interior that supports mesic species. In climax or near climax hammocks, the canopy cover of mature oaks intercepts light and limits development of vegetation in the shrub and herbaceous layers. Hammocks on the site contained occasional saw palmetto, beautyberry, wax myrtle, and oak seedlings in the open shrub stratum; the sparsely-vegetated ground layer support such shade tolerant herb taxa as dichanthelium grass, chickweed, elephant's foot, Florida parietaria, and broomweed.

Mixed Oak/Pine Woods--431

Mixed oak/pine woods is the dominant, plant community on the Polk Power Station site, occupying 530 acres (12.2 percent). Mixed oak/pine forest results when oaks become co-dominant with pines either through the absence of fire or logging operations followed by fire suppression. Except for the mixture of pines and oaks in the canopy, the species composition and structure of understory layers are similar to pine flatwoods and palmetto rangeland. The majority of the relatively disturbed but unmined habitat located within the area of power plant facility development consists of mixed oak/pine forest. The mixed oak/pine woods on the site occupy the same soils as described for pine flatwoods.

For comparative purposes, oak/pine forest was sampled at two separate locations (southwestern and northeastern) within the unmined portions of the site's eastern tract. The shrub layers of the two stands were floristically similar (Appendix 11.10.2, Tables 2 and 3). Both areas exhibited open understory layers. In the southwestern area, the understory was dominated by water oak seedlings, saw palmetto, gallberry, wax myrtle, live oak seedlings, slash pine seedlings, dahoon holly seedlings, swamp redbay seedlings, staggerbush, and paw paw. The northeastern area had a similar shrub stratum of saw palmetto, laurel oak seedlings, wax myrtle, live oak seedlings, gallberry, Southern fox grape, shiny sumac, dahoon holly, and highbush blueberry.

The canopy strata were also similar in species composition. Water oak and live oak dominated the northeastern area; while live oak and laurel oak were more prominent in the southeastern site. Slash pine and wax myrtle followed in order of importance within both stands (see Section 2.3.6.3 for a description of species importance within a community).

The herbaceous complement of both stands was the most diverse and the most variable between sample sites and seasons (Appendix 11.10.2, Tables 4 and 5). Over the years, both areas (southwestern and northeastern) exhibited a prominent open, unvegetated ground layer of leaf litter and bare ground. The most important species

of the ground stratum within the southwestern and northeastern sites in spring were Virginia chain fern and Southern fox grape, respectively. Both stands also shared 13 species within the herb stratum in the spring. In the southwestern site from spring to fall, species composition decreased from 21 to 17 species; only nine species were common to both survey episodes. In the northeastern stand, changes in ground layer species composition also occurred between sampling events. Out of the 22 species present in the spring, 14 species still remained in the fall. The referenced changes in seasonal species composition within the ground stratum of the two oak/pine stands are probably due to the following factors: (1) dieback of spring annuals followed by the emergence of fall flowering species, (2) disturbances between the two sampling periods within the sample sites due to vehicles/machinery, and (3) variance in species' occurrences based upon potential quadrant relocations (i.e., many of the flagged plots were disturbed beyond recognition presumably either by man or animals).

Canals and Ditches/Ponds and Lakes--513/563

About 1 acre (0.02 percent) of ditches/canals were of a sufficient size on the property to map. The ditches and canals on the site can be characterized as sparsely vegetated, deeply incised permanent to semi-permanent water channels.

Approximately 200 acres (or 4.6 percent) of old ponds/lakes resulting from either drainage or mine-related activities occur at scattered locations on the site. The smaller man-made ponds are seasonally inundated and typically support a proliferation of aquatic emergent macrophytes. Two prominent, large lakes located at the east side of the eastern tract are permanent surface water features that were created as a result of phosphate mining. The northern lake in this area is a 30-year-old mine cut with unstable, eroding steep banks and was never reclaimed. The southern lake has been recently reclaimed and supports shallow slopes partially planted with native hydrophytes such as pickerelweed, arrowhead, and bulrush.

An intermittent stream, which is an unnamed tributary to the South Prong Alafia River occurs on the site at the northwestern corner of the western tract. This surface water feature was not mapped as a stream because it is obscured by floodplain forest. It is, however, included within the FLUCCS designation of freshwater swamp (621).

Freshwater Swamp--621

The swamp community is situated on 66 acres (1.5 percent) of the Tampa Electric Company Polk Power Station site. Freshwater swamps are remnant forested wetland associations that occur as small connected or hydrologically-isolated lowlands throughout the property. Arboreal overstory and understory water-tolerant hardwood components of the swamps on the site include either single species dominant or mixed assemblages of red maple, black gum, swamp redbay, loblolly bay, willow and sweet bay. Hardwood swamps typically are found on deep organic layers and may have standing water for long periods. Included in the swamp category are shrub swamps. Shrub swamps are seral stages leading in transition to mature tree swamps. Willow, elderberry and primrose willow form monotypic or codominant stands of shrub swamp on the property. In general, swamps on the site occur on poorly drained Placid and Myakka fine sand, depressional soils. These soil types are ponded for at least 6 months out of the year. Placid soils have an organic matter content of 2 to 10 percent, while the Myakka portion has a content of 2 to 7 percent.

Three remnant, disturbed hardwood swamps were sampled within the northeastern, unmined parcel of the eastern tract where the power block is proposed. The three hardwood swamp types include maple swamp, mixed hardwood swamp, and mixed shrub swamp (see Tables 6, 7, and 8, respectively, Appendix 11.10.2). The maple swamp is a small association located on the edge of a larger, open marshy area. The canopy of the swamp is composed of red maple, willow and dahoon holly. The shrub layer is open and contains red maple saplings. Dog fennel was also recorded as a shrub associate, due to its woody nature and stature at this sampling site. Frog's-bit was the most important taxon within the herb stratum. Other herbaceous components included goldenrod, smartweed, clubrush, soft rush, torpedograss, dog fennel,

marsh pennywort, panic grass, water hoarhound, beardgrass, galingale, and big carpetgrass, in decreasing order of importance.

The mixed hardwood swamp located west of the maple swamp exhibited a greater species diversity within the canopy, although red maple was still the most important tree species overall. Other canopy associates included laurel oak, water oak, dahoon holly, black gum, slash pine, swamp redbay, and wax myrtle. The shrub layer was open with red maple saplings, saw palmetto, groundsel bush and wax myrtle, in descending order of importance. The herb stratum was mostly unvegetated, but contained species generally indicative of a fluctuating hydrological regime such as Virginia chain fern, redroot, goldenrod, soft rush, dog fennel, chalky bluestem, clubrush, smartweed, bushy goldenrod, and torpedograss. The mixed shrub swamp is located within the center of the remnant, disturbed area which was historically the headwaters of Little Payne Creek. The area has been altered due to mining operations. However, the depressions located between berms and spoil piles collect water and support the growth of hydrophytes. The area is mostly open with the occasional occurrence of shrubs throughout. Groundsel bush, primrose willow, willow, and red maple saplings comprise the shrub layer. Large specimens of Caesar's weed and pokeweed were also conspicuous components within the shrub stratum.

The open herbaceous layer contained 26 species of plants that are typically associated with transitional or disturbed wetlands. Maidencane dominated the deeper water areas of the system. The most common herbs within the ground stratum included the following species in order of importance: maidencane, beardgrass, goldenrod, pickerelweed, smartweed, soft rush, frog's-bit, wild balsam apple and bushy beardgrass.

Freshwater Marsh--641

Total acreage of freshwater marsh on the site is approximately 101 acres (2.3 percent). Freshwater marshes are circular to irregularly-shaped, herb-dominated wetlands that may be ponded for 6 months out of the year. The marshes on the property occupy hydric soils such as Samsulla muck and Basinger mucky fine sand, depressional soils that have an organic matter content that ranges from 8 to 20 percent and greater than 20 percent, respectively. These open, nonforested wetlands are represented by remnant, natural areas that have been hydrologically altered due to drawdowns of the surficial aquifer associated with mining and artificially-created wetlands established during past earth-moving operations. Maidencane, pickerelweed, arrowhead, and fire flag are some of the typical emergents associated with the deeper water areas of the marshes. The shallow fringes to the deeper water areas are dominated by such species as sand cordgrass, little bluestem, chalky bluestem, soft rush and fireweed. Most of the marshes on the property have been invaded by weedy species such as dog fennel due to alterations in hydrological regimes or other disturbances.

Since the majority of marshes have not experienced fires over a long period of time, wetland tree and shrub species have become established in some areas. One marsh located in the center of the southwestern corner of the eastern tract is relatively undisturbed (see Tables 9 and 10, Appendix 11.10.2). This marsh is dominated by maidencane in the herbaceous layer. Buttonbush also occurred sporadically throughout this marsh. Other emergents included sand cordgrass, redroot, chalky bluestem, creeping rush, big carpetgrass, beak rush, dichanthelium grass, and pedicelled milkweed, in descending order of importance. From spring to summer, the marsh exhibited a decrease in the importance value by maidencane (importance values = 151.1 to 79.7). However, this system was not invaded by weedy, opportunistic species at any time during 1991. Due to the rather isolated location of this wetland, past perturbations have not apparently had an adverse effect on overall species composition or diversity (i.e., all of the species present are indicative of a healthy, stable wetland system). However, this wetland is the exception to the rule on the property.

The majority of marshes on the site are disturbed, as stated previously. These marshes are experiencing a shift in species composition due to alterations to historic hydrologic regimes. For example, dog fennel has invaded many of the marshes on the site. This composite is a pioneer, weedy species that usually becomes established in open wetlands that are experiencing prolonged dry conditions. During a long period of drought, dog fennel may temporarily invade undisturbed marshes, but die back once normal water levels return. In a wetland system hydrologically altered either due to surface water drainage or groundwater interruptions, dog fennel may become established for longer durations. Most of the marshes on the property reflect this latter circumstance. A typical disturbed marsh was sampled within the southwestern area of the eastern tract (see Table 9, Appendix 11.10.2). Dog fennel is the most important species in this marsh with an overall importance value of 54.6. The next most important species, bushy goldenrod, is also indicative of moist to dry soils and is a common component of upland flatwoods and rangeland. Other associates in decreasing order of importance include: goldenrod, chalky bluestem, little bluestem, water primrose, smartweed, galingale, marsh fleabane, fireweed, pickerelweed, rush, dichanthelium grass, and buttonweed.

Due to higher water levels in the fall, species composition within the marsh changed dramatically (see Table 10, Appendix 11.10.2). The species dominance of dog fennel (importance value = 28.8) was replaced by an obligate wetland species, arrowhead. However, it should be noted that dog fennel quickly resprouted after water levels receded in the winter-spring of 1992.

Scraped Over Areas/Spoil Banks--741/743

Approximately 532 acres (12.3 percent) of the site contains scraped areas and spoil banks. Weedy, pioneer species of grasses, forbs, and herbs quickly invade newly exposed soil created by clearing and earthmoving operations. These open, grassy areas resemble old fields in character and are dominated by a diverse assemblage of upland and in some portions, wetland transitional plant species. Species compositions of these fields are generally dependent upon the local seed source and the

corresponding hydrological/elevational gradients resulting from abrupt changes in the natural topography. Old field species such as common ragweed, bushy beardgrass, beardgrass, purple thistle, tick trefoil, and rabbit's tobacco are characteristic of scraped areas. Spoil piles and banks that were created by the dumping of overburden from mining operations either support similar species to the old fields or are dominated by woody taxa such as shrub verbena, shiny sumac, and black cherry.

Old fields occur throughout the southwestern and northeastern parcels located in the eastern tract. Little bluestem dominated both of these areas in the spring and fall seasons (see Tables 11 through 14, Appendix 11.10.2). However, overall species composition changed dramatically between sampling events due to changes associated with the season and rainfall.

Phosphate Mined Land--751

The majority of the Polk Power Station site has been or will be mined or disturbed through phosphate mining operations (4,115 acres or 94.6 percent). Prior to July 1, 1975, approximately 523 acres of land on the site was mined or disturbed through mining. From July 1, 1975, to May 1992, an additional 906 acres of land was disturbed through mining activities, and an additional 2,173 acres of the site was mined between July 1, 1975, and May 1992. From May 1992 until mining ceases in 1994, approximately 21 acres of land will be disturbed by mining activities, and 492 acres will be mined. Only 233 acres of the site has not been or will not be mined or disturbed through mining activities. Based on current (December 19, 1991) site conditions (i.e., land cover changes since mining operations began), only 2,186 acres or 50.2 percent of the site exhibits the land forms consistent with FLUCCS category 751. These lands consist of cleared land, spoil piles of material which have been scraped from the surface, and excavated areas which are filled with water. Generally, these areas are either devoid of vegetation, are dominated by the ruderal species as described for old fields, or support opportunistic wetland plants (especially cattails) along the littoral/shallow water reaches of mine ponds and cuts.

Terrestrial Systems--Fauna

Wildlife

Presence and likelihood of occurrence were assessed for terrestrial vertebrates occurring onsite during field inspections conducted throughout 1991 and early 1992. Semi-annual (dry and wet season) surveys were conducted in March and August 1991. Appendix 11.10.3 presents lists of amphibian, reptile, bird, and mammal species with their scientific names that were either observed onsite or have the potential to occur there. Descriptions and likelihood of occurrence of endangered, threatened, or species of special concern wildlife can be found in the following section. A discussion of potential impacts to these species resulting from power plant development can be found in Section 4.4.

Birds

The 4,348-acre Polk Power Station property supports a variety of upland, wetland, and aquatic bird habitats ranging from relatively small, undisturbed tracts of oak hammock, freshwater swamp, mixed oak/pine woods, and pine flatwoods to large, highly altered areas such as phosphate-mined land, spoil areas, and scraped-over areas. The former comprise only 18 percent of the available habitat, while mined, spoil, and scraped-over land (FLUCCS categories 741, 743, and 751), which offer only marginal habitat value to birds, currently comprise 62 percent of the property's acreage. The remaining onsite habitats include improved pasture, citrus grove, canals and ditches, ponds and lakes, palmetto rangeland, freshwater marsh, and shrub and brushland, which offer different degrees of habitat value to resident as well as migratory species. Many of these remaining habitats had been mined and regenerated or were reclaimed while others will be mined in the near future.

The avifauna of the Polk Power Station site generally consists of species common to central Florida. The population of summer residents (i.e., nesting species) is seasonally augmented by the influx of migrant species and winter residents. Migrant species commonly observed and expected to occur on the property include yellow-rumped warbler, palm warbler, pine warbler, black and white warbler, blue-gray

gnatcatcher, ruby-crowned kinglet, brown creeper, cedar waxwing, northern parula warbler, Canada warbler, American redstart, yellow warbler, brown-headed cowbird, and a variety of sparrows (Family Fringillidae). These migrants occur primarily in mixed species flocks and forage ubiquitously in onsite hedgerow, shrub- and brushland, and forested habitats during the spring and fall migratory seasons. None of these species is expected to nest on the property or in central Florida.

The aquatic habitats of the site, particularly the old mine cuts and reclaimed lake on the eastern portion of the property, also provide feeding habitat to large numbers of migratory waterbirds including ducks, mergansers, pelicans, coots, gallinules, gulls, terns, and shorebirds. Although a number of these species (e.g., pied-billed grebe, mottled duck, American coot, common gallinule, laughing gull, Caspian tern, and killdeer) also occur as summer residents, their relative abundance on the Polk Power Station site sharply decreases each spring.

A number of resident species such as black and turkey vultures, common crow, bluejay, mourning dove, several species of swallows, eastern cardinal, common grackle, and rufous-sided towhee occur throughout all upland habitats. However, the onsite bird species diversity and distribution are primarily dependent on the presence of specific vegetation communities and suitable habitat conditions. The highest diversity of species and the greatest abundance of birds were regularly observed along the dike road separating old mine ponds and lakes on the east-central portion of the site. This area supports several interspersed vegetation communities including mixed oak/pine, shrub and brushland, freshwater swamp, and revegetated spoil areas in different seral stages. This mix of habitats, along with the adjoining densely vegetated shorelines, provides excellent forage and nesting areas for upland and wetland species. Resident upland species commonly recorded in this area of the property include northern cardinal, rufous-sided towhee, common crow, white-eyed vireo, tufted titmouse, bluejay, eastern mockingbird, mourning dove, gray catbird, common grackle, Carolina wren, and brown thrasher. Common yellowthroat, boat-

tailed grackle, redwing, and short-billed marsh wren were the common wetland songbirds in this area.

The avifauna of the eastern portion of the property, however, is dominated by aquatic and wading birds due to the presence of old mine ponds and lakes with shallow littoral zones as well as sections of dense shrub swamp. Large numbers of double-crested cormorants, ring-billed gulls, laughing gulls, Caspian terns, black terns, American coots, common gallinules, American anhinga, and pairs of mottled ducks, wood ducks, pied-billed grebes, purple gallinules, king rails, and white pelicans were observed during each field survey. Wading birds were particularly abundant along the eastern ponds and lakes. One March 1992 early morning bird survey of these areas identified 240 great egrets, 50 great blue herons, 57 black-crowned night herons, 20 glossy ibis, 78 snowy egrets, 5 tricolored herons, 50 cattle egrets, and several green-backed herons feeding along shorelines on the eastern portion of the property. Although many of these waders, particularly black-crowned night herons, roost in the maples, willows, and cattails surrounding these lakes, no wading bird nesting colony was located within the boundaries of the Polk Power Station site. Several American woodstorks, which were also recorded roosting and feeding along the eastern lakes, are not expected to nest on or in the vicinity of the property due to the absence of suitable nesting habitat. Ospreys and an occasional individual bald eagle were also recorded in the aquatic habitats of the eastern portions of the site.

The bird species diversity and abundance on the remaining, i.e., central and western, portions of the property are lower. Improved pasture, mixed oak/pine forest, and to a lesser degree, oak hammock are the principal habitats on the central portion of the site. Eastern meadowlark, killdeer, American kestrel (including the southeastern and eastern subspecies), red-tailed hawk, great horned owl, loggerhead shrike, tree swallow, and cattle egret are the most commonly recorded species in the improved pasture habitat. The associated mixed oak/pine forest stands and interspersed shrub-brushland communities support eastern cardinal, rufous-sided towhee, ruddy ground dove, bluejay, tufted titmouse, Carolina wren, yellow-breasted sapsucker, downy

woodpecker, red-bellied woodpecker, common nighthawk, ruby-throated hummingbird, white-eyed vireo, Cooper's hawk, sharp-shinned hawk, bobwhite, eastern bluebird, eastern phoebe, brown thrasher, Carolina chickadee, common grackle, yellow-breasted chat, downy woodpecker, and gray catbird. A survey of the shrub-brushland habitats for scrub jays failed to locate any scrub jay nesting colonies.

Birds characteristic of the oak hammocks include barred owl, pileated woodpecker, black-billed cuckoo, red-headed woodpecker, red-shouldered hawk, red-eyed vireo, summer tanager, wild turkey, bluejay, screech owl, chuck-wills-widow, and great-crested flycatcher. Many of the species listed under the mixed oak/pine community, however, are opportunistic feeders and frequently range into the oak hammocks of the site as well.

In comparison with the forested, shrub and brushland, and aquatic habitats, the bird diversity and abundance in the isolated marshes of the property were low. This was directly attributable to the recent drought conditions and the concomitant lowering of the surficial water table, which left most of the onsite marshes dry. As a result, wetland species such as Florida sandhill crane, American woodstork, king rail, Virginia rail, eastern snipe, American woodcock, belted kingfisher, and redwing were not recorded in these habitats during the 1991-1992 bird surveys.

The western portion of the Polk Power Station property, located west of SR 37, supports primarily phosphate-mined land and active mining operations. As a result, birds occur in scattered tracts of mixed oak/pine forest and improved pasture, as well as in the pine flatwoods community covering the northern section of this tract. Birds commonly observed or expected in this pine flatwoods habitat include great horned owl, Bachman's sparrow, great-crested flycatcher, eastern bluebird, common flicker, bluejay, bobwhite, mourning dove, pileated woodpecker, brown-headed nuthatch, blue-gray gnatcatcher, summer tanager, and pine warbler. No red-cockaded woodpeckers were recorded in onsite pine flatwoods during seasonal surveys of this habitat. The citrus grove, located on the northwestern corner of the western tract,

supports primarily eastern mockingbirds, loggerhead shrikes, southeastern American kestrels, ruddy ground doves, and common grackles.

In summary, the bird composition of the Polk Power Station site consists primarily of common species characteristic of grassland, shrub, and forested habitats of central Florida. The mine cuts and lakes on the eastern portion of the site provide feeding habitat for large numbers of cormorants, wading birds, shorebirds, gulls, and terns. In contrast, bird habitats on the western portions of the property are confined to remnant unmined areas.

Mammals

The relatively undisturbed habitats onsite (mixed oak/pine woods, pine flatwoods, and various wetlands), coupled with the mined and reclaimed areas provide sufficient requirements for most mammals found in this region of Florida. Species using edge communities were commonly observed and included white-tailed deer, eastern cottontail, armadillo, and southeastern pocket gopher. Forest dwelling animals included bobcat, raccoon, opossum, and the eastern gray squirrel. The aquatic systems provide habitat for marsh rabbits and river otters. Although not observed onsite, it would be expected that the gray fox, feral hog, and both the striped and spotted skunk would also occur there. Appendix 11.10.3 lists all mammal species either occurring or expected to occur on the site.

Small mammal live-trapping, conducted in the dry and wet seasons, was performed in wetlands, old field, and mixed oak/pine habitats. The results of these efforts are presented in Table 2.3.6-5. More individuals but fewer species were trapped in March 1991. The two most common species captured were the eastern harvest mouse and hispid cotton rat. Species trapped in old field habitats included these two species plus the cotton mouse. Oak/pine forests produced hispid cotton rat, eastern harvest mouse, cotton mouse, golden mouse, and eastern wood rat. Trapping in wetland communities produced hispid cotton rat, eastern harvest mouse, short-tailed

Table 2.3.6-5. Results of Small Mammal Trapping at the Tampa Electric Company Polk Power Station Site

Species	Dry Season (March 1991)			Wet Season (September 1991)			Total
	Old Field	Oak/Pine	Wetland	Old Field	Oak/Pine	Wetland	
Short-tailed shrew			1				1
Eastern harvest mouse	56	123	11	5	63	1	259
Cotton mouse					1		1
Golden mouse					8		8
Eastern wood rat		4					4
Hispid cotton rat	98	20	28	30	8	16	200
Rice rat						2	2
Subtotal	154	147	40	35	80	19	
TOTAL							475

Source: ECT, 1992.

shrew, and rice rat. No unusual species were captured which would be expected in such a disturbed site.

Reptiles and Amphibians

Reptiles and amphibians were noted by direct sightings or calls heard while performing other field investigations. Common reptile species encountered in the oak/pine woods or brushy fields included the corn snake, eastern coachwhip snake, black racer, pygmy rattlesnake, eastern box turtle, and green anole. The Florida cooter and alligator were common inhabitants of the open water habitats.

Commonly encountered amphibians included the oak toad in the oak/pine communities and the green treefrog and southern leopard frog in the hardwood swamp habitats. Given the abundance of aquatic habitats onsite, several other species of frogs and toads would be expected to occur commonly and are listed in Appendix 11.10.3.

Threatened and Endangered Species--Flora and Fauna

Important species identified as occurring or potentially occurring on or near the Tampa Electric Company Polk Power Plant site and the probability of their occurrence are provided in Table 2.3.6-6. This list was derived from a review of the Florida Natural Areas Inventory (FNAI) matrix, the current records of FGFWFC, and USFWS, and a thorough investigation of the site and the immediate vicinity. Monitoring for endangered and threatened species and species of special concern was conducted at quarterly intervals on and adjacent to the site during 1991. Each species' current status is discussed in the following paragraphs. An assessment of potential impacts to these species due to construction of the project can be found in Section 4.4.

Table 2.3.6-6. Threatened and Endangered Species that Occur or Could Potentially Occur on or Near the Tampa Electric Company Polk Power Station Site

Common Name	Scientific Name	Designated Status*					Potential for Occurrence†
		USFWS ¹	FGFWFC ²	FDACS ³	FCREPA ⁴	CITES ⁵	
<u>Plants</u>							
Rein orchid	<u>Habenaria odontopetala</u>	--	--	T	--	II	H
Long-horned orchid	<u>Habenaria quinqueseta</u>	--	--	T	--	II	H
Water spider orchid	<u>Habenaria repens</u>	--	--	T	--	II	H
Hartwrightia	<u>Hartwrightia floridana</u>	C2	--	T	R	--	L
Dahoon holly	<u>Ilex cassine</u>	--	--	CE	--	--	P
Prickly pear	<u>Opuntia compressa**</u>	--	--	T	--	II	P
Cinnamon fern	<u>Osmunda cinnamomea</u>	--	--	CE	--	--	P
Royal fern	<u>Osmunda regalis</u>	--	--	CE	--	--	P
Spoon-flower	<u>Peltandra sagittifolia</u>	--	--	--	R	--	H
Golden polypody	<u>Phlebodium aureum</u>	--	--	T	--	--	P
Wild coco	<u>Pteroglossapsis ecristata</u>	C2	--	T	--	II	P
Wild azalea	<u>Rhododendrum viscosum</u>	--	--	T	--	--	P
Bluestem	<u>Sabal minor</u>	--	--	T	--	--	P
Aspidium fern	<u>Thelypteris kunthii</u>	--	--	T	--	--	P
Red-needle leaf	<u>Tillandsia setacea</u>	--	--	T	--	--	H
Shoestring fern	<u>Vittaria lineata</u>	--	--	T	--	--	H
Netted chain fern	<u>Woodwardia areolata</u>	--	--	T	--	--	P
Coontie	<u>Zamia pumila††</u>	--	--	CE	T	II	M
<u>Amphibians and Reptiles</u>							
American alligator	<u>Alligator mississippiensis</u>	T(S/A)	SSC	--	SSC	II	P
Eastern indigo snake	<u>Drymarchon corais couperi</u>	T	T	--	SSC	--	P
Florida pine snake	<u>Pituophis melanoleucus mugitus</u>	C2	SSC	--	--	--	H
Short-tailed snake	<u>Stilosoma extenuatum</u>	C2	T	--	E	--	M
Gopher tortoise	<u>Gopherus polyphemus</u>	C2	SSC	--	T	--	P
Gopher frog	<u>Rana areolata aesopus</u>	C2	SSC	--	T	--	H

2.3.6-37

Table 2.3.6-6. Threatened and Endangered Species that Occur or Could Potentially Occur on or Near the Tampa Electric Company Polk Power Station Site (Continued, Page 2 of 3)

Common Name	Scientific Name	Designated Status*					Potential for Occurrence†
		USFWS ¹	FGFWFC ²	FDACS ³	FCREPA ⁴	CITES ⁵	
<u>Birds</u>							
Southern bald eagle	<u>Haliaeetus leucocephalus</u>	E	T	--	T	I	P
Southeastern American kestrel	<u>Falco sparverius paulus</u>	C2	T	--	T	II	P
Arctic peregrine falcon	<u>Falco peregrinus tundrius</u>	T	E	--	E	I	U
Short-tailed hawk	<u>Buteo brachyurus</u>	--	--	--	R	--	L
Cooper's hawk	<u>Accipiter cooperii</u>	--	--	--	SSC	--	P
Osprey	<u>Pandion haliaetus</u>	--	SSC***	--	T	II	P
Little blue heron	<u>Egretta caerulea</u>	--	SSC	--	SSC	--	P
Great egret	<u>Casmerodius albus</u>	--	--	--	SSC	--	P
Snowy egret	<u>Egretta thula</u>	--	SSC	--	SSC	--	P
Tricolored heron	<u>Egretta tricolor</u>	--	SSC	--	SSC	--	P
Black-crowned night heron	<u>Nycticorax nycticorax</u>	--	--	--	SSC	--	P
Yellow-crowned night heron	<u>Nycticorax violacea</u>	--	--	--	SSC	--	L
Eastern least bittern	<u>Ixobrychus exilis</u>	--	--	--	SSC	--	H
Glossy ibis	<u>Plegadis falcinellus</u>	--	--	--	SSC	--	P
White ibis	<u>Eudocimus albus</u>	--	--	--	SSC	--	P
Wood stork	<u>Mycteria americana</u>	E	E	--	E	--	P
Limpkin	<u>Aramus quarauna</u>	--	SSC	--	SSC	--	H
Florida sandhill crane	<u>Grus canadensis pratensis</u>	--	T	--	T	II	P
Red-cockaded woodpecker	<u>Picoides borealis</u>	E	T	--	--	--	L
Southern hairy woodpecker	<u>Picoides villosus auduboni</u>	--	--	--	SSC	--	L
Florida scrub jay	<u>Aphelocoma coerulescens</u>	T	T	--	T	--	P
<u>Mammals</u>							
Sherman's fox squirrel	<u>Sciurus niger shermani</u>	C2	SSC	--	T	--	P
Florida mouse	<u>Peromyscus floridanus</u>	C2	SSC	--	T	--	L

2.3.6-38

Table 2.3.6-6. Threatened and Endangered Species that Occur or Could Potentially Occur on or Near the Tampa Electric Company Polk Power Station Site (Continued, Page 3 of 3)

Common Name	Scientific Name	Designated Status*					Potential for Occurrence†
		USFWS ¹	FGFWFC ²	FDACS ³	FCREPA ⁴	CITES ⁵	
Round-tailed muskrat	<u>Neofiber alleni</u>	C2	--	--	SSC	--	L
Florida panther	<u>Felis concolor corvi</u>	E	E	--	E	I	U

* R = rare.
T = threatened.
T(S/A) = threatened due to similarity of appearance.
E = endangered.
SSC = species of special concern.

†U = unlikely; site is not within the species' range and contains unsuitable habitat.
L = low; occurrence of an important species within or near property boundaries is highly unlikely because of species range or unsuitable habitat or both.

CE = commercially exploited.
C2 = a candidate for listing, with some evidence of vulnerability, but for which not enough data exists to support listing.
I = included in Appendix I (of CITES).
II = included in Appendix II (of CITES).

M = moderate; important species may occur onsite since range and suitable habitat exists within property boundaries.
H = high; there is a very good possibility that an important species exists within property boundaries since range and suitable to optimal habitat for the species are found onsite.
P = present; the species listed has been observed on the subject property either visually or by signs thereof.

**Opuntia compressa = O. humifusa fide Wunderlin, 1982.

††Zamia floridana, Z. integrifolia, and Z. umbrosa = Zamia pumila fide Wunderlin, 1982.

***Applicable in Monroe County only.

Sources: ¹USFWS, 1991.

²FGFWFC, 1991.

³FDACS (list published in Preservation of Native Flora of Florida Act, Section 581.185-187, F.S.).

⁴FCREPA (Pritchard, 1978-1979).

⁵CITES of Wild Fauna and Flora, 1973.
ECT, 1992.

2.3.6-39

Flora

Due to the highly disturbed condition of the site, few important plant species would be expected to occur. No federally listed plant species have the potential to occur on the site. Eighteen species of plants either listed by the Florida Department of Agriculture and Consumer Services (FDACS) as either threatened or commercially exploited or by Florida Committee on Rare and Endangered Plants and Animals (FCREPA) as rare have the potential for occurrence on the property. Out of the 18 species, 10 species were found on the site. However, two epiphytic species (shoe-string fern and red-needle leaf), a terrestrial aroid (spoon-flower), and three terrestrial orchids (*Habenaria* orchids) also have a high potential for occurrence within appropriate habitat in unmined areas of the site. The majority of listed plant species either found onsite or that have a high probability of occurrence do occur or are likely to occur in areas not proposed for power plant development. Therefore, no significant adverse effects to regional or local populations of these species are anticipated from the proposed project. Species descriptions and the results of the field surveys for important species on the site follow.

Habenaria Orchids (*Habenaria odontopetala*, *H. quinqueseta* and *H. repens*)--The three species of *Habenaria* referenced above are listed as threatened by FDACS and are listed in Appendix II of Convention on International Trade in Endangered Species (CITES). These orchids are small, leafy, light green terrestrial herbs with greenish-white flowers. *Habenaria* orchids grow within cypress swamps, hardwood swamps, hammocks, marshes, bogs, and ditches. These orchids are actually quite common throughout central and south Florida, but have received a *threatened* status by FDACS presumably to restrict collection by orchid enthusiasts. Although not seen on the property, *Habenaria* orchids could occur within the floodplain forest of the unmined tributary to the South Prong Alafia River in the northwestern corner of the site. Since this area is not slated for mining or power plant development, no impacts to potential populations of *Habenaria* orchids are anticipated.

Hartwrightia (Hartwrightia floridana)--Hartwrightia is currently under review (Category 2) for federal listing by USFWS and is listed as threatened by FDACS and rare by FCREPA. Hartwrightia is a fall-flowering composite with pinkish or lavender flowers. This species occasionally inhabits open, acidic seepage areas such as the edges of marshes in central and northern Florida. None of the potential habitat areas investigated during 1991 contained Hartwrightia. Since this conspicuous composite was not observed during the fall flowering season on the property, the probability of occurrence for this species on the property is considered low.

Dahoon Holly (Ilex cassine), Prickly Pear (Opuntia compressa = O. humifusa fide Wunderlin, 1982), Cinnamon Fern (Osmunda cinnamomea), and Royal Fern (Osmunda regalis)--The referenced species are very common within the State of Florida. Dahoon holly, cinnamon fern and royal fern are listed as commercially exploited species by FDACS; while prickly pear is listed as threatened by FDACS and within Appendix II of CITES. Dahoon holly, cinnamon fern, and royal fern are mostly swamp inhabitants, while prickly pear occurs within flatwoods and scrubby areas. All of these species were observed on the site. Dahoon holly, cinnamon fern, and royal fern mostly occur within the woods contiguous to the unnamed tributary to the South Prong Alafia River on the western tract. This area will not be impacted by mining or site development. Prickly pear occurs sporadically throughout the flatwoods and mixed oak/pine woods on the site. No significant adverse impacts to regional populations of prickly pear are anticipated from the proposed plant development.

Spoon-Flower (Peltandra sagittifolia)--Spoon-flower is listed as rare by FCREPA. Spoon-flower is an aroid with showy white spathes, sagittate to hastate leaves, and red berries which occasionally inhabit swamps and marshes in central and northern Florida. Only one flowering specimen of Peltandra (P. virginica) was found on the site within the floodplain of the unnamed tributary to South Prong Alafia River. However, in its vegetative stage, spoon-flower is virtually indistinguishable from P. virginica. There is a high probability of occurrence for spoon-flower on the site.

However, since it is likely to occur in an area not scheduled for power plant development, no impacts to this species are expected.

Golden Polypody (Phlebodium aureum)--Golden polypody is listed as a threatened species by FDACS. This species is widespread and quite common throughout central and south Florida. Golden polypody is an epiphytic, pendent or spreading fern with broadly ovate, lobed, pinnatifid blades on shiny petioles attached to creeping, golden-brown-colored rhizomes. This species, which mostly inhabits the old frond bases of cabbage palms, occurs within the floodplain reaches of the unnamed tributary to the South Prong Alafia River located on the extreme northwestern area of the western tract and within the unmined, southeastern area of the eastern tract. Since these areas are not scheduled for mining or power plant development, no impacts to golden polypody are expected.

Wild Coco (Pteroglossapsis ecristata)--This orchid is under review (Category 2) by USFWS and is listed as threatened by FDACS. Wild coco is a 4-ft tall or taller, terrestrial fall-flowering orchid with a conspicuous raceme of magenta or yellowish-colored flowers. Wild coco is frequent within sand pine scrub, sandhills, and pine-lands in central and south Florida. Approximately 500 or more individuals of wild coco were observed within the grassy fields of the power block area within the eastern tract. Smaller numbers of this orchid were also observed in the southwestern, unmined area within the eastern tract. Since this southwestern area is not scheduled for power plant development or mining operations, no significant adverse effects to regional populations of wild coco are anticipated from the proposed project.

Wild Azalea (Rhododendron viscosum), Bluestem (Sabal minor), and Aspidium Fern (Thelypteris kunthii)--All of the above-referenced species are common mostly within hydric hammocks and hardwood swamps in the State of Florida. These species are only listed as threatened by FDACS. All of these species were observed in the floodplain swamp along the unnamed tributary to the South Prong Alafia River on the property. No impacts to species populations are expected from plant development.

Red-Needle Leaf (Tillandsia setacea)--Red-needle leaf is listed as a threatened species by FDACS. Red-needle leaf or wild pine is a small, epiphytic bromeliad with needle-like leaves and violet flowers with reddish floral bracts. Red-needle leaf occurs on tree trunks and branches within hammocks and swamps throughout central Florida. This air plant is the third most common species of indigenous bromeliad in the State of Florida. The *threatened* species status by FDACS is probably attributable to its potential over-collection because of its showy needle-like leaves that turn a reddish color in the fall. No red-needle leaf was found on the site. However, due to suitable habitat, this epiphyte may occur within the unnamed tributary to South Prong Alafia River floodplain forest, which is not scheduled for power plant development.

Shoestring Fern (Vittaria lineata)--Shoestring fern is listed as threatened by FDACS. Typically, shoestring fern can be found growing in the axils of old cabbage palm leaf bases within hammocks or the woodland edges of hardwood swamps. Its dark green, pendent linear leaves are distinctive and resemble shoestrings. This fern is frequent throughout central and south Florida and probably occurs within the floodplain of the unnamed tributary to the South Prong Alafia River. However, no specimens of shoestring fern were observed during searches on the site.

Netted Chain Fern (Woodwardia areolata)--Netted chain fern is listed as threatened by FDACS. This terrestrial fern species is common within swamps and marshes in Florida. Netted chain fern was observed in the floodplain area adjacent to the unnamed tributary to the South Prong Alafia River. No impacts to populations of netted chain fern are anticipated from the proposed action.

Coontie (Zamia floridana, Z. integrifolia, Z. umbrosa = Zamia pumila fide Wunderlin, 1982)--Coontie is listed as a commercially exploited species by FDACS, as threatened by FCREPA, and within Appendix II of CITES. Coontie is a cycad with a large starchy tuber used by Florida Indians as an important food source. This palmlike plant occasionally occurs within scrub, hammocks, pine flatwoods, and

sometimes in converted palmetto rangeland and pasture within interior counties in west-central Florida. No coontie was found within the well-drained rangeland, pasture, flatwoods, or hammock on the property during repeated searches. Therefore, there is only a moderate potential for occurrence of coontie on the site.

Fauna

A total of 31 wildlife species either endangered, threatened, rare, or species of special concern were identified as occurring or having potential to occur on the Polk Power Station site. These species are discussed in the following paragraphs.

American Alligator (Alligator mississippiensis)--The American alligator is designated as a species of special concern by FGFWFC and FCREPA, and threatened due to similarity of appearance by USFWS. This species ranges throughout the southeastern United States in the lower coastal plain and inhabits most wetland communities where sufficient open water is present. Since alligator populations have recovered sufficiently within their historic range, the species' USFWS-protected status has been downgraded to threatened due to similarity of appearance, which will maintain protective measures for other protected crocodile species. Currently, the State of Florida permits regulated harvests of alligators to control population growth, especially where alligators are incompatible with current land uses. Alligators were commonly observed in the reclaimed and unreclaimed lakes onsite as well as ditches, canals, and streams in the vicinity of the site.

Eastern Indigo Snake, Drymarchon corais couperi--Eastern indigo snakes are listed as threatened by USFWS and FGFWFC, and as a species of special concern by FCREPA. Reasons for their decline include overcollecting, mortality from rattlesnake roundups, and habitat destruction due to clearing for agriculture and residential developments. Indigo snakes occur in xeric scrub and sandhill communities (frequently in association with gopher tortoises), and moister communities such as pine flatwoods and hardwood hammocks. One individual was observed in the old field portion of the eastern tract. Gopher tortoise burrows were also found onsite

so it is likely this uncommon species resides on the property. The gopher tortoise burrows, however, occur in areas not scheduled for power plant development.

Florida Pine Snake, Pituophis melanoleucus mugitus--The Florida pine snake has similar habitat requirements as the gopher tortoise and is found in xeric upland habitats including sandhill, scrub oak, and longleaf pine/turkey oak habitats where the pocket gopher is found. Designated as a species of special concern by FGFWFC and under review for listing by USFWS, this upland species is known to inhabit gopher tortoise burrows. Since its range includes the site, and its preferred habitat and prey species occur onsite, it is highly likely this snake occurs onsite.

Short-Tailed Snake (Stilosoma extenuatum)--This endemic species is currently listed as threatened by FGFWFC, endangered by FCREPA, and is under review by USFWS. It prefers extremely well-drained soils usually in longleaf pine-turkey oak habitats. Not much is known of its life history, but it does spend much of its time underground. Since its range and some habitat occur onsite, there is a moderate likelihood this species could be found onsite.

Gopher Tortoise (Gopherus polyphemus)--Florida gopher tortoises are listed as a species of special concern by FGFWFC, threatened by FCREPA, and under review for listing by USFWS. Gopher tortoises have been primarily impacted by habitat losses associated with residential, commercial, and industrial developments on well-drained soils, and conversion of lands into commercial pine plantations. Gopher tortoises prefer xeric habitats such as sand pine scrub, oak scrub, turkey oak associations, relatively well-drained pine flatwoods, and old-field associations. This species is present on the site due to discovery of nine active, four inactive, and six abandoned burrows. In the northeastern corner of the eastern tract, one active burrow was found. In the southeastern corner of the eastern tract, four active burrows were found, and in the southwestern corner of that same tract, two active burrows were discovered. Two active burrows were also discovered on the northwestern corner of

the western tract. All active burrows were found in areas not scheduled for power plant development.

Gopher Frog (Rana areolata)--The gopher frog is designated as a species of special concern by FGFWFC, threatened by FCREPA, and is currently under review by USFWS. The primary cause for concern is habitat loss resulting from clearing for residential, commercial, and industrial development. Suitable habitat for gopher frogs includes xeric uplands such as sandhill and sand pine scrub communities. Although occasionally found in mouse burrows, crayfish holes, and stump holes, the gopher frog is most often associated with gopher tortoise burrows. The occurrence of this species onsite is listed as high due to its range and habitat requirements being met. However, as previously stated, gopher tortoise burrows which may be inhabited by gopher frogs were only located in areas not scheduled for power plant development.

Southern Bald Eagle (Haliaeetus l. leucocephalus)--The southern bald eagle is listed as endangered by USFWS and as threatened by FCREPA and FGFWFC. Eagles occurring in peninsular Florida include permanent residents and seasonally occurring migrants. The distribution, population, status, nest locations, and reproductive success of resident Florida eagles are closely monitored by FGFWFC and the National Audubon Society (NAS) through annual counts and aerial nest surveys. Based on aerial and ground surveys of the study area and a review of known nest locations and agency data, three bald eagle nests are known to occur in the study area. Most eagle nests are located in tall pines or cypress high above the surrounding forest, are large and conspicuous, and can be detected during aerial surveys.

Two of the nests were found onsite (one in the southeast corner of the eastern tract and one in the northwest corner of the western tract) and both are believed to be abandoned. Neither of these abandoned nest areas will be disturbed by the proposed project development (see Section 4.4). Repeated visits during potential nesting periods yielded no sighting of eagles. Both nests are in relatively poor shape

structurally. No evidence underneath the nest indicated any eagle use. Great horned owls were recorded using the eastern nest in early 1991.

The third nest is active but occurs offsite to the east along Fort Green Road. This nest is identified by FGFWFC as PO-40-A and has been active since 1989. The nest is located in a slash pine tree situated on a farmstead, with a residence located near the tree. The nest was active when observed in January 1992. This nest lies approximately 1.5 miles from the power block area, while the closest construction activities (the cooling reservoir) will occur approximately 2,500 ft away. Both these distances fall outside the primary management zone (750 to 1,500 ft away from nests) recommended by USFWS in their Habitat Management Guidelines for the Bald Eagle in the Southeast Region. The entire power block actually falls beyond the secondary management zone (1,500 ft to 1 mile) recommended by USFWS.

Southeastern American Kestrel (Falco sparverius paulus)--This small falcon is an openland bird often seen perching on utility poles and wires, preying on insects and small rodents. It is found throughout Florida and typically nests in cavities drilled by woodpeckers or in nest boxes and birdhouses. Several individuals were observed on the site, although no nesting areas were found. The species is listed as threatened by both FGFWFC and FCREPA and is under review by USFWS. Its status is really unknown since locally the species may be abundant but declining elsewhere.

Arctic Peregrine Falcon (Falco peregrinus tundrius)--This bird of prey breeds throughout most of the United States, but not in Florida. It is unique in that it nests on cliffs, tall trees, or buildings, and captures its prey (birds) on the wing. It is currently listed as threatened by USFWS, but endangered by both FGFWFC and FCREPA. None were observed onsite although it does like areas where birds congregate. If it were to occur, it would be considered an uncommon migrant.

Short-Tailed Hawk (Buteo brachyurus)--This medium-sized hawk is listed as rare by FCREPA. Their preferred habitat is mature cypress, mangroves, or riverine

hardwood swamps bordering open areas where they hunt. Its main prey is small birds. Due to the lack of suitable habitats, the likelihood of occurrence for this bird on the site is low.

Cooper's Hawk (Accipiter cooperi)--The Cooper's hawk inhabits edge areas between lowland hardwoods or hammocks and open areas primarily preying on small birds, mammals, or herpetofauna. This species is currently designated as a species of special concern by FCREPA. Population declines have been attributed to illegal shooting, pesticide contamination, and habitat destruction. Its breeding and wintering range includes all of the study area. Suitable habitat is also present throughout the site. One individual was observed onsite during field investigations.

Osprey (Pandion haliaetus)--The osprey is designated as a species of special concern (Monroe County only) by FGFWFC and as threatened by FCREPA. It inhabits wooded edges of water bodies such as lakes, rivers, and bays. It utilizes tall trees, utility poles, and navigation channel markers for nesting. Birds were observed feeding onsite, and one active nest was found onsite at the southern edge of the proposed power block area. Another osprey nest was located just offsite along the edge of a large clay settling area south of the southern property boundary of the eastern tract.

Little Blue Heron (Egretta caerulea)--This medium-sized wading bird, like the great egret, inhabits all wetland systems in Florida including fresh and salt water. Prey consists of small fish, crustaceans, and insects. This bird is designated a species of special concern by FGFWFC and FCREPA due to habitat destruction. Found with other waders, it was observed occasionally on the site.

Great Egret (Casmerodius albus)--This large, white bird is found throughout Florida in virtually all wetland habitats from fresh to salt water. Due to loss of wetland habitats, FCREPA lists this bird as a species of special concern. Great egrets were the most common wading bird observed onsite. It was seen in all lakes, ponds, and ditches around the site.

Snowy Egret (Egretta thula)--Snowy egrets nest throughout Florida in both salt and fresh water wetlands. They frequently nest in mixed colonies with great egrets and tricolored herons; they feed on small fish and insects. Habitat destruction is attributed to its decline over the last half-century, although, it is still considered a common bird. It is currently listed as a species of special concern by FGFWFC and FCREPA. This bird was also commonly observed using the aquatic habitats onsite.

Tricolored Heron (Egretta tricolor)--This species occurs throughout Florida but tends to nest more in coastal areas than freshwater areas. They are commonly found either nesting or feeding with other waders and eat primarily small fish. Their status as a species of special concern by FGFWFC and FCREPA is again attributed to habitat loss. They were occasionally observed onsite feeding with other waders. However, no nest sites were found during site surveys.

Black-Crowned Night Heron (Nycticorax nycticorax)--This species is common throughout most of the United States and breeds and winters throughout Florida. They utilize virtually all shallow aquatic habitats and tend to forage at night. Population levels within the state are unknown and FCREPA has listed the species as one of special concern. Several individuals were repeatedly observed roosting and feeding along the willows bordering the unreclaimed lake on the northeast corner of the site. No nests were discovered, however.

Yellow-Crowned Night Heron (Nyctanassa violacea)--Similar to the black-crowned night heron, this species utilizes a wide range of wetland habitats in Florida. However, it appears that coastal areas (mangroves and mud flats) are favored. The

species is listed as a species of special concern by FCREPA. None were observed onsite and due to its habitat preference, there is a low likelihood of occurrence onsite.

Least Bittern (Ixobrychus exilis)--This secretive, small heron inhabits both fresh and saltwater marshes and prefers dense stands of grassy vegetation. Its status in Florida is somewhat unknown, but FCREPA lists the species as one of special concern due to vanishing wetlands. Although not observed onsite, there is a high likelihood of occurrence due to suitable habitat onsite.

Glossy Ibis (Plegadis f. falcinellus)--This species utilizes many wetland types in the state and feeds in marshy or wet prairie areas. Principal food items include crayfish and insects. Its dependence on wetland habitats has caused FCREPA to classify this species as a species of special concern. As with other wading birds, it was observed feeding in some of the lakes onsite.

White Ibis (Eudocimus albus)--The white ibis also inhabits both fresh and salt water wetlands. They typically nest in large colonies and feed in shallow water. Principal food items are crayfish and insects. This species is one of the most abundant wading birds in the state but is declining due to habitat loss. Their status is listed as a species of special concern by FCREPA. This bird was also observed feeding onsite, although in small numbers.

Wood Stork (Mycteria americana)--Wood storks are listed as endangered by USFWS, FCREPA, and FGFWFC due to their continued population decline caused by the progressive loss of suitable feeding and nesting areas. As a result, their population status, colony locations, and reproductive success are closely monitored by FGFWFC and NAS through annual counts and ground and aerial colony surveys. Wood storks nest in cypress swamps and feed in freshwater marshes and flooded pastures and ditches.

A review of FGFWFC colony data compiled during annual aerial surveys indicates that no known colonies are located in the vicinity of the site. Individual storks or small flocks may feed or occur as transients throughout the study area that is suitable feeding habitat. Such areas include wet prairie and freshwater marshes, and flooded portions of fields and pastures. A few individuals were observed feeding on the site.

Limpkin (Aramus guarauna)--The limpkin inhabits slow-moving freshwater habitats such as rivers, streams, marshes, and lake shores of Florida. The limpkin feeds on freshwater snails and mussels. It is listed as a species of special concern by FGFWFC and FCREPA. No individuals were observed onsite although suitable habitat is available. Its likelihood of occurrence is considered high.

Florida Sandhill Crane (Grus canadensis pratensis)--The Florida sandhill crane is a nonmigratory resident and is listed as threatened by FGFWFC and FCREPA. Florida sandhill cranes nest and feed in shallow freshwater marshes and wet prairies throughout central and south Florida. Feeding also occurs in low-lying pastures, shallow marshes, and prairies. The primary reasons for their population decline are habitat loss and human encroachment of nesting and feeding areas. The range of the Florida sandhill crane includes the proposed plant site and it can be expected to be found occasionally in suitable non-forested wetland habitats onsite. No known nesting areas for the sandhill were identified in the site vicinity, however.

Red-Cockaded Woodpecker (Picoides borealis)--This species is listed as endangered by USFWS and FCREPA and threatened by FGFWFC. The red-cockaded woodpecker is usually restricted to pine flatwoods containing overmature longleaf pine stands affected by red-heart disease. Although this habitat extends throughout the southeastern United States, early harvesting of southern pines has reduced the number of preferable trees for these birds. Due to the limited acreage and age of pine flatwoods found onsite, there is a low probability of finding red-cockaded woodpeckers.

Southern Hairy Woodpecker (Picoides villosus auduboni)--Although little is known about this bird, it is believed to prefer heavily forested areas including pines, cypress stands, or hardwood swamps. The species is classified as one of special concern by FCREPA, but that may be due more to lack of its life history knowledge than anything. Since large tracts of forested lands do not exist onsite, the likelihood of occurrence for this species is expected to be low.

Florida Scrub Jay (Aphelocoma c. coerulescens)--Florida scrub jays, listed as threatened by FGFWFC, FCREPA, and USFWS, occur in xeric scrub habitats in scattered locations along the central Florida ridge and along coastal ridges. Florida scrub jays have specific habitat requirements and require oak scrub along with saw palmetto, scattered sand pine, and rosemary. They tend to avoid wetlands and forested communities. The decline of Florida scrub jays is apparently caused by the loss of scrub habitat which has been converted to residential developments, citrus groves, and pastureland. Two individuals were observed onsite in the proposed power block area; however, repeated efforts failed to locate individuals on subsequent field inspections.

Sherman's Fox Squirrel (Sciurus niger shermani)--Sherman's fox squirrel, which is designated as threatened by FCREPA, as a species of special concern by FGFWFC, and under review for listing by USFWS, inhabits northern and central peninsular Florida where suitable habitat such as sandhill and scrub oak communities exist. Alteration of its habitat is a major reason for its decline. A few individuals were observed in the oak/pine woods in the northwestern corner of the western tract in an area not scheduled for power plant development (see Section 4.4 and Figure 4.4.1-1). Even more individuals were observed offsite along areas of Albritton Road to the west of the site.

Florida Mouse (Podomys floridanus)--The Florida mouse is listed as threatened by FCREPA, as a species of special concern by FGFWFC, and is currently under review for listing by USFWS. This burrowing species is confined to xeric scrub habitats of

peninsular Florida, and the principal habitat of this Florida endemic is sand pine scrub in an early successional stage. It also occurs in xeric longleaf pine-turkey oak and scrubby flatwood associations. It is often found as a commensal with gopher tortoises. Although some suitable habitat is found onsite, the range of this species is marginal in southern Polk County, so its likelihood of occurrence is listed as low.

Round-Tailed Muskrat (Neofiber alleni)--This rodent, also called the Florida water rat, lives in and around freshwater marshes composed of dense maidencane stands and pickerelweed. Although this species is found throughout much of Florida and southeastern Georgia, the round-tailed muskrat is designated a species of special concern by FCREPA and is currently under review for listing by USFWS. Because the muskrat is nocturnal and its presence is sporadic even in suitable habitat, accurate population estimates are difficult to obtain. Since the preferred habitat of this species is extremely limited onsite, its likelihood of occurrence is considered low.

Florida Panther (Felis concolor coryi)--Currently, panthers in Florida occur primarily in large tracts of undisturbed lands south of the site. The majority of panther sightings are from Big Cypress Swamp in Collier County. In Charlotte County, Telegraph Swamp provides suitable habitat. This species is listed as endangered by USFWS, FGFWFC, and FCREPA.

Numerous cat tracks (primarily bobcat) were observed onsite. Although a larger cat was actually observed by field personnel, its tracks were too small for an adult panther. Discussions with FGFWFC's biologists seem to indicate that the cat may have been a jaguarundi (Felis yagouaroundi), which sporadically occur in Florida. In either case, it was FGFWFC's opinion that due to the range and habitat requirements of the panther, it is highly unlikely one would be found onsite.

2.3.6.2 Pre-existing Stresses

Aquatic Systems

As discussed in Section 2.1, the wetland headwater areas of Little Payne Creek and Payne Creek were originally located in the area of what is today the Polk Power Station site. However, due to phosphate mining on the property prior to 1991, these headwaters and any recognizable creek beds have long been eliminated. Prior to and during the time of ecological investigations, a headwater area just upstream to the unnamed tributary to South Prong Alafia River was also mined. However, the floodplain forest associated with the tributary was left undisturbed. The offsite aquatic sampling stations along Little Payne and Payne Creek are located within channelized portions of the original stream courses. The two lakes sampled on the site have resulted from mining. One lake was reclaimed recently; the other 30-year old lake, an old mine cut, was not reclaimed.

Terrestrial Systems

Phosphate mining is the greatest pre-existing stress to biota on and in the vicinity to the site. Over the life of the mine, 4,115 acres (94.6 percent) of the property will be or have been mined or disturbed through mining operations. Mining results in elimination or conversion of vegetation and wildlife habitats and alterations to the topography, surface water drainage, groundwater levels, and soil compositions. Areas within the western tract and at the northwestern corner of the eastern tract were still being mined during the site investigations. Currently, only portions of the northern area of the eastern tract have been reclaimed. It is proposed that the entire site, except for unmined areas and the proposed power plant facilities will be completely reclaimed.

Other secondary stresses to the remaining vegetation and wildlife habitats on the property associated with mining are fugitive dust and hydrological alterations. Fugitive dust particles from nearby mining operations are carried by wind and deposited on the leaf surfaces of vegetation. This accumulation of dust can result in lower transpiration rates and photosynthesis causing physiological stress during

periods of drought. Except for the presence of fugitive dust, the majority of vegetation surveyed near mining operations appeared to be relatively healthy.

Alterations to the surface water and groundwater have resulted in drastic changes to the hydroperiods of remnant wetland associations. Most of the wetlands onsite have been invaded by weedy plants that flourish due to hydrological changes. Invasion by these competitive plants results in changes in community structure, species dominance, and species diversity.

Prior to 1981, 945 acres (21.7 percent) of land had previously been converted and maintained for agricultural uses (i.e., citrus groves and pastureland). Although not as ecologically devastating as mining, agriculture also results in major changes to native communities. With the exception of mining, agriculture is the predominant land use within Polk County. Approximately 451 acres or 10.4 percent of the land on the Polk Power Station site will be reclaimed or left under its current land use (i.e., pasture and citrus).

2.3.6.3 Measurement Programs

Aquatic Ecology

The Polk Power Station site is located within three drainage basins: South Prong Alafia River, Payne Creek, and Little Payne Creek. The portion of the site east of SR 37, to be devoted to plant facilities and the cooling reservoir, lies primarily within the Little Payne Creek drainage basin. Most of the site has been extensively impacted by previous and ongoing phosphate mining activities. The portion of the site to the west of SR 37 lies primarily within the South Prong Alafia River and Payne Creek drainage basins.

As discussed in Section 3.0, stormwater drainage after development/reclamation of the site will be discharged to the South Prong Alafia River, Payne Creek, and Little Payne Creek in compliance with applicable reclamation and stormwater management requirements. In addition, cooling reservoir discharges will be directed to the Little

Payne Creek. The aquatic ecology baseline studies were designed to provide needed data on important species, populations, and habitats for ecological impact assessments in all three site drainage basins.

The monitoring program focused on collecting and analyzing macroinvertebrate and fish samples to describe existing biological communities. The field studies conducted to define the biological communities in the receiving waters included two macroinvertebrate and fisheries field efforts: one in March-April and the other in August 1991.

In addition to the onsite collection of empirical data, the available literature pertaining to the region of the Tampa Electric Company project site involving macroinvertebrate communities and fish populations was also reviewed.

The aquatic sampling program was described in the environmental licensing plan of study which was reviewed and approved by reviewing agencies (ECT, 1991b). The number, location, and condition of aquatic sampling stations, as well as detailed information on aquatic sampling and other data collection methods, data analyses and results are provided in the following sections.

Description of Sampling Stations

The aquatic ecology monitoring program focused on providing the baseline information needed to assess potential impacts associated with the cooling reservoir, stormwater, or wastewater discharges on the receiving water bodies within the three drainage basins associated with the Polk Power Station site. Seven aquatic ecology sampling stations (AE-1 through AE-7) were located in these drainage systems to characterize the important species, seasonal variability, community structure, and pre-existing stresses associated with the biological communities that may be impacted by construction and operation of the plant (see Figure 2.3.6-1). These data were also correlated with water quality data collected at the same sampling station locations, to aid in the interpretation of baseline information (see Section 4.2.1.2).

Three aquatic ecology stations were located in the South Prong Alafia River drainage basin. Station AE-1 was located on a small, unnamed tributary to the South Prong Alafia River at the northern property boundary along Albritton Road. The tributary is a first-order, intermittent stream located within a mixed hardwood swamp surrounded by citrus grove and pasture. The stream bed is very narrow and shallow at this location. The stream almost completely disappears within a lowland, floodplain forest situated within property boundaries. During the March 1991 sampling period, a portion of the stream was pooled. Water depth was generally 6 inches or less. The stream width averaged less than a foot at the sampling station. The water was relatively cool during sampling events because of shading by trees. The substrate consists of a mixture of leaves, sand, silt, and detritus. Vegetation growing in the stream includes soft rush, false nettle, dog fennel, buttonbush, and water hemlock. Canopy trees growing at this station include red maple, laurel oak, sweet bay, and storax. Two additional aquatic sampling stations were located on the South Prong Alafia River along Bethlehem Road at bridged crossings with one as a reference or upstream station (Station AE-3) in Polk County and the other a downstream site (Station AE-2) located in Hillsborough County (see Figure 2.3.6-1). The South Prong Alafia River is a relatively shallow stream situated just north-northwest of the property. Depth within the narrow stream bed is generally less than 1 ft. The creek bottom is typically a combination of leaves, detritus, sand, and silt. There is a moderate input of allochthonous detrital material into the system, primarily from leaf fall. Abundant leaf packs, undercut banks, instream woody substrates, and aquatic vegetation provide ample habitat for stream macroinvertebrates. Shoreline vegetation at Station AE-2 includes elderberry, red maple, dog fennel, smartweed, willow, paragrass, marsh pennywort, pop ash, false nettle, and Florida paretaria. Vegetation in the vicinity of Station AE-3 includes a canopy of laurel oak, live oak, stiff cornel, pop ash, and red maple. Shoreline vegetation at this station includes Florida paretaria, string lily, peppervine, false nettle, cranesbill, lizard's tail, cat-brier, buttonbush, galingale, and butterweed.

Station AE-4 was located near the highly disturbed headwaters of Payne Creek at the point where SR 37 crosses the channelized portion of Payne Creek. The headwater area of Payne Creek situated upstream to the west of Station AE-4 has been completely altered due to current mining activities. The channel at the station exhibited no appreciable flow. The sediment consists of deep layers of anaerobic muck. During sampling, hydrogen sulfide bubbles were released as the Ponar penetrated the sediment. Channel width at this site is approximately 15 ft. Instream vegetation consisted of cattail, spatterdock, water lettuce, water fern, pickerelweed, willow, smartweed, clubrush, and soft rush.

Station AE-5 was located in the drainage canal that now replaces a portion of the headwaters of Little Payne Creek at Fort Green Road. Flow at this station was considerable during sampling episodes. Because of the strong flow, the substrate is primarily sand with some silt around vegetated areas. Instream vegetation is abundant and consists of dock, water pennywort, water primrose, water hyacinth, and Florida elodea. Bank vegetation at this station includes primrose willow, water hemlock, false nettle, shrub verbena, Spanish needles, and wax myrtle. Phosphate mining has occurred upstream of this site and a railroad crossing is approximately 100 ft upstream of the station.

Stations AE-6 and AE-7 were both located in phosphate mining-created lakes. Station AE-6 was an approximately 73-acre reclaimed lake. The sampling station was located along the northeastern shore. Depth at the sample site was 2 ft or less. The substrate is primarily clay, occasionally mixed with small quantities of sand. Conspicuous vegetation at this station consisted of primrose willow, marsh pennywort, galingale, smartweed, and hydrilla. Planted vegetation included common flag and bulrush. Station AE-7 was a >30-year-old mine cut with steep side slopes that was never reclaimed. Samples were collected from the southeastern shore in a bed of cattails at a depth of approximately 1 to 2 ft within a sandy substrate area. Vegetation at this station also includes primrose willow, paragrass, and willow.

Data Collection and Analyses

Macroinvertebrate Sampling--Macroinvertebrate sampling included benthic infaunal communities and epifaunal communities. Benthic infaunal organisms are normally considered indicators of the relative health of a system. In addition to the important role benthic communities play at the base of the aquatic food web as primary, secondary, and detrital consumers, benthic invertebrates are thought to reflect changes and/or fluctuations in environmental quality. Benthic organisms are good indicators of the relative ecological status of aquatic systems because they generally have limited mobility and cannot escape from deteriorating environmental conditions.

Adequate description of the structure and function of any benthic community considers spatial and temporal variables using both quantitative and qualitative methods. The use of techniques designed to measure spatial changes in communities is especially important for this project since large fluctuations in community composition may be expected within the various water bodies. Seasonal measurements allow the assessment of naturally occurring changes in macroinvertebrate assemblages associated with seasonal differences in environmental conditions. Therefore, the macroinvertebrate studies consisted of sediment grab sampling of the infaunal (organisms living within the substrate) benthic community and of artificial substrate sampling of the epifaunal (organisms living on vegetation, wood, and other substrates) communities in March and August 1991.

The epifaunal communities were sampled by allowing them to colonize Hester-Dendy artificial substrate samplers. At each station, four samplers were suspended in the water column at mid-depth and allowed to incubate for 4 weeks or approximately 28 days. Infaunal communities were sampled with a petite Ponar grab. Five Ponar samples were collected along a transect to identify the populations inhabiting different substrate locations. Each station was marked along the shoreline with flagging.

Artificial substrate samples were carefully placed within screw lid, plastic jars while underwater and then preserved in 95 percent ethanol/rose bengal solution. Ponar samples were washed in the field through a U.S. No. 30 sieve (595-micrometer openings), placed and double-bagged in pre-labeled Ziploc® freezer bags, and preserved with a 20 percent formalin/rose bengal solution. Both the artificial substrate and Ponar samples were then stored in coolers and immediately transported to the laboratory for analysis.

In the laboratory, samples were washed of preservative, sorted from the debris, and identified to the lowest practical taxonomic level. Three artificial substrate and four Ponar grab samples were analyzed from each station. The additional samples were retained in the event that the replicates analyzed did not provide an adequate sample size. The Shannon Weaver diversity index as described by Wilhm and Dorris (1968) was used to calculate a species diversity for each sample and each station.

Fisheries Sampling--The fisheries associated with the Polk Power Station site were sampled once in the spring dry season and again in the summer wet season. Seven fisheries sampling stations were established which corresponded with data collection stations for water quality and aquatic macroinvertebrates.

The majority of the fish species collected were obtained with a 30-ft long, 6-ft tall seine having a 0.5-centimeter (cm) mesh size. In the larger, flowing streams (Stations AE-2, AE-3, AE-4, and AE-5), one seine was stretched across the stream and tended by one sampler, while two other samplers moved upstream overland with a second seine. The second seine was stretched across the stream and vigorously worked within the vegetation along the banks downstream towards the first seine. Once the second seine reached the first, the first seine was looped around the second and dragged toward one stream bank. This method proved to be very effective and tended to achieve both more numerous individuals and greater species diversity than all other methods attempted. In streams with low flow and narrow cross section (Station AE-1), a 0.5-cm mesh D-framed dip net was used to sample the limited fishery.

Sampling in the reclaimed lake (Station AE-6) and an old mine cut (Station AE-7) was primarily performed using a large seine. The net was worked quietly out from the bank to the maximum depth (6 ft), and looped around to return to the bank. Care was taken to minimize any disturbance to the desirable aquatic emergent vegetation when the seine was dragged ashore.

Individuals captured during the collection effort were identified to species and tallied by station. If taxonomy was uncertain, specimens were preserved in 10 percent formalin for later identification. Unknowns were labelled ("Unknown A," "Unknown B," etc.) and most individuals were released alive after being counted. Preserved specimens were identified to species under magnification utilizing taxonomic keys. The preserved individuals are archived as voucher specimens as dictated by the project plan of study.

Terrestrial Ecology

The terrestrial ecology surveys conducted for this project were specifically designed to obtain the baseline information necessary to characterize the site as required by specific regulatory requirements and as needed for the impact assessment. The required information includes: (1) identification of important flora and fauna on and in the vicinity of the site, including state and federally listed species; (2) their habitats, abundance and distribution; (3) the relationship between species and their environment; and (4) the identification of the extent, distribution, type, successional status, preexisting stresses, condition, species composition and diversity, and function of vegetation communities on the site, particularly wetlands. The referenced ecological information on the site's biota under existing conditions, i.e., prior to power plant construction, will serve as the basis for projecting impacts of the proposed facility to ecosystem structure and function, as well as to species composition and diversity.

As preparation for site reconnaissance and field surveys, a literature search/agency consultation was conducted to review maps and aerial photographs, current listings

and records of endangered and threatened species, and published material dealing with regional biota, pre-existing environmental stresses, and effects of power plant construction and operation on plant and animal species. After the appropriate documents, records, photographs, and maps were reviewed, two senior ecologists, a botanist and a wildlife biologist, conducted a preliminary site reconnaissance in February 1991. The purpose of this site walkover was to verify any previously collected information, locate potentially sensitive or unique areas, classify major vegetation communities on the site, identify land uses and existing stresses and impacts, identify any observed endangered or threatened species, determine the number and locations of sampling transects in each major plant community/wildlife habitat selected for evaluation, identify the locations of appropriate areas for seasonal threatened and endangered species surveys, and identify the locations of major wetlands to be evaluated. Subsequently, vegetation and wildlife surveys were scheduled for both dry and wet seasons.

Because of the highly altered condition of the property due to mining and the relative size of the power block as compared to the overall dimensions of the site (1:4 ratio), it was necessary to focus ecological investigations upon those components and processes associated with the site which are most vital to defining the character and functions of the ecosystems, and those which are most pertinent for defining or assessing impacts of the proposed action. The criteria for selection of the systems to be studied included, but were not limited to, the following:

- Major communities or ecosystems comprising 10 percent or more of the areal extent of the property, and which are characteristic of the site;
- Unique features which are rare within the vicinity or have restrictive environmental requirements;
- Areas whose functional integrity could be critical for a species listed in one of the prior categories, or whose integrity is necessary for maintenance of offsite environmental quality; and
- Components or processes identified as those most likely to be altered by the proposed action or facility.

These criteria were generally used in the selection of sampling areas and organisms to be sampled. Standard field sampling, laboratory analysis, chain-of-custody, and documentation procedures for terrestrial ecology were followed. The following describes the vegetation and wildlife sampling efforts used for this project.

Flora

All vegetation communities and associations on the proposed plant site were identified and characterized by species composition and habitat structure. Quantitative sampling of vegetative strata was performed in selected plant communities to provide information on the abundance and relative importance of the more common plant species in each community. Comparisons of species composition among tree canopy and shrub and ground covers, as well as the comparisons between communities, yield information valuable to understanding the relationships between species, successional status of communities, and species-environmental relationships. Understanding these relationships provides a basis for determining the impacts of project construction and operation, as well as facility construction and operation on the regional biota, and information on the upland, wetland, and aquatic communities that can be utilized for reclamation/mitigation purposes. The areas selected for quantitative evaluation within the plant communities under investigation met the following criteria:

- Must be relatively undisturbed and therefore, remnant or characteristic of pre-existing or existing plant communities; and
- Must be within a homogeneous area indicative of the plant community(s) situated onsite.

Nine vegetation transects were established on the site to quantitatively evaluate seven separate community types: mixed oak/pine woods, disturbed marsh, undisturbed marsh, old field, mixed hardwood swamp, maple swamp, and mixed shrub swamp. The transects were located in communities within the unmined areas of the site, some of which were potentially scheduled for power plant development.

After an area had been selected, the trees, shrubs, and ground cover were quantitatively sampled using standard sampling methodologies (Mueller-Dombois and Ellenberg, 1974). The following standard sampling techniques were used to evaluate three vegetative strata (herb, shrub, and tree) within each community type studied.

Herb--Vegetation transects were established across the most homogeneous, undisturbed areas of upland communities studied. Within wetland systems, the transects were initiated at the outermost edge of the subject community and extended directly waterward. Twenty 1-square meter (m^2) quadrats, typically spaced at 5-meter (m) intervals, were established along a linear transect within each area sampled that exhibited only a herbaceous layer (old fields, marshes). In systems that only contained herbaceous and shrub strata (overgrown fields, cutover forests, shrub swamps), the 1- m^2 quadrats were nested within 4- by 4-m shrub quadrats typically spaced at 4-m intervals (see Shrub). In wooded areas, the herbaceous quadrats were nested within shrub/tree quadrats situated at 10-m intervals. The termini of each transect were monumented with orange surveyor's flagging. The quantitative herbaceous sampling was either conducted in both the spring and summer or summer only. The general methodology consisted of overlaying a portable 1- by 1-m PVC frame over each sampling point in order to exactly define the spatial limits of each plot. By direct overhead visual inspection, the percent coverage of each species within the herb stratum was recorded in tabular form on field data sheets.

To qualify for inclusion, the individual herbaceous/woody plants within the herb quadrat had to fulfill the following criteria:

- Less than 0.5-m in height;
- Vascular;
- Rooted or floating within the quadrat;
- Aerial portions located within quadrat (e.g., individual plants rooted on raised hummocks and logs not included);

- Visible (e.g., material not visible during high water stages are not recorded); and
- Live material.

In addition, nonherbaceous items such as leaf litter, debris, etc., that occupied space within the herb stratum of the quadrat were recorded collectively.

Shrub--Within shrubby or wooded areas, a minimum of twenty 4- by 4-m shrub plots was established along linear transects. In wooded areas, these shrub quadrats were nested within 10- by 10-m tree quadrats spaced at 10-m intervals. In shrub swamps, and overgrown fields, shrub quadrats were spaced at contiguous intervals along a belt transect. Quantitative sampling of shrub quadrats was typically conducted in the spring or summer. The general methodology consisted of stretching a meter tape perpendicular to the linear transect to establish the spatial limits of each plot. By visual inspection, the percent coverage of each species within the shrub stratum was recorded on field data sheets.

To qualify for inclusion, the individual shrubs within the quadrat had to fulfill the following criteria:

- Greater than 0.5 m in height,
- Woody,
- Rooted within the quadrat,
- Aerial portions located within the quadrat,
- Live material, and
- Less than 10 cm diameter-at-breast-height (dbh).

Tree--Within each forested area selected, a minimum of twenty 10- by 10-m tree plots was spaced at contiguous intervals along a belt transect. Quantitative sampling of the tree canopy within each wooded area was typically conducted in the spring or summer. The general methodology consisted of stretching a meter tape perpendicu-

lar to the linear transect to establish the spatial limits of each plot. Each live tree ≥ 10 cm dbh was assessed for identity of species, general condition, and dbh.

All plant species that were easily identifiable in the field were identified to species level and recorded by vegetative stratum. For plant species not easily identifiable in the field, voucher specimens were collected, pressed, dried, and verified at the University of South Florida Herbarium.

Data collected during the study were analyzed to determine species' dominance, density, and frequency. Relative values were also calculated to determine overall species importance. Relative frequency was calculated by dividing the number of quadrats in which a species occurred by the total occurrence for all species. Relative dominance was determined by dividing the total percent cover for a species by the total percent cover for all species. The relative density of trees was calculated as the number of individual trees over the area sampled (density) for a species divided by the total density for all species. Importance values were calculated as either the sum of the relative frequency, relative dominance, and relative density (trees), or the sum of the relative frequency and relative dominance (shrub and ground layers). Combining these relative values into a single importance value reflects different measures of the importance of a species in each plant community studied on the project.

A series of vegetation association transects were also located within the unmined areas of the property on both the eastern and western tract in order to determine species composition by community type. A qualified botanist recorded all the plant species observed while walking along an imaginary linear transect crossing two or more discernable community types. The information was then compiled into a table provided in Appendix 11.10.2.

Fauna

This section describes the methodologies used in collecting wildlife data. Objectives and frequency of sampling are described for each group of species. Methodologies

were consolidated to include as many species as possible by using each method. A majority of the information needed for endangered and threatened species was obtained while conducting studies on animal communities.

Sampling was conducted seasonally (wet and dry season) to determine variations in abundance and distribution of resident species and utilization of the site by migrant species. Each major seasonal survey was scheduled at a time when conditions were generally typical of that particular season.

Birds, mammals, reptiles, and amphibians were surveyed by appropriate qualitative techniques. Each observation was recorded in a field notebook by date and habitat type.

Mammals--Mammals of the site were sampled during spring and fall surveys. Small mammal trapping was conducted in five unmined areas which represented the most common terrestrial and wetland habitats on the site. The five communities sampled included two secondary-growth mixed oak/pine woods, two old fields, and one ephemeral marsh system. Twenty permanent sampling stations were established along flagged transects in each of the five communities. One large and a small Sherman live trap were placed at each of the stations. Altogether, 200 traps were set each evening and inspected each morning. Trapping occurred over a consecutive 5-day period in the spring and again in the late summer. There was a total of 1,000 trap-nights per event.

Captured mammals were identified to species with the aid of field guides and then released unharmed on the site. Larger mammal populations were identified by direct observations or indirect signs such as tracks, scats, dens, burrows, etc. Surveys of large mammals occurred during seasonal walkovers of the site.

Birds--Birds of the site were censused in the spring and fall during early morning and evening surveys along pre-established transects on different areas of the project site.

Birds were identified by direct sightings or calls during timed surveys in each of the principal onsite habitats by an experienced ornithologist.

Amphibians and Reptiles--Amphibians and reptiles of the site were identified during searches of suitable terrestrial and aquatic habitats. Such searches of suitable habitat (e.g. dead falls, burrows) were incidental to other field efforts.

Wetland Evaluations

A detailed analysis of the type, structure, extent, and functional status of onsite freshwater wetlands was also conducted. The purpose of the wetland evaluation was to identify and describe the wetlands associated with the site, to evaluate the functional quality of those wetlands, and to determine potential effects to offsite wetlands, which are adjacent or connected to onsite wetlands or are affected by the withdrawal of groundwater.

Wetlands onsite were evaluated with regard to the functions provided such as water storage, erosion control, maintenance of water quality, and wildlife habitat. The evaluation was based on wetland size and productivity as determined by percent vegetation cover, hydroperiod, species richness, degree of connection with other wetlands, and soil characteristics. The size and degree of connection of the wetlands was initially estimated with the aid of aerial photographs; the areas were then ground-truthed to determine the exact boundaries of wetlands. The landward extent of wetlands was determined using plant indicator species, soils, and hydrology as used by federal, state, and regional agencies in establishing their respective jurisdictional authorities. Wetland limits were mapped and acreages of potential impact were then calculated.

Consultations with FDER, SWFWMD, and USACE were conducted to establish each agency's respective jurisdictional authority over the wetlands and surface waters on the site.

Threatened and Endangered Species Analysis

Current listings of endangered and threatened species prepared by USFWS, FNAI, and FCREPA (plant and animal species); FGFWFC (animal species only); and FDACS (plant species only) were reviewed to determine potential occurrence within the study area based upon habitat suitability and range of distribution. Contacts were made with FGFWFC, USFWS, and FNAI to review current files/maps depicting any important species location records within or up to 1 mile outside of project boundaries. The property and adjacent lands were searched for important species from March to December 1991 and January to March 1992 during both quarterly and random episodes. The time expended during seasonal surveys varied depending on species characteristics and the probability of endangered species occurrence.

Pre-Existing Stress Surveys

Pre-existing stress surveys were also conducted to identify existing natural or man-made stresses which do, or have the potential to, adversely impact the ecological conditions, or alter the diversity, abundance, or distribution of plants and animals on the site and surrounding area. This stress survey was conducted during the late summer of 1991 to coincide with a period of maximum plant emergence and wildlife abundance. The purpose of such a survey was to document existing impacts prior to site clearing activities for the proposed facilities.

2.3.7 METEOROLOGY AND AMBIENT AIR QUALITY

2.3.7.1 Climatology/Meteorology

The central Florida climate is classified as subtropical with maritime influences from the Atlantic Ocean and the Gulf of Mexico. Summers are long, warm, and relatively humid, while winters are generally mild because of the southern latitude and the warming influence of the Gulf Stream.

Table 2.3.7-1 provides a summary of monthly mean and extreme temperatures based on NWS data collected at Bartow for the period-of-record 1941 through 1980 (NWS, 1990). Bartow, located 25 kilometers (km) northeast of the Polk Power Station, is the nearest NWS surface observation station. January exhibits the lowest mean minimum temperature (49.2°F) and the lowest normal mean monthly temperature (61.2°F). The highest normal mean maximum temperature (92.6°F) and the maximum normal mean monthly temperature (82.4°F) occur in August. The highest and lowest record temperatures of 103°F and 18°F were experienced in June 1977 and December 1962, respectively.

Based on the same 40-year record (NWS, 1990), normal annual rainfall is approximately 53 inches. The monthly statistics (see Table 2.3.7-1) show the rainy season to begin in May or June and end in early September. Summer rainfall is generally derived from local showers or thunderstorms. The highest normal monthly rainfall is 8.5 inches in July. November and December are the driest months, with an average of approximately 2 inches of precipitation. Record monthly precipitation occurred in July 1960, when 17.6 inches of rain were recorded.

While the NWS data collected at Bartow are adequate for climate characterization, the data are not usable as a basis for air dispersion modeling. The NWS station at the Tampa International Airport, 62 km northwest of the Polk Power Station, is the nearest first-order observation facility with a database adequate for dispersion modeling. Thus, consistent with FDER guidance, NWS surface and mixing height observations for Tampa were used as dispersion modeling input.

Table 2.3.7-1. Meteorological Data from Bartow, Florida (1941 to 1980)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<u>Total Monthly Precipitation (inches)</u>													
Average	2.27	2.97	3.53	2.51	4.57	7.30	8.48	7.39	6.62	2.83	2.13	2.17	53.42
Maximum	7.79	8.42	11.53	8.40	13.05	15.03	17.58	14.39	15.59	9.10	7.40	11.38	83.44
Minimum	0.03	0.24	0.05	0.00	0.02	0.73	2.91	2.60	1.04	0.20	0.00	0.15	37.19
<u>Maximum Daily Precipitation (inches)</u>													
Average	1.00	1.44	1.31	1.24	1.61	2.34	2.07	1.86	2.10	1.23	1.10	1.05	
Extreme	3.36	4.07	4.72	3.56	4.30	9.82	4.00	4.64	6.75	5.06	4.57	3.49	
<u>Monthly Average of Daily Maximum Temperature (°F)</u>													
Maximum	83.1	82.3	87.3	90.3	94.4	95.4	94.9	95.3	93.5	88.6	85.0	79.9	89.1
Average	73.3	75.3	79.9	84.8	89.4	91.7	92.3	92.6	90.4	85.4	79.3	74.4	84.1
<u>Monthly Average of Daily Minimum Temperature (°F)</u>													
Minimum	37.0	43.5	49.4	53.5	60.7	66.8	69.3	68.3	66.5	59.2	48.8	44.5	55.5
Average	49.2	50.7	55.2	59.8	65.3	70.4	71.8	72.1	71.1	64.3	56.7	51.1	61.4

Source: NWS, 1990.

2.3.7-2

Table 2.3.7-2 provides a summary of monthly mean and extreme temperatures for Tampa. January exhibits the lowest mean minimum temperature (49.5°F) and the lowest normal mean monthly temperature (59.8°F). The highest normal mean monthly temperature (82.3°F) and the highest mean maximum temperature (90.3°F) occur in August. Table 2.3.7-2 provides a summary of monthly mean and extreme precipitation and relative humidity. The highest normal monthly precipitation (7.64 inches) occurs in August, and the lowest normal monthly precipitation (approximately 1.7 inches) occurs in November and April. Comparing the Tampa temperature and precipitation record with the Bartow records demonstrates that the two stations are climatologically very similar and that using Tampa meteorological data for dispersion modeling of the Polk Power Station is appropriate.

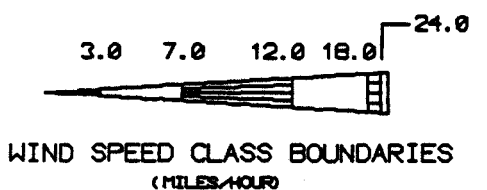
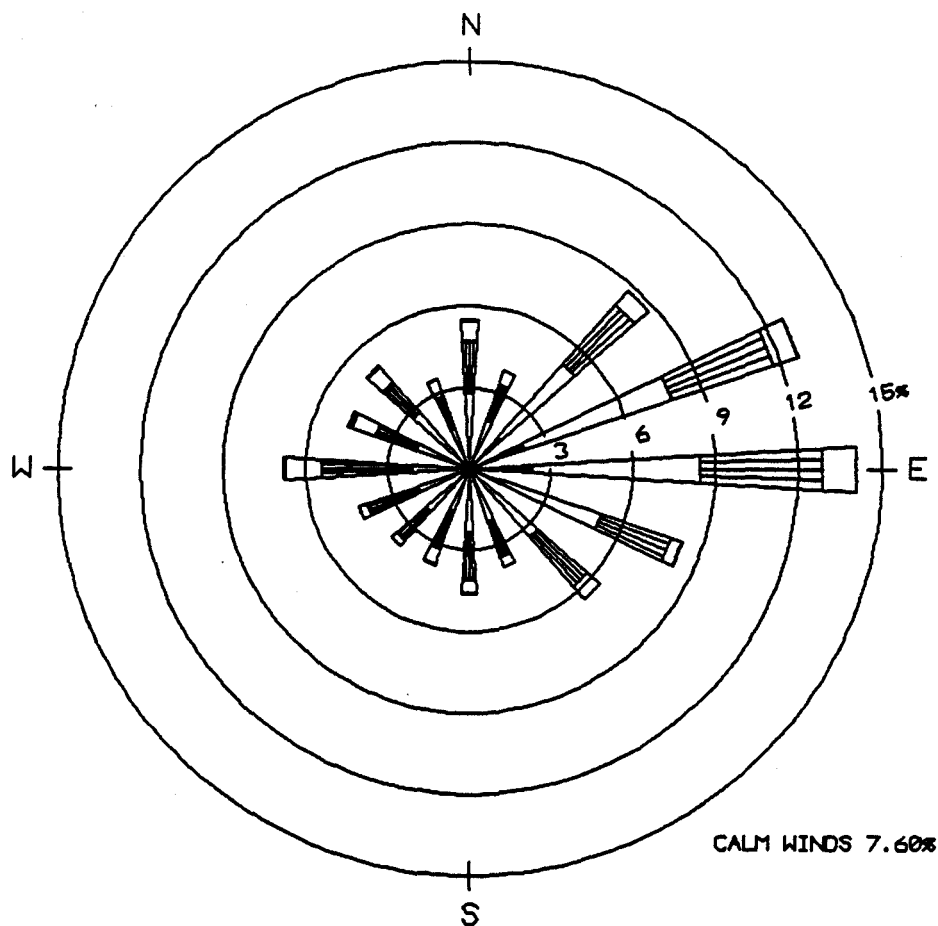
Figure 2.3.7-1 presents a 5-year annual wind rose (1982 to 1986) based on wind direction and windspeed observed at the Tampa International Airport. Figure 2.3.7-2 presents 5-year seasonal wind roses for the same station. The values presented in the figure represent the percent of the time that the wind blows from a particular direction at a given speed. The predominant wind direction during the 5-year period was from the east, which occurred approximately 14 percent of the time. Wind directions from the east-northeast, northeast, and east-southeast each occurred more than 8 percent of the time. March has the highest mean monthly windspeed of 9.7 miles per hour (mph). The lowest mean monthly windspeed of 7.2 mph occurs in August. An easterly prevailing wind direction is evident during most of the year. The annual average windspeed is 8.6 mph. The highest recorded windspeed was 67 mph in June 1964. Table 2.3.7-3 presents detailed annual windspeed and direction information.

Table 2.3.7-4 presents the annual and seasonal pattern of atmospheric stability in the Tampa area, as determined by NWS. During the summer, unstable conditions are present approximately 38 percent of the time because of strong insulation. During the winter, the occurrence of unstable conditions is reduced to 16 percent of the time. Neutral stability is more common in the winter, occurring approximately

Table 2.3.7-2. Meteorological Data from Tampa, Florida (1951 to 1980)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<u>Monthly Precipitation (inches)</u>													
Normal	2.17	3.04	3.46	1.82	3.38	5.29	7.35	7.64	6.23	2.34	1.87	2.14	46.73
Maximum	8.02	7.95	12.64	6.59	17.64	13.75	20.59	18.59	13.98	7.36	6.12	6.66	
Minimum	0.00	0.21	0.06	0.00	0.17	1.86	1.65	2.35	1.28	0.16	0.00	0.21	
<u>Maximum Daily Precipitation (inches)</u>													
Extreme	3.29	3.68	5.20	3.70	11.64	5.53	12.11	5.37	4.67	2.54	4.22	3.28	12.11
<u>Monthly Temperature (°F)</u>													
Normal	59.8	60.8	66.2	71.6	77.1	80.9	82.2	82.2	80.9	74.5	66.7	61.3	72.0
Average	70.0	71.0	76.2	81.9	87.1	89.5	90.0	90.3	88.9	83.7	76.9	71.6	81.4
Maximum													
Average	49.5	50.4	56.1	61.1	67.2	72.3	74.2	74.2	72.8	65.1	56.4	50.9	62.5
Minimum													
<u>Relative Humidity (percent)</u>													
Hour 01	85	83	83	82	82	84	85	87	86	85	86	85	84
Hour 07	86	86	86	87	86	87	88	91	91	88	88	88	88
Hour 13	59	56	55	51	53	60	63	65	62	57	57	59	58
Hour 18	73	69	67	61	62	69	73	76	75	71	74	74	70

Source: NWS, 1990.



NOTES:
 DIAGRAM OF THE FREQUENCY OF
 OCCURRENCE FOR EACH WIND DIRECTION.
 WIND DIRECTION IS THE DIRECTION
 FROM WHICH THE WIND IS BLOWING.
 EXAMPLE - WIND IS BLOWING FROM THE
 NORTH 5.5 PERCENT OF THE TIME.

FIGURE 2.3.7-1.

5-YEAR ANNUAL WIND ROSE FOR TAMPA INTERNATIONAL AIRPORT (1982-1986)

Source: ECT, 1992.

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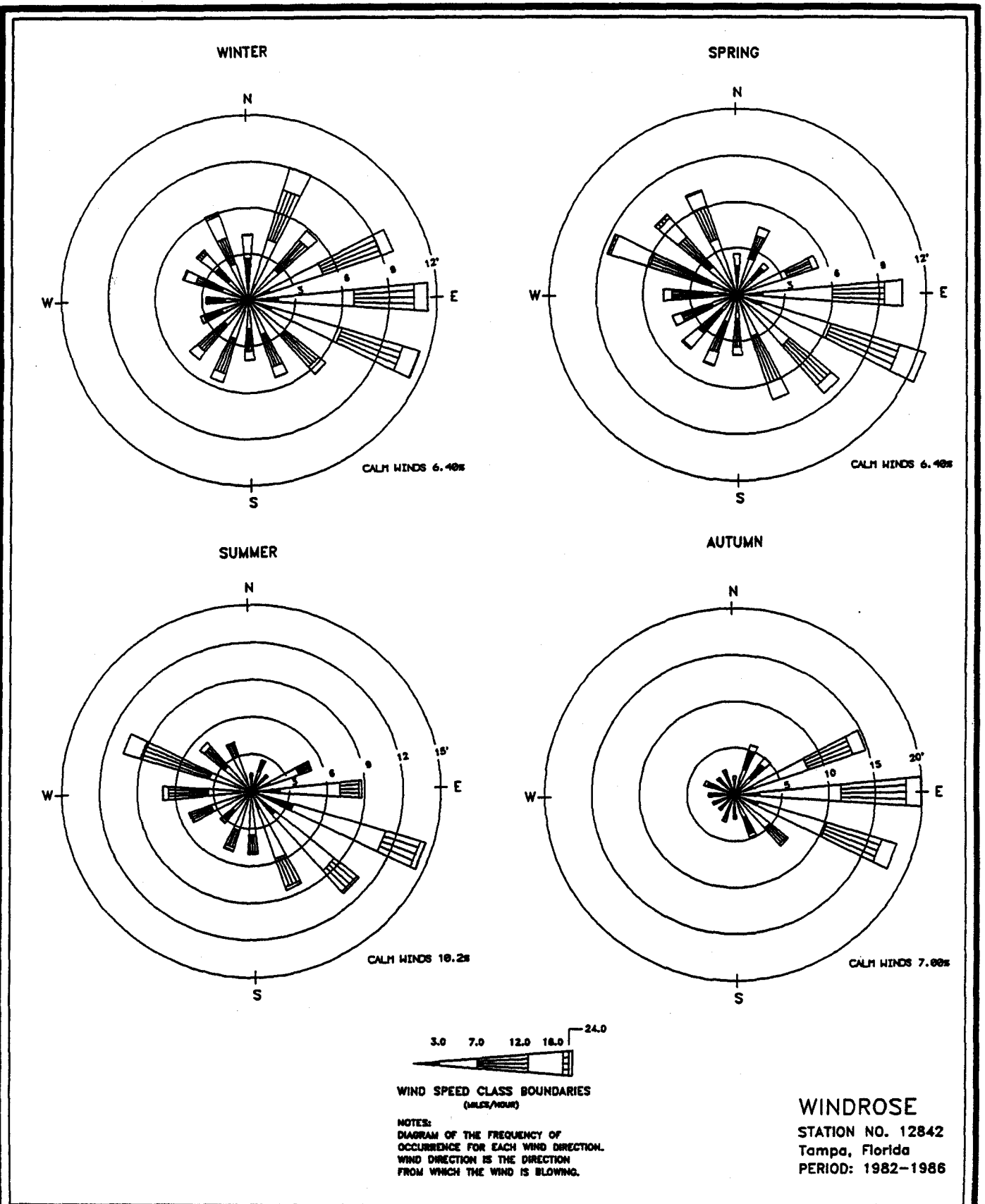


FIGURE 2.3.7-2.

5-YEAR SEASONAL WIND ROSE FOR TAMPA INTERNATIONAL AIRPORT (1982-1986)

Source: ECT, 1992.

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Table 2.3.7-3. Annual Average Frequency Distribution of Wind Direction and Windspeed for Tampa, Florida, from 1982 through 1986

Direction	Frequency Distribution Speed (knots)						Total
	0 to 3	4 to 6	7 to 10	11 to 16	17 to 21	than 21	
N	0.00744	0.02059	0.01917	0.00719	0.00034	0.00000	0.05473
NNE	0.00533	0.01372	0.01406	0.00502	0.00012	0.00000	0.03824
NE	0.01541	0.03640	0.02880	0.00710	0.00014	0.00000	0.08784
ENE	0.02158	0.05661	0.03911	0.00947	0.00021	0.00000	0.12699
E	0.02349	0.06095	0.04434	0.01198	0.00016	0.00007	0.14099
ESE	0.01364	0.03781	0.02677	0.00427	0.00007	0.00005	0.08261
SE	0.00747	0.02615	0.02424	0.00607	0.00012	0.00000	0.06405
SSE	0.00431	0.01639	0.01422	0.00356	0.00002	0.00000	0.03850
S	0.00552	0.01785	0.01753	0.00477	0.00034	0.00016	0.04617
SSW	0.00305	0.01353	0.01511	0.00568	0.00048	0.00009	0.03795
SW	0.00475	0.01661	0.01417	0.00251	0.00012	0.00002	0.03819
WSW	0.00414	0.01618	0.01965	0.00299	0.00007	0.00005	0.04307
W	0.00458	0.01620	0.03336	0.01278	0.00068	0.00025	0.06787
WNW	0.00553	0.01502	0.01611	0.00883	0.00142	0.00037	0.04727
NW	0.00729	0.02031	0.01481	0.00726	0.00075	0.00021	0.05063
NNW	0.00448	0.01123	0.01258	0.00657	0.00021	0.00000	0.03507
Total	0.13802	0.39556	0.35402	0.10605	0.00524	0.00126	1.00015

Note: Total relative frequency of calms distributed = 0.0760.

Source: ECT, 1992.

Table 2.3.7-4. Annual and Seasonal Average Distribution of Atmospheric Stability Classes for Tampa, Florida (1982 through 1986)

Season	Occurrence (%) of Stability Class					
	Very Unstable	Moderately Unstable	Slightly Unstable	Neutral	Slightly Stable	Moderately Stable
Winter	0.0	3.8	12.2	42.6	16.7	24.6
Spring	0.8	10.7	17.3	29.6	15.8	25.7
Summer	3.5	17.2	17.4	17.9	15.8	28.2
Fall	0.6	9.3	16.1	26.6	18.3	29.0
Annual	1.2	10.3	15.8	29.1	16.7	26.9

Source: NWS, 1986.

43 percent of the time. Stable conditions are uniformly distributed throughout the year, occurring 41 to 47 percent of the time.

The mixing height defines the upper limit of the surface boundary layer, and thus, is an important factor in determining the atmosphere's dispersion characteristics. The annual and seasonal averaging morning and afternoon mixing heights for Tampa, as calculated by NWS, are presented in Table 2.3.7-5. The lowest mixing heights occur in the morning in the winter and the highest mixing heights occur in the afternoon in the spring.

Thunderstorms are the most common severe weather in the area, occurring on an average of 87 days each year at the NWS Tampa observation station. Thunderstorms occur most frequently from late spring to early autumn, but may occur at any time during the year.

Hurricanes and tornadoes are types of severe weather that may occur in the area, but the probability of a hurricane or tornado passing over the Polk Power Station site is small. The possibility of any tropical storm crossing the Tampa Bay area is less than 10 percent in any given year. The possibility of a hurricane-strength tropical storm (winds greater than 117 km per hour) crossing the area is approximately 6 percent in any given year. The possibility of a hurricane with winds greater than 200 km per hour crossing the area in any given year is approximately 1 percent. Tornadoes also are reported rarely in the area, with June being the month of highest occurrence.

Wind, temperature, and precipitation measurements were collected on the Polk Power Station site from April 1, 1991, to March 31, 1992. The annual and seasonal wind roses for the site are presented in Figures 2.3.7-3 and 2.3.7-4. The wind data are also summarized in Table 2.3.7-6 and 2.3.7-7. Comparing these wind roses with the Tampa NWS wind roses presented in Figures 2.3.7-1 and 2.3.7-2 demonstrates that using the Tampa meteorological database for dispersion modeling is appropriate. This approach is further supported by comparing the onsite temperature and

Table 2.3.7-5. Annual and Seasonal Average Mixing Heights for Tampa, Florida
(1982 through 1986)

Season	Mixing Height (meters)	
	Morning	Afternoon
Winter	464	1,041
Spring	562	1,500
Summer	760	1,428
Fall	565	1,305
Annual	588	1,320

Source: NWS, 1986.

WIND ROSE ANALYSIS FOR 04/01/91 TO 03/31/92

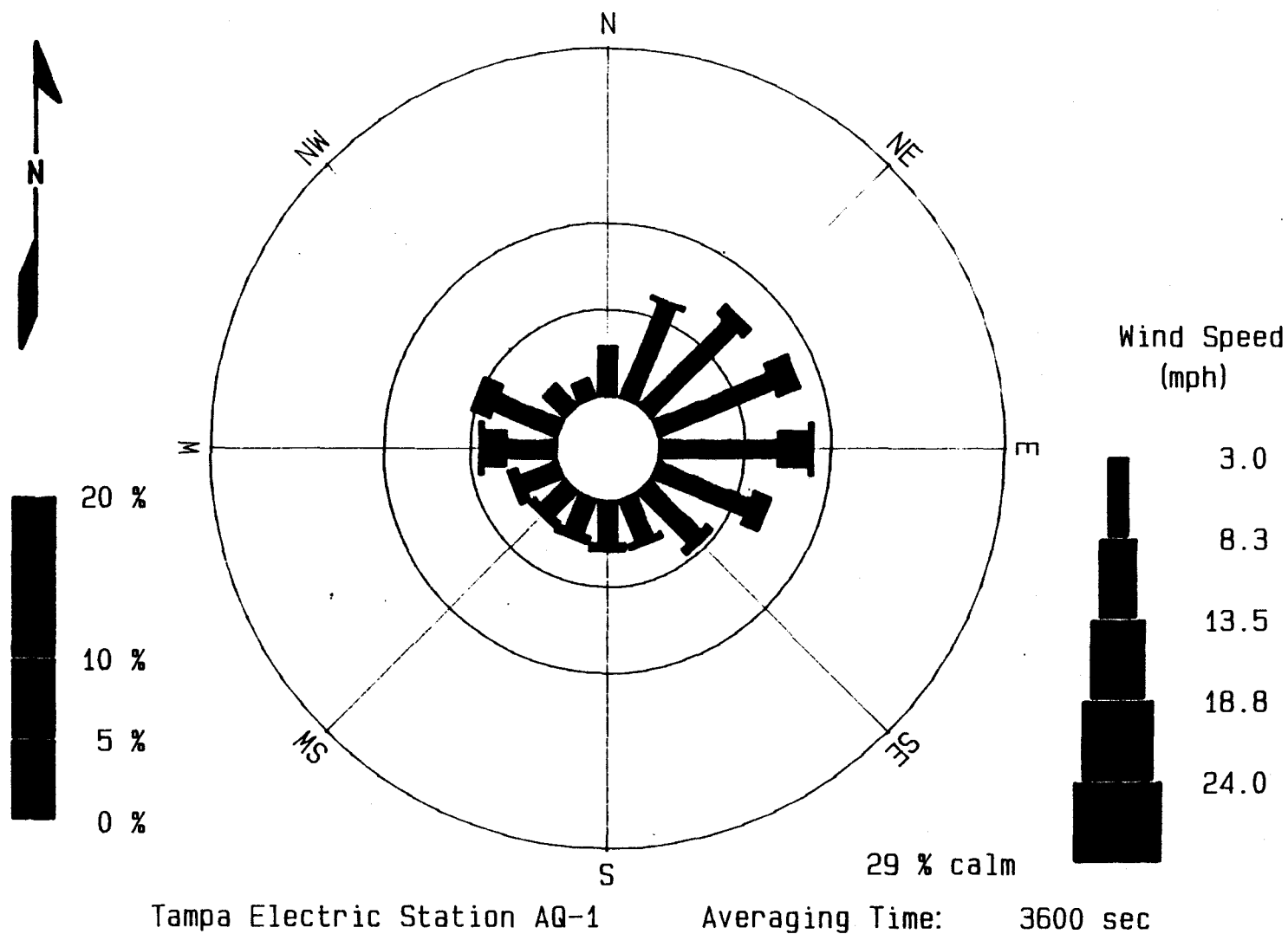


FIGURE 2.3.7-3.

ANNUAL WIND ROSE ANALYSIS FOR POLK POWER
STATION SITE (APRIL 1991 THROUGH MARCH 1992)

Source: ECT, 1992.

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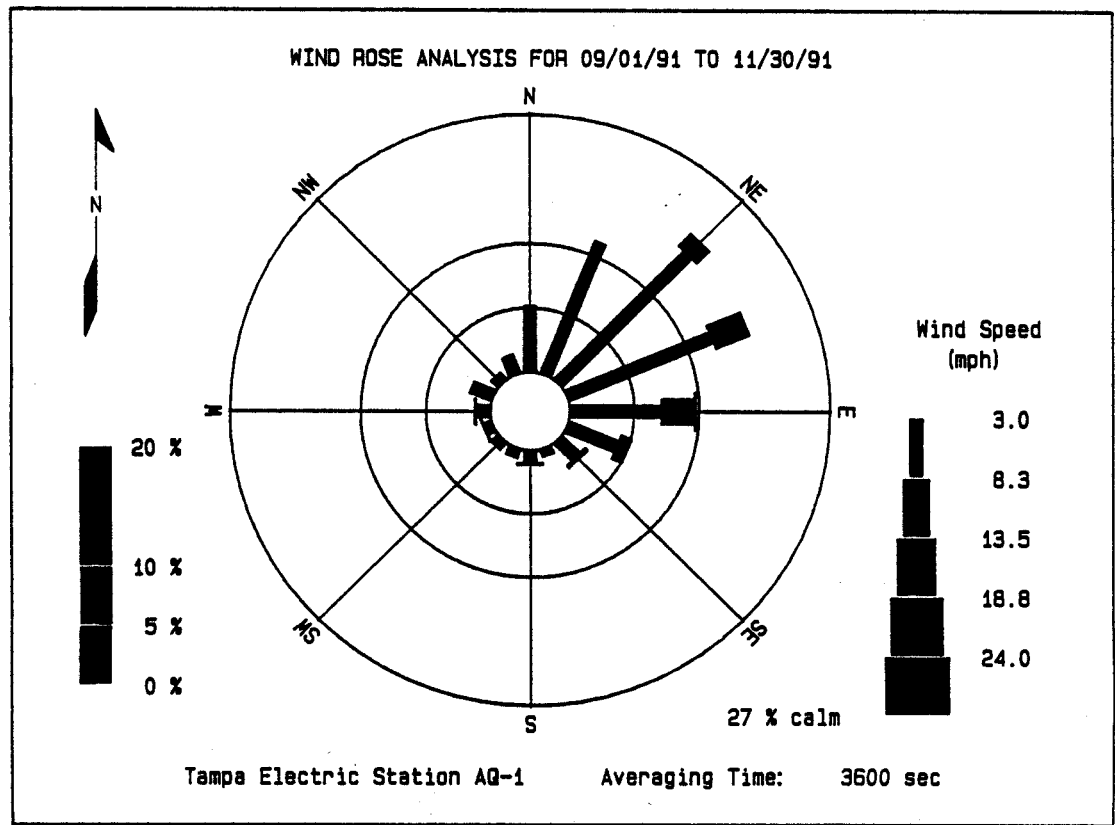
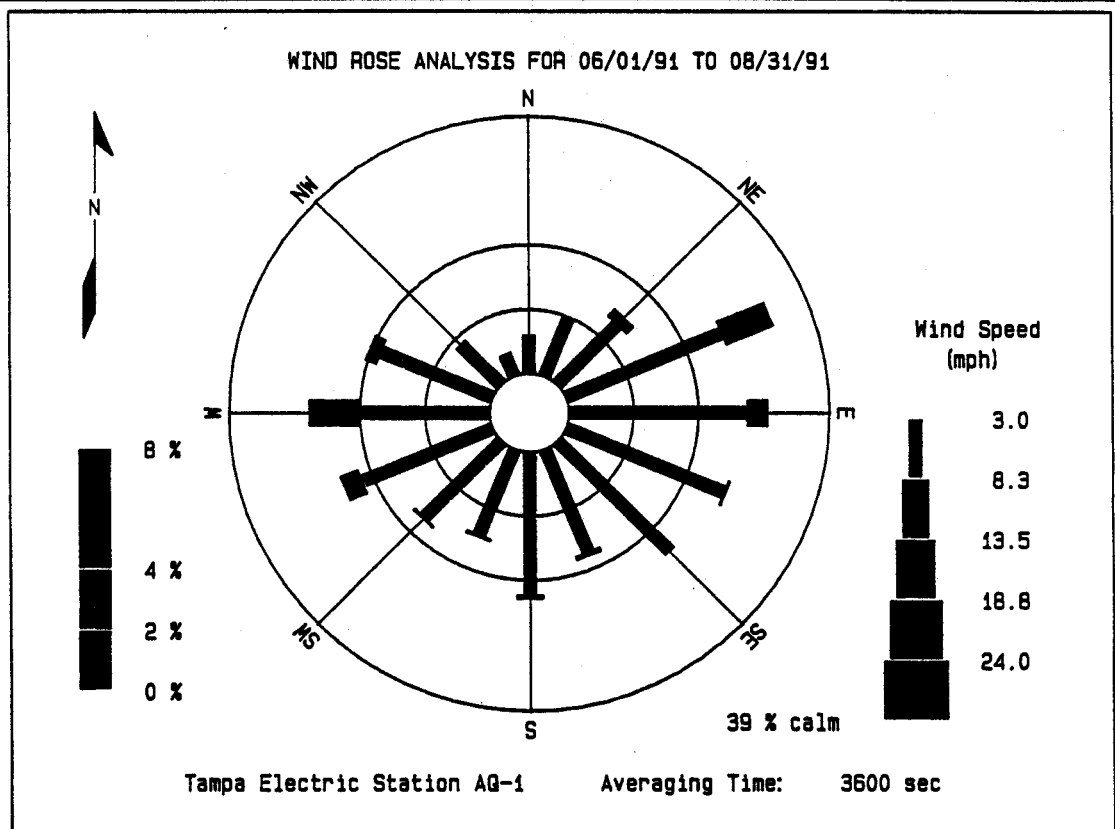


FIGURE 2.3.7-4.

SEASONAL WIND ROSE ANALYSIS FOR POLK POWER
STATION SITE (SUMMER AND FALL) (PAGE 1 OF 2)
Source: ECT, 1991.



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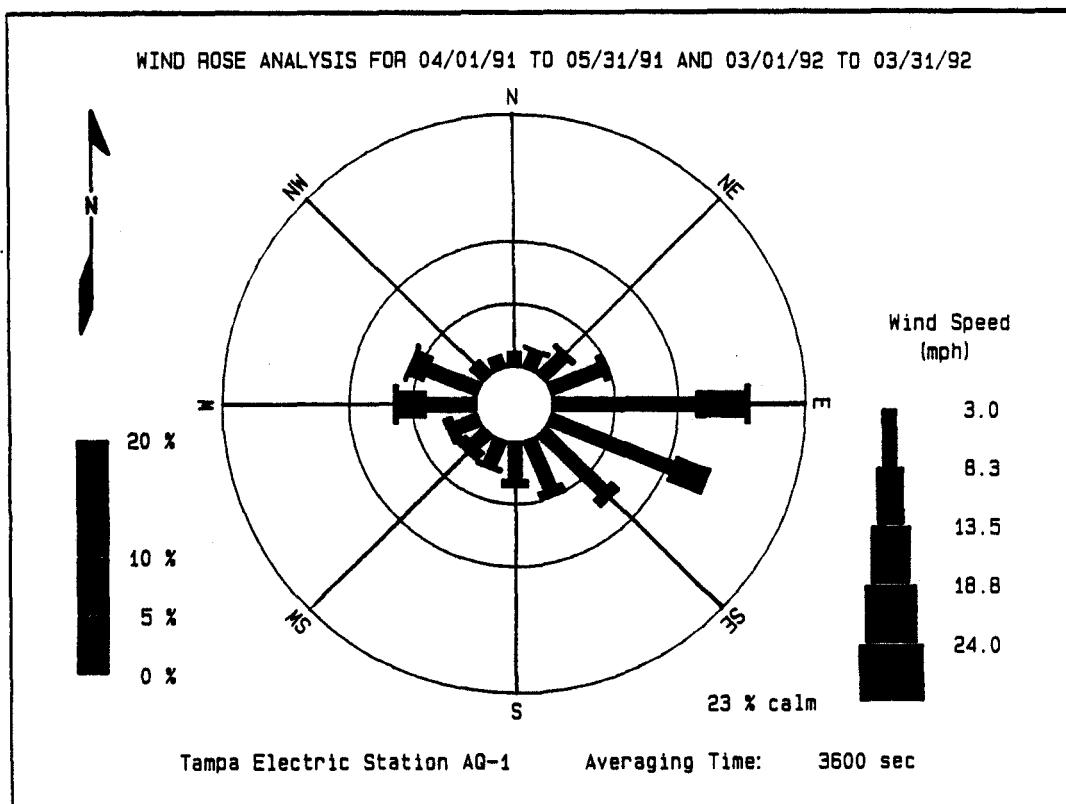
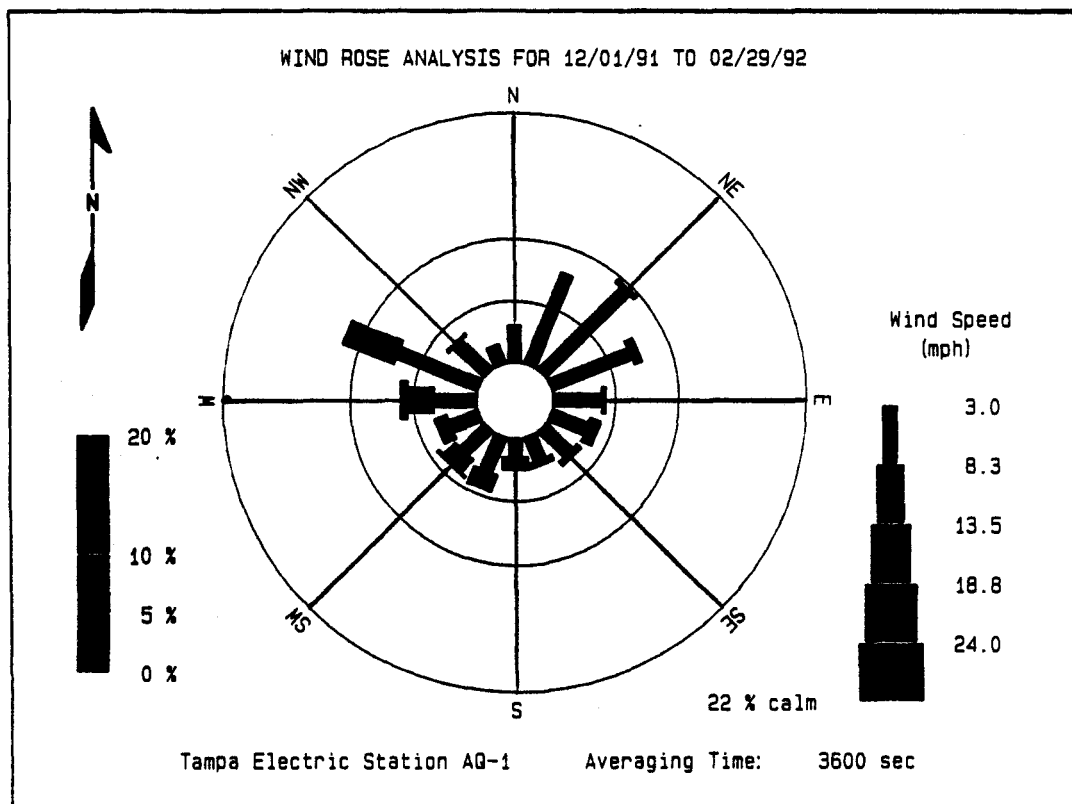


FIGURE 2.3.7-4.

SEASONAL WIND ROSE ANALYSIS FOR POLK POWER STATION SITE (WINTER AND SPRING) (PAGE 2 OF 2)

Source: ECT, 1991.



**POLK
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Table 2.3.7-6. Average Frequency Distribution of Wind Direction and Windspeed for the Polk Power Station Site (April 1991 through March 1992)

Direction	Frequency Distribution Speed (mph)				
	3.0 - 8.3	8.3 - 13.5	13.5 - 18.8	18.8 - 24.0	>24.0
N	2.8	0.0	0.0	0.0	0.0
NNE	5.9	0.2	0.0	0.0	0.0
NE	7.0	0.6	0.0	0.0	0.0
ENE	7.2	1.4	0.1	0.0	0.0
E	6.9	1.8	0.2	0.0	0.0
ESE	5.8	1.1	0.0	0.0	0.0
SE	4.0	0.4	0.0	0.0	0.0
SSE	2.5	0.3	0.0	0.0	0.0
S	2.4	0.4	0.0	0.0	0.0
SSW	2.0	0.4	0.0	0.0	0.0
SW	1.9	0.4	0.1	0.0	0.0
WSW	2.3	0.6	0.0	0.0	0.0
W	2.9	1.3	0.2	0.0	0.0
WNW	3.9	1.1	0.0	0.0	0.0
NW	1.8	0.0	0.0	0.0	0.0
NNW	1.2	0.0	0.0	0.0	0.0
Total	60.5	10.0	0.6	0.0	0.0

Note: Calms = 30.9 percent.

Source: ECT, 1992.

Table 2.3.7-7. Summary of Monthly Mean, Maximum, and Minimum 1-Hour Windspeeds; Monthly Mean Wind Direction; and Monthly Mean Sigma Theta for the Polk Power Station Site (April 1991 through March 1992)

Month	Speed		Date and Time	Direction Mean (° true)	Sigma Theta Mean (°)
	Mean (mph)	Maximum 1-hour (mph)			
April	5.6	17.0	04/23/91 14:00	150	17.3*
May	5.6	16.3	05/22/91 08:00	126	18.1
June	4.2	12.3	06/04/91 13:00	160	23.7
July	3.8	15.3	07/24/91 14:00	182	13.8†
August	3.6	11.5	08/23/91 16:00	168	23.6
September	4.2	11.1	09/18/91 14:00	97	20.3
October	4.8	13.5	10/25/91 11:00	98	17.2
November	4.9	15.9	11/29/91 12:00	115	16.2
December	4.5	17.2	12/20/91 13:00	127	16.4
January	5.0	15.7	01/23/92 13:00	166	16.5
February	5.4	16.3	02/26/92 15:00	171	16.3**
March	5.3	17.0	03/19/92 14:00	191	18.0

* Data capture was 58.8 percent.

† Data capture was 62.6 percent.

** Data capture was 62.5 percent.

Source: ECT, 1992.

precipitation data (Tables 2.3.7-8 and 2.3.7-9, respectively) with the Tampa and Bartow data presented previously. The onsite temperature data are presented graphically in Figure 2.3.7-5.

2.3.7.2 Ambient Air Quality

The area which includes the Polk Power Station site meets all state and federal ambient air quality standards (AAQS), as presented in Table 2.3.7-10. As a result, FDER has classified the area as attainment for all criteria pollutants, in accordance with Section 17-2.420, F.A.C.

Ambient air monitoring data are available with which to characterize the existing conditions in the vicinity of the site. FDER collected ambient total suspended particulate (TSP) data during 1989, 1990, and 1991 at several locations in the vicinity.

These locations were:

1. Auburndale, approximately 43 km north, northeast of the site;
2. Nichols, approximately 20 km north of the site; and
3. Bartow Municipal Airport, approximately 25 km northeast of the site.

The monitoring results are summarized in Table 2.3.7-11. In all cases, the measured concentrations are well below TSP standards.

SO₂ concentrations have been measured by FDER at Nichols and in Mulberry, approximately 20 km north of the Polk Power Station. FDER data from 1989, 1990, and 1991 show that existing SO₂ concentrations in the area are well below AAQS (Table 2.3.7-12).

Ambient data for NO_x, CO, ozone (O₃), and lead have been collected by FDER only in the Tampa and Sarasota metropolitan areas and would not be representative of southwest Polk County. However, given the rural location of the site, existing concentrations of these pollutants, which are usually associated more closely with urban environments, should be well below the applicable standards.

Table 2.3.7-8. Summary of Monthly Mean, Maximum, and Minimum 1-Hour Temperatures (°C) for the Polk Power Station Site (April 1991 through March 1992)

Month	Mean	Maximum 1-hour	Date and Time	Minimum 1-Hour	Date and Time
April	22.8	32.4	04/29/91 15:00	10.1	04/02/91 04:00
May	25.2	32.8	05/16/91 13:00	19.3	05/31/91 04:00
June	25.7	34.3	06/28/91 15:00	17.4	06/11/91 05:00
July	25.9	33.6	07/07/91 15:00	21.5	07/12/91 02:00
August	26.5	33.4	08/17/91 14:00	21.1	08/30/91 17:00
September	26.2	34.2	09/06/91 16:00	15.7	09/27/91 05:00
October	22.9	31.4	10/05/91 13:00	8.9	10/17/91 06:00
November	17.8	28.5	11/30/91 15:00	3.1	11/26/91 00:00
December	17.5	29.2	12/02/91 15:00	3.4	12/05/91 06:00
January	14.5	27.4	01/29/92 14:00	0.1	01/17/92 06:00
February	17.0	29.0	02/17/92 14:00	3.8	02/02/92 03:00
March	18.0	28.9	03/09/92 16:00	5.5	03/12/92 01:00

Source: ECT, 1992.

Table 2.3.7-9. Summary of Monthly Precipitation, Hourly Averages (inches) at AQ-1 for the Polk Power Station Site (April 1991 through March 1992)

Date	Amount	Monthly Total
04/01/91	0.01	
04/06/91	1.84	
04/07/91	0.29	
04/08/91	0.01	
04/17/91	0.18	
04/18/91	0.57	
04/19/91	0.01	
04/20/91	0.62	
04/23/91	0.05	
04/25/91	0.66	
04/91 total		4.24
05/07/91	0.13	
05/09/91	0.16	
05/13/91	0.12	
05/14/91	0.05	
05/16/91	0.12	
05/17/91	0.01	
05/18/91	0.03	
05/19/91	0.13	
05/20/91	0.31	
05/21/91	0.02	
05/22/91	0.80	
05/23/91	0.18	
05/24/91	0.85	
05/26/91	2.04	
05/27/91	0.06	
05/28/91	0.01	
05/30/91	0.35	
05/91 total		5.35
06/05/91	2.03	
06/06/91	0.01	
06/17/91	0.55	
06/18/91	0.03	
06/19/91	0.02	
06/20/91	0.75	
06/21/91	0.01	
06/22/91	0.57	
06/23/91	0.14	

Table 2.3.7-9. Summary of Monthly Precipitation, Hourly Averages (inches) at AQ-1 for the Polk Power Station Site (April 1991 through March 1992)
(Continued, Page 2 of 4)

Date	Amount	Monthly Total
06/24/91	0.02	
06/25/91	0.60	
06/26/91	0.01	
06/29/91	0.52	
06/30/91	0.61	
06/91 total		5.87
07/01/91	0.87	
07/02/91	0.34	
07/03/91	2.01	
07/04/91	0.01	
07/05/91	0.16	
07/06/91	0.17	
07/07/91	1.52	
07/09/91	0.47	
07/24/91	0.11	
07/25/91	0.03	
07/26/91	0.84	
07/28/91	0.24	
07/29/91	0.01	
07/30/91	0.28	
07/31/91	0.67	
07/91 total		7.73
08/01/91	0.12	
08/02/91	0.02	
08/06/91	0.01	
08/07/91	0.18	
08/09/91	0.94	
08/15/91	0.01	
08/16/91	0.01	
08/17/91	0.01	
08/18/91	0.11	
08/19/91	0.08	
08/20/91	0.19	
08/21/91	0.37	
08/23/91	0.05	
08/24/91	1.89	
08/27/91	0.08	

Table 2.3.7-9. Summary of Monthly Precipitation, Hourly Averages (inches) at AQ-1 for the Polk Power Station Site (April 1991 through March 1992)
(Continued, Page 3 of 4)

Date	Amount	Monthly Total
08/28/91	0.03	
08/30/91	1.20	
08/31/91	0.01	
08/91 total		5.31
09/03/91	0.07	
09/06/91	0.43	
09/07/91	0.48	
09/08/91	0.76	
09/24/91	0.07	
09/25/91	0.35	
09/26/91	0.34	
09/29/91	0.04	
09/30/91	0.01	
09/91 total		2.55
10/01/91	0.08	
10/02/91	0.22	
10/04/91	0.01	
10/05/91	0.09	
10/06/91	0.17	
10/07/91	0.01	
10/10/91	0.01	
10/23/91	0.02	
10/25/91	0.08	
10/30/91	0.01	
10/91 total		0.70
11/03/91	0.02	
11/09/91	0.04	
11/20/91	0.05	
11/91 total		0.11
12/02/91	0.24	
12/03/91	0.19	
12/04/91	0.29	
12/24/91	0.01	
12/27/91	0.03	
12/91 total		0.76
01/01/92	0.06	
01/09/92	0.01	

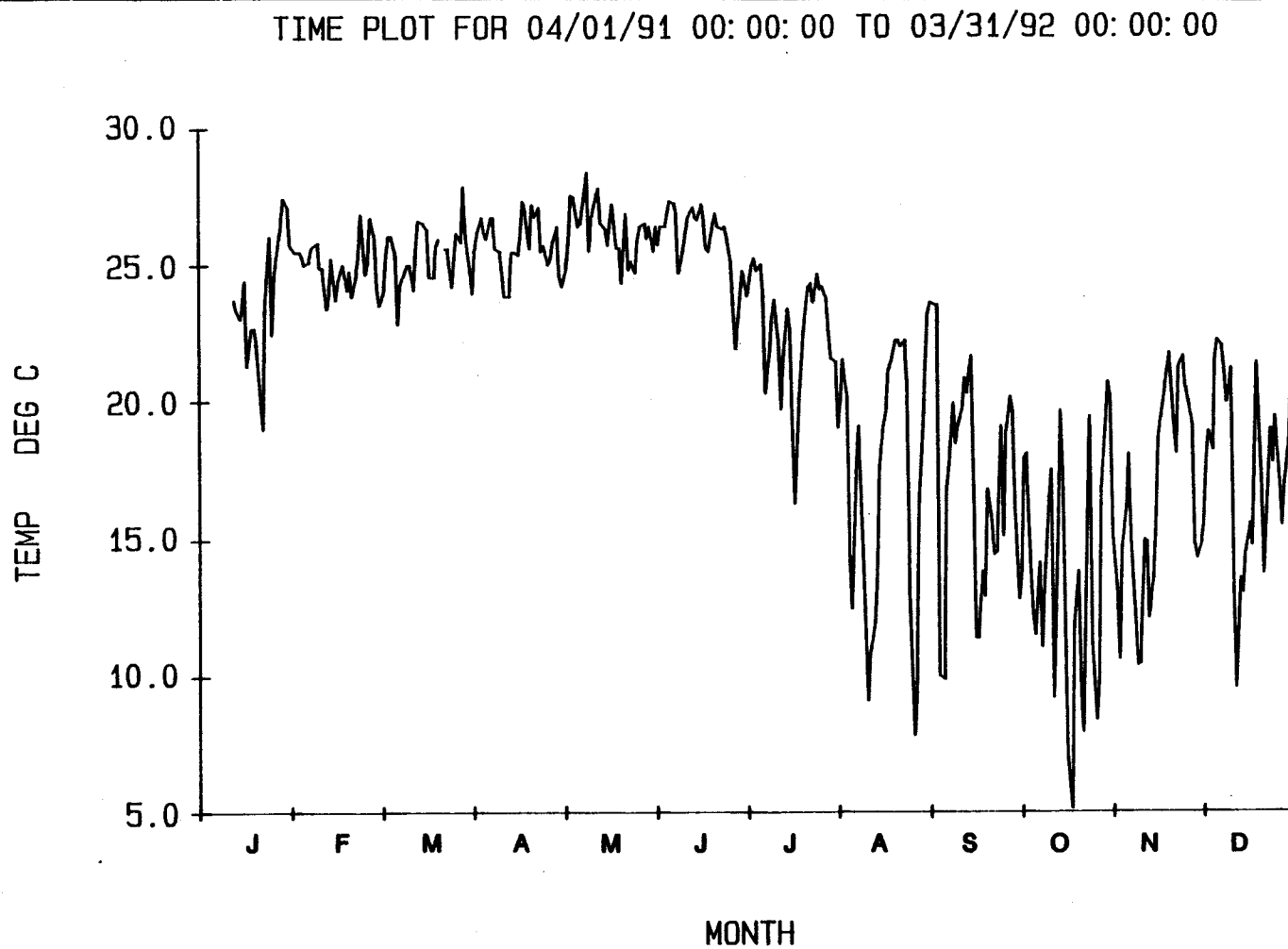
Table 2.3.7-9. Summary of Monthly Precipitation, Hourly Averages (inches) at AQ-1 for the Polk Power Station Site (April 1991 through March 1992) (Continued, Page 4 of 4)

Date	Amount	Monthly Total
01/92 total		0.07*
02/26/92	0.02	
02/27/92	0.14	
02/92 total		0.16†
03/01/92	0.07	
03/02/92	0.06	
03/03/92	0.04	
03/04/92	0.15	
03/05/92	0.01	
03/08/92	0.05	
03/10/92	0.09	
03/11/92	0.01	
03/12/92	0.12	
03/13/92	0.06	
03/16/92	0.01	
03/17/92	0.05	
03/21/92	0.04	
03/22/92	0.46	
03/23/92	0.28	
03/30/92	0.27	
03/31/92	0.02	
03/92 total		1.79
Annual total		34.48

* Data capture was 61.3 percent.

† Data capture was 61.6 percent.

Source: ECT, 1992.



Tampa Electric Station AQ-1

Averaging Time: 24 Hour

FIGURE 2.3.7-5.

DAILY TEMPERATURES FOR THE POLK POWER STATION SITE

Source: ECT, 1991.



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Table 2.3.7-10. National and Florida AAQS

Pollutant	Averaging Time	National AAQS				Florida AAQS	
		Primary		Secondary			
		$\mu\text{g}/\text{m}^3$	ppb	$\mu\text{g}/\text{m}^3$	ppb	$\mu\text{g}/\text{m}^3$	ppb
PM ₁₀	Annual arithmetic mean	50	NA	50	NA	50	NA
	24-hour maximum*	150	NA	150	NA	150	NA
SO ₂	Annual arithmetic mean	80	30	NA	NA	60	20
	24-hour maximum*	365	140	NA	NA	260	100
	3-hour maximum*	NA	NA	1,300	500	1,300	500
NO ₂	Annual arithmetic mean	100	53	100	53	100	53
CO	8-hour maximum*	10,000	9,000	NA	NA	10,000	9,000
	1-hour maximum*	40,000	35,000	NA	NA	40,000	35,000
O ₃	1-hour maximum†	235	120	235	120	235	120
Lead	Calendar quarter arithmetic mean	1.5	NA	1.5	NA	1.5	NA

Note: $\mu\text{g}/\text{m}^3$ = micrograms per cubic meter.

ppb = parts per billion.

NO₂ = nitrogen dioxide.

NA = not applicable.

* Maximum concentration not to be exceeded more than once per year.

† The O₃ standard is attained when the expected number of days per calendar year with a maximum hourly average concentration above the standard is equal to or less than one.

Sources: 40 CFR 50.
Chapter 17-2.300, F.A.C.

Table 2.3.7-11. Summary of FDER TSP Monitoring Near the Polk Power Station Site

Location	Site Identification Number	Year	24-Hour Measurement		Annual Geometric Mean ($\mu\text{g}/\text{m}^3$)
			Highest ($\mu\text{g}/\text{m}^3$)	Second-highest ($\mu\text{g}/\text{m}^3$)	
Auburndale	0120-001-F01	1989	98	90	38
		1990	169	68	44
		1991*	60	60	42
Bartow	0180-003-F01	1989†	49	46	28
		1990	78	66	29
		1991**	68	64	34
Nichols	3680-010-F02	1989	91	71	38
		1990	96	76	42
		1991**	65	63	36

Note: The 24-hour ambient TSP standard was $150 \mu\text{g}/\text{m}^3$, not to be exceeded more than once per year; the annual ambient TSP standard was $60 \mu\text{g}/\text{m}^3$, annual geometric mean. Ambient TSP standards have been replaced with standards for PM_{10} .

*January through April.

†October through December.

**January through July.

Source: FDER, 1989, 1990, 1991.

Table 2.3.7-12. Summary of FDER SO₂ Monitoring Near the Polk Power Station Site

Lactation	Site Identification Number	Year	Highest 3-Hour Average ($\mu\text{g}/\text{m}^3$)	Highest 24-Hour Average ($\mu\text{g}/\text{m}^3$)	Annual Average ($\mu\text{g}/\text{m}^3$)
Nichols	3680-010-F02	1989	356	63	10
		1990	341	66	9
		1991	179	67	10
Mulberry	2860-006-F02	1991*	203	42	12

Note: The 3-hour ambient standard is 1,300 $\mu\text{g}/\text{m}^3$, not to be exceeded more than once per year.

The 24-hour ambient standard is 260 $\mu\text{g}/\text{m}^3$, not to be exceeded more than once per year.

The annual ambient standard is 60 $\mu\text{g}/\text{m}^3$, arithmetic mean.

*February through December.

Source: FDER, 1989, 1990, 1991.

In addition to FDER data collected in the site vicinity, an FDER-approved onsite ambient air monitoring program was operated by Tampa Electric Company from April 1, 1991, through March 31, 1992. The monitoring network consisted of two stations. Ambient levels of SO₂ and O₃ were monitored continuously at one location. PM₁₀ was monitored at two locations, with collocated samplers at one location. The PM₁₀ samples were collected on a 6-day schedule, concurrent with the national sampling schedule.

A summary of the onsite ambient monitoring SO₂ data is presented in Table 2.3.7-13. The 3- and 24-hour averages for the monitoring year are presented in Figures 2.3.7-6 and 2.3.7-7, respectively. The onsite measured ambient SO₂ levels are well below all applicable AAQS.

A summary of the onsite ambient monitoring O₃ data is presented in Table 2.3.7-14. The 1-hour averages for the monitoring year are presented in Figure 2.3.7-8. The onsite measured ambient O₃ levels are well below all applicable AAQS.

A summary of the onsite ambient monitoring PM₁₀ data is presented in Table 2.3.7-15. These levels are well below all applicable AAQS.

The annual report and data collected as a result of the onsite ambient air monitoring program are provided in Appendix 11.11.

2.3.7.3 Measurement Programs

Both the FEPPSA and the rules pertaining to prevention of significant deterioration (PSD) review identify the potential need for air quality data with which to characterize existing site conditions. The PSD review process, especially, imposes certain specific preconstruction monitoring requirements. EPA has provided guidance to determine the need for such monitoring (EPA, 1987). This guidance also includes procedures to design a monitoring program if one is required.

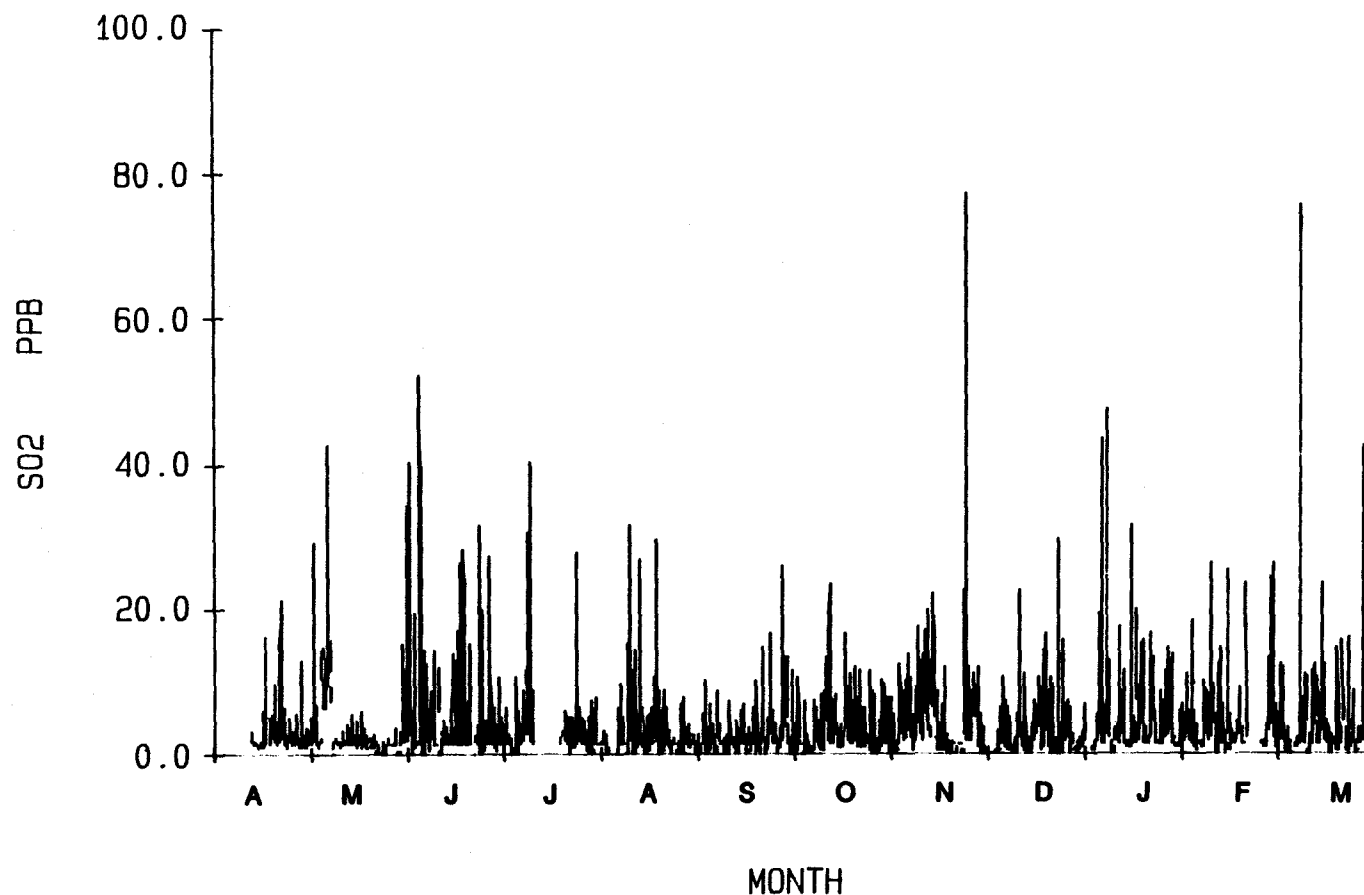
Table 2.3.7-13. Summary of Monthly Mean, Maximum 3-Hour, and 24-Hour SO₂ Concentrations (ppb) at AQ-1 for the Polk Power Station Site (April 1991 through March 1992)

Month	Mean	Maximum 3-Hour*	Ending Date and Time	Maximum 24-Hour*	Ending Date and Time
April	2	21	04/21/91 17:00	9	04/22/91 11:00
May	3	43	05/06/91 17:00	16	05/07/91 14:00
June	4	53	06/04/91 18:00	11	06/04/91 21:00
July	3	40	07/09/91 11:00	12	07/09/91 10:00
August	2	31	08/09/91 13:00	10	08/09/91 17:00
September	2	26	09/26/91 15:00	9	09/27/91 12:00
October	3	23	10/11/91 17:00	7	10/17/91 05:00
November	5	78	11/23/91 17:00	17	11/24/91 04:00
December	3	29	12/22/91 20:00	10	12/19/91 19:00
January	4	48	01/06/92 15:00	15	01/07/92 07:00
February	4	26	02/28/92 19:00	11	02/27/92 17:00
March	4	76	03/07/92 23:00	16	03/08/92 20:00

*Based on a rolling average.

Source: ECT, 1992.

TIME PLOT FOR 04/01/91 00: 00: 00 TO 03/31/92 23: 00: 00

3-HOUR STANDARD = 500 ppb ($1,300 \mu\text{g}/\text{m}^3$)

Tampa Electric Station AQ-1

Averaging Time: 3 Hour

FIGURE 2.3.7-6.

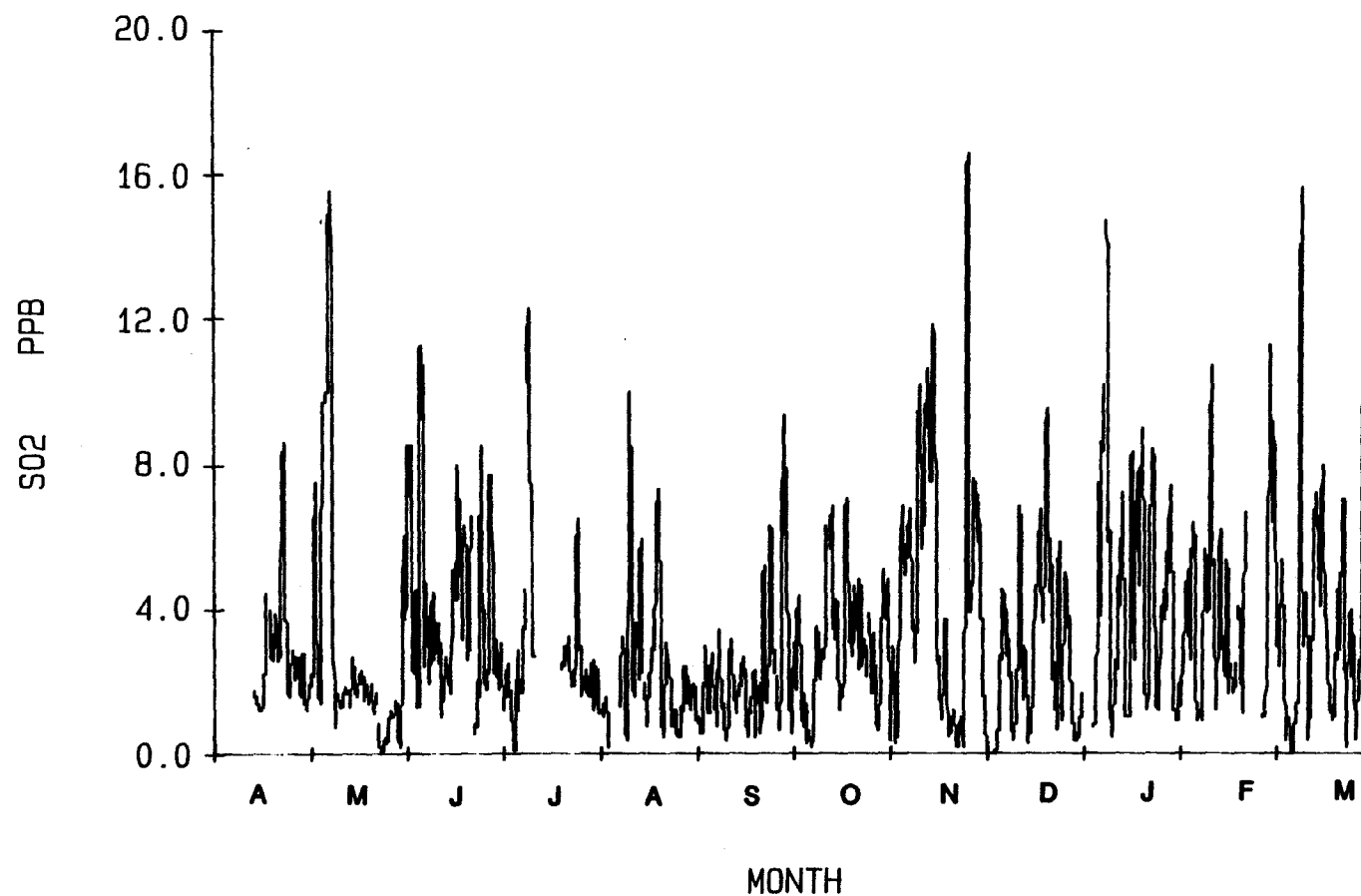
MEASURED AMBIENT 3-HOUR SO_2 AVERAGES AT
THE POLK POWER STATION SITE

Source: ECT, 1992.



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TIME PLOT FOR 04/01/91 00:00:00 TO 03/31/92 23:00:00

24-HOUR STANDARD = 100 ppb ($260 \mu\text{g}/\text{m}^3$)

Tampa Electric Station AQ-1

Averaging Time: 24 Hour

FIGURE 2.3.7-7.

MEASURED AMBIENT 24-HOUR SO₂ AVERAGES AT
THE POLK POWER STATION SITE

Source: ECT, 1992.

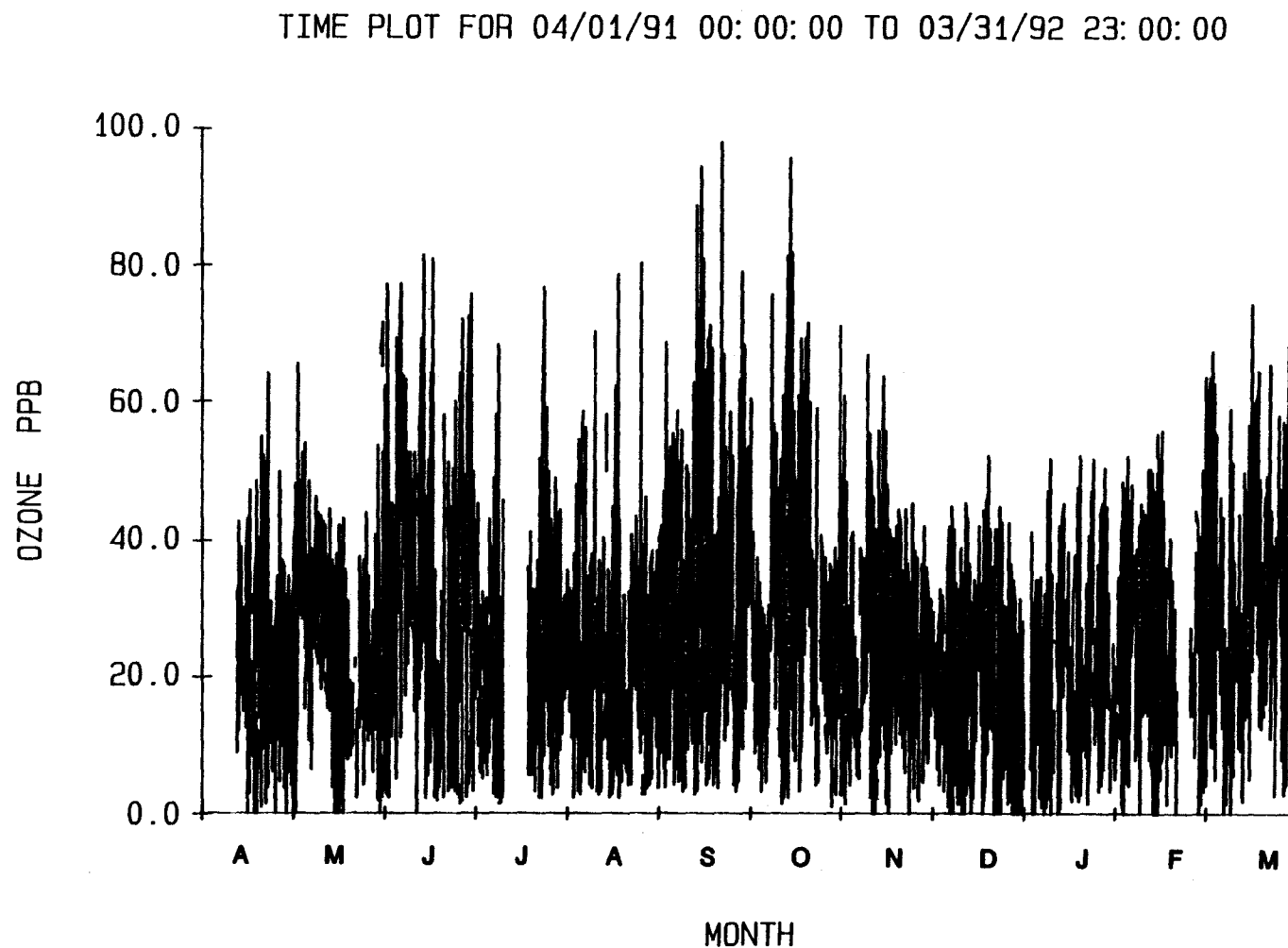


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Table 2.3.7-14. Summary of Monthly Mean and 1-Hour Maximum O₃ Concentrations (ppb) at AQ-1 for the Polk Power Station Site (April 1991 through March 1992)

Month	Mean	Maximum 1-Hour	Date and Time
April	24	69	04/02/91 19:00
May	25	72	05/30/91 14:00
June	35	82	06/13/91 16:00
July	24	77	07/23/91 16:00
August	23	81	08/24/91 17:00
September	34	99	09/20/91 14:00
October	31	96	10/13/91 13:00
November	24	67	11/08/91 13:00
December	18	53	12/18/91 15:00
January	21	53	01/18/92 14:00
February	25	64	02/29/92 15:00
March	33	75	03/28/92 16:00

Source: ECT, 1992.



1-HOUR STANDARD = 120 ppb ($235 \mu\text{g}/\text{m}^3$)

Tampa Electric Station AQ-1

Averaging Time: 1 Hour

FIGURE 2.3.7-8.

MEASURED AMBIENT 1-HOUR O_3 AVERAGES AT
THE POLK POWER STATION SITE

Source: ECT, 1992.



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Table 2.3.7-15. Summary of PM₁₀ Concentrations (μg/m³) at AQ-1 and AQ-2 for the Polk Power Station Site (April 1991 through March 1992)

Date	PM ₁₀ Concentration by Site		
	AQ-1	AQ-2C	AQ-2D
03/31/91	23.3	28.3	26.9
04/06/91	17.6	*	*
04/12/91	18.9	18.1	18.7
04/18/91	14.3	*	*
04/24/91	19.7	*	*
04/30/91	18.2	*	*
05/06/91	20.5	17.3	19.8
05/12/91	22.5	26.4	22.4
05/18/91	15.4	17.6	16.5
05/24/91	13.8	14.6	14.1
05/30/91	29.3	30.0	33.5
06/05/91	20.9	22.7	21.2
06/11/91	16.4	16.3	15.8
06/17/91	13.3	18.2	12.9
06/23/91	20.6	20.4	21.1
06/29/91	48.3	17.1	29.6
07/05/92	23.4	43.5	†
07/11/91	†	29.6	12.0
07/17/91	45.4	16.7	23.6
07/23/91	29.9	18.8	29.9
07/29/91	42.4	46.9	†
08/04/91	14.6	15.1	13.8
08/10/91	12.3	11.0	†
08/16/91	25.1	27.0	26.5
08/22/91	16.2	9.4	9.4
08/28/91	9.9	8.4	†
09/03/91	14.0	14.5	14.9
09/09/91	10.9	10.5	10.1
09/15/91	16.6	16.8	16.7
09/21/91	16.2	16.4	14.0
09/27/91	25.1	25.0	30.8
10/03/91	26.9	22.5	†
10/09/91	26.3	†	†
10/15/91	23.5	20.0	19.5
10/21/91	10.8	14.4	13.3
10/27/91	11.6	12.1	10.5
11/02/91	14.6	12.6	12.1
11/08/91	45.1	42.7	43.9

Table 2.3.7-15. Summary of PM₁₀ Concentrations (μg/m³) at AQ-1 and AQ-2 for the Polk Power Station Site (April 1991 through March 1992)
(Continued, Page 2 of 2)

Date	PM ₁₀ Concentration by Site		
	AQ-1	AQ-2C	AQ-2D
11/14/91	19.5	22.4	24.0
11/20/91	7.5	7.2	6.8
11/26/91	24.4	20.7	22.7
12/02/91	7.9	8.5	8.7
12/08/91	8.1	8.5	7.4
12/14/91	7.1	8.7	9.0
12/20/91	16.8	17.6	18.3
12/26/91	13.7	14.1	14.0
01/01/92	12.3	11.7	11.6
01/07/92	19.2	19.1	19.3
01/13/92	9.9	10.6	11.4
01/19/92	7.6	8.8	8.3
01/25/92	14.8	16.5	15.8
01/31/92	10.2	11.6	12.1
02/06/92	7.7	7.6	8.2
02/12/92	25.5	27.6	28.1
02/18/92	11.8	11.4	9.0
02/24/92	7.1	8.6	10.0
03/01/92	19.3	19.1	17.6
03/07/92	8.1	7.3	7.7
03/13/92	12.2	12.4	13.6
03/19/92	30.2	18.7	19.6
03/25/92	15.0	14.8	14.9
03/31/92	14.4	12.5	13.4
Highest	48.3	46.9**	43.9
Date	06/29/91	07/29/91	11/08/91
Second highest	45.4	43.5**	33.5
Date	07/17/91	07/05/91	05/30/91
Average	18.4	17.7	17.2

* Electrical problems.

† Invalid data.

** The data for AQ-2D were not valid on July 5 and 29, 1991.

Source: ECT, 1992.

Following the EPA guidance, a monitoring plan for PSD ambient monitoring at the Polk Power Station site, dated March 26, 1991 (ECT, 1991c), was prepared, submitted, and approved by FDER. The analysis described in the plan determined that preconstruction monitoring was required for SO₂, PM₁₀, and O₃. For all other pollutants subject to PSD review, either (1) the impacts of the proposed facility's emissions were predicted to be less than specified *de minimis* levels, (2) impacts due to existing sources' emissions would be less than *de minimis*, or (3) no acceptable ambient measurement method was available.

Based on the results of modeling analyses described in the monitoring plan, a two-station air quality monitoring network was implemented to satisfy the preconstruction requirements mandated by the PSD regulations. This monitoring approach was approved by FDER. Ambient levels of SO₂ and O₃ were monitored continuously at one location. PM₁₀ was monitored at two locations, with collocated samplers at one location. The PM₁₀ samples were collected on a 6-day schedule, concurrent with the national sampling schedule. A summary of the ambient monitoring network configuration is provided in Table 2.3.7-16. Station locations in Universal Transverse Mercator (UTM) coordinates are provided in this table. The station locations are shown in Figure 2.3.7-9. Table 2.3.7-17 summarizes the rationale behind the selection of each location.

Basic meteorological information was collected at one monitoring location (AQ-1). The parameters measured were windspeed and wind direction at 10 m, and ambient temperature and precipitation (collected at approximately 2 m).

A list of the sampling equipment used to monitor each parameter is presented in Table 2.3.7-18. Ambient concentrations of SO₂ and O₃ were measured continuously using monitoring equipment manufactured by Thermo Environmental Instruments, Inc. Thermo Environmental calibration systems for the gas analyzers were used. The air sampling probe heights were approximately 4 m aboveground. The PM₁₀ samplers chosen for this monitoring network were manufactured by Sierra-Andersen,

Table 2.3.7-16. Polk Power Station Site Ambient Air Monitoring Station Configurations and Locations

Station Number	SO ₂	O ₃	PM ₁₀	PM ₁₀ Col- located	Wind Velocity	Ambient Temper- ature	Precipi- tation	UTM Location	
								East	North
AQ-1	✓	✓	✓		✓	✓	✓	400.1	3,066.2
AQ-2			✓	✓				401.1	3,067.4

Note: ✓ = this parameter measured at this station.

Source: ECT, 1991a.

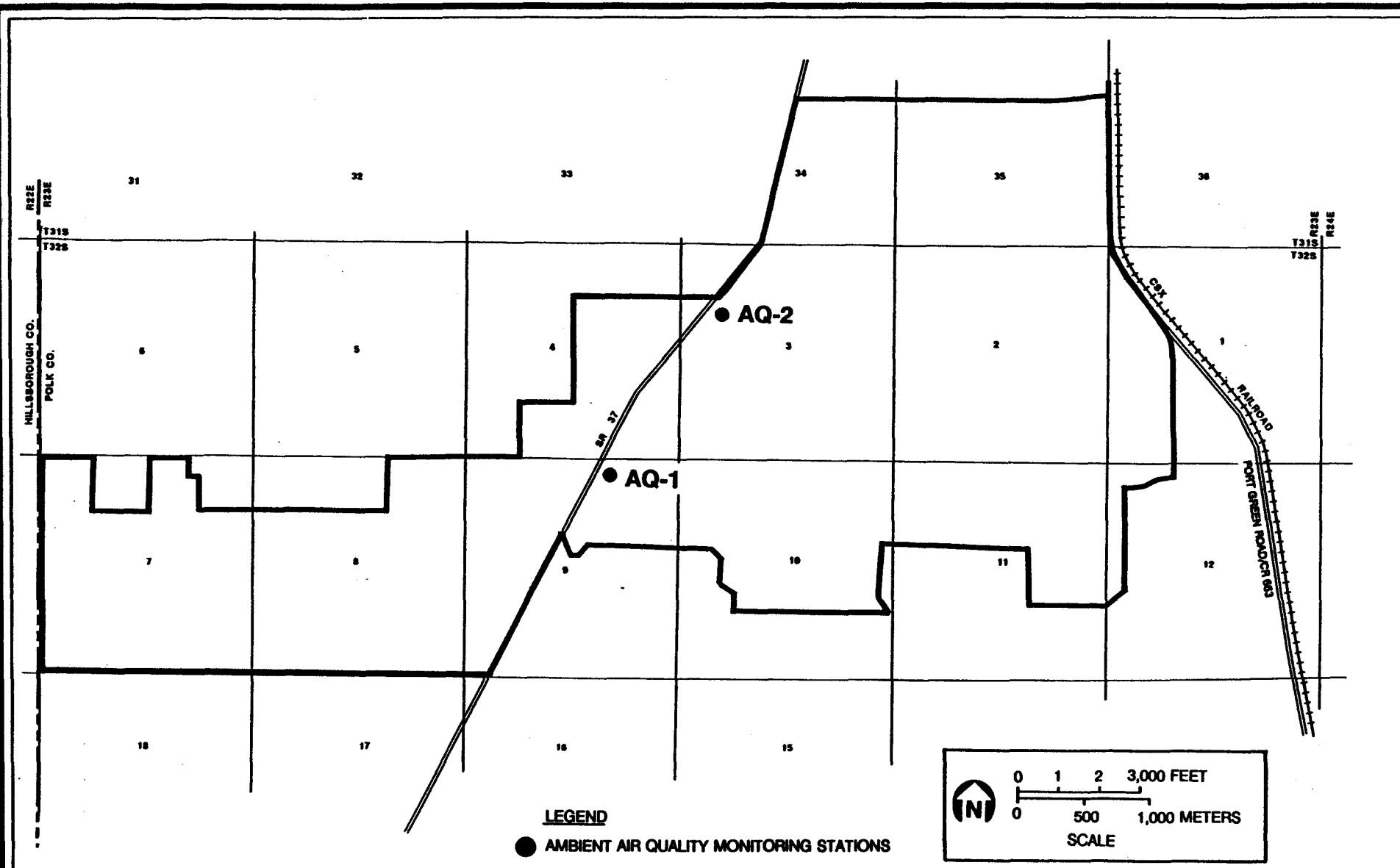


FIGURE 2.3.7-9.

AMBIENT AIR MONITORING STATIONS

Source: ECT, 1991a.



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Table 2.3.7-17. Rationale for Monitoring Locations

Station Number	Rationale
AQ-1	Projected high SO ₂ impacts due to proposed facilities Hypothetical maximum combined impacts (proposed plus existing) Projected maximum particulate matter impacts (proposed facilities)
AQ-2	Projected high particulate matter impacts (proposed facilities) Particulate matter from automotive traffic Windblown dust from exposed areas and phosphate mining operations

Source: ECT, 1991a.

Table 2.3.7-18. Monitoring Equipment List for Polk Power Station Ambient Air Monitoring Program

Model Description	Manufacturer	Model Number
SO ₂ analyzer	Thermo Environmental, Inc.	43A
O ₃ analyzer	Thermo Environmental, Inc.	49
PM ₁₀ samplers	Sierra-Andersen, Inc.	SAUV-15H
Meteorological equipment	R.M. Young and Climatronics	Various
Data acquisition system	Odessa Engineering	DSM-3260
Gas calibration system	Thermo Environmental, Inc.	146
Three-pen chart recorder	Esterline-Angus	MS-413C
Two-pen chart recorder	Esterline-Angus	MS-412C

Source: ECT, 1991a.

Inc. Meteorological instrumentation (manufactured by R.M. Young Company and Climatronics Corporation) meeting PSD measurement specifications was used. The outputs of the continuous monitoring devices (i.e., SO₂ and O₃ monitors) and the meteorological sensors were connected directly to the data acquisition system inside the adjacent air quality monitoring shelter. The data acquisition system chosen for the project was manufactured by Odessa Engineering.

The equipment shelter chosen for the project was designed with no windows and sufficient insulation to maintain the conditioned environment required for proper operation of the monitoring equipment. The shelter was equipped with electric heaters and an air conditioner to maintain a temperature between 20°C and 30°C.

Continuous monitoring data, including meteorological parameters, were recorded concurrently using the DSM-3260 data acquisition system and analog strip chart recorders. Ten percent of the strip chart data were digitized for comparison to the data recorded by the DSM-3260. The data stored in the DSM-3260 were polled via a PC-modem system, downloaded onto floppy disk, and edited for completeness and validity as part of the data processing and reporting function.

The operation of the network was consistent with detailed standard operating procedures (SOPs) (ECT, 1991d). The SOP manual provided detailed descriptions of all monitoring equipment, specific procedures for their normal operation, quality assurance/quality control (QA/QC) procedures, and procedures for performance auditing.

The QA program was designed to conform with the PSD regulations as set forth in 40 CFR 58, Appendix B, QA Requirements for PSD Air Monitoring, and with FDER's State-Wide QA Air Program Plan. The five important elements that provided the basis for the QA program were:

1. Equipment calibration--calibration procedures and complete recordkeeping;
2. Independent audit program--independent performance and system audits as required and/or needed;
3. Data handling--field assessment and chain-of-custody procedures for transfer of samples and records between individuals and from the sampling site to the Project Data Manager;
4. Data reduction--editing and digitizing of data tapes and strip charts as well as data interpretation; and
5. Preparation and filing of data report--proper report preparation, thorough documentation, and retention of records.

QA procedures were implemented in accordance with the FDER approved SOP Manual and QA Plan. The QA Plan addressed QA requirements specified by Appendix B, CFR Part 58 and the FDER State-Wide QA Air Program Plan. Major components of the QA program included:

- Daily automated zero, span, and precision checks for the O₃ and SO₂ continuous monitors;
- Quarterly multipoint calibrations of the O₃, SO₂, and PM₁₀ analyzers, strip chart recorders, and data acquisition system;
- Quarterly multipoint audits of the O₃, SO₂, and PM₁₀ analyzers;
- Audit of the O₃, SO₂, and PM₁₀ analyzers using EPA-furnished audit equipment (National Performance Audit Program);
- Monthly one-point flow rate checks of the PM₁₀ samplers;
- Biannual calibration of the meteorological sensors; and
- Systems audit conducted by FDER personnel.

Four quarterly performance audits were conducted, the first by ECT and the last three by FDER personnel. An additional performance audit, using EPA furnished test equipment in accordance with the National Performance Audit Program, was

performed by ECT. All audit results met the required accuracy criteria. A summary of the performance audits is shown on Table 2.3.7-19.

A systems audit was conducted by FDER personnel on August 13 and 14, 1991, at ECT's offices in Gainesville, Florida. FDER personnel also performed a systems audit of the PM_{10} filter processing procedures performed by PACE, Inc. on November 13, 1991, in Charlotte, North Carolina. Corrective action was taken to satisfactorily resolve all audit findings. FDER issued a final audit report on January 10, 1992, which stated: (a) an overall rating of satisfactory, (b) that all findings were properly addressed, and (c) that the audit was formally closed (FDER, 1992).

Table 2.3.7-19. Summary of Performance Audit Results

Audit Date	Agency	Pollutant	Audit Parameter	Audit Value (%)
05/21/91	ECT	O ₃	Mean deviation	-4.5
		SO ₂	Mean deviation	5.5
		PM ₁₀ - AQ1	Flow rate deviation	1.2
		PM ₁₀ - AQ2C	Flow rate deviation	0.8
		PM ₁₀ - AQ2D	Flow rate deviation	0.5
08/13/91	FDER	O ₃	Mean deviation	13.2
		SO ₂	Mean deviation	7.5
		PM ₁₀ - AQ1	Flow rate deviation	-1.0
		PM ₁₀ - AQ2C	Flow rate deviation	-1.0
		PM ₁₀ - AQ2D	Flow rate deviation	-0.6
12/03/91	FDER	O ₃	Mean deviation	1.0
		SO ₂	Mean deviation	4.1
		PM ₁₀ - AQ1	Flow rate deviation	0.5
		PM ₁₀ - AQ2C	Flow rate deviation	0.5
		PM ₁₀ - AQ2D	Flow rate deviation	2.8
01/16/92 (EPA equipment)	ECT	PM ₁₀ - AQ1	Flow rate deviation	-4.0
		PM ₁₀ - AQ2C	Flow rate deviation	-3.5
		PM ₁₀ - AQ2D	Flow rate deviation	-2.8
02/13/92 (EPA equipment)	ECT	O ₃	Mean deviation	4.2
		SO ₂	Mean deviation	-7.6
02/19/92	FDER	O ₃	Mean deviation	5.0
		SO ₂	Mean deviation	-1.1
		PM ₁₀ - AQ1	Flow rate deviation	0.3
		PM ₁₀ - AQ2C	Flow rate deviation	-0.7
		PM ₁₀ - AQ2D	Flow rate deviation	0.4

Source: ECT, 1992.

2.3.8 NOISE

Noise conditions in the Polk Power Station site area are described in terms of A-weighted decibels (dBA), using the following common descriptors: (1) equivalent sound level for 24-hour periods [$L_{eq}(24)$] and (2) day-night sound level (L_{dn}). The former may be considered a time weighted average, while the latter is weighted more heavily for noise during the night [Edison Electric Institute (EEI), 1984]. While there are no federal, state or local noise standards applicable to the site, existing conditions can be compared to EPA noise guidelines, which were developed to protect public health and welfare (EPA, 1974). These guidelines are summarized in Table 2.3.8-1.

The Department of Housing and Urban Development (HUD) has established a set of guidelines for noise levels in residential areas. These categories of acceptability have been defined: acceptable if the L_{dn} is less than 65 dBA, normally unacceptable if the L_{dn} is greater than 65 dBA and less than 75 dBA, and unacceptable if the L_{dn} is greater than 75 dBA (HUD, 1979). According to EPA studies, the majority of people complain when the L_{dn} exceeds 65 dBA (EPA, 1973).

To characterize the existing noise environment, a noise monitoring program was conducted for the Polk Power Station site during the period of June 8 through 12, 1991. The four monitoring locations are shown in Figure 2.3.8-1. The monitor locations were determined by the location of noise-sensitive receptors. In this case, the noise-sensitive receptors were identified as residential areas. Figure 2.3.8-1 shows the three major groups of residences in the vicinity of the site. The following table provides the approximate distances in feet between each group and the power block center.

<u>Residential Area</u>	<u>Power Block Center (ft)</u>	<u>Number of Residences</u>
1	22,250	53
2	10,125	45
3	8,250	1

Table 2.3.8-1. Summary of Noise Levels Identified as Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety

Effect	Level	Area
Hearing loss	$L_{eq}(24) = 70 \text{ dBA}^*$	All areas.
Outdoor activity interference and annoyance	$L_{dn} = 55 \text{ dbA}$	Outdoors in residential areas where people spend widely varying amounts of time and other places in which quiet is a basis for use.
	$L_{eq}(24) = 55 \text{ dBA}$	Outdoor areas where people spend limited amounts of time, such as school yards, playgrounds, etc.
Indoor activity interference and annoyance	$L_{dn} = 45 \text{ dBA}$	Indoor residential areas.
	$L_{eq}(24) = 45 \text{ dBA}$	Other indoor areas with human activities such as schools, etc.

*Based on annual averages of the daily level over a period of 40 years.

Source: EPA, 1974.

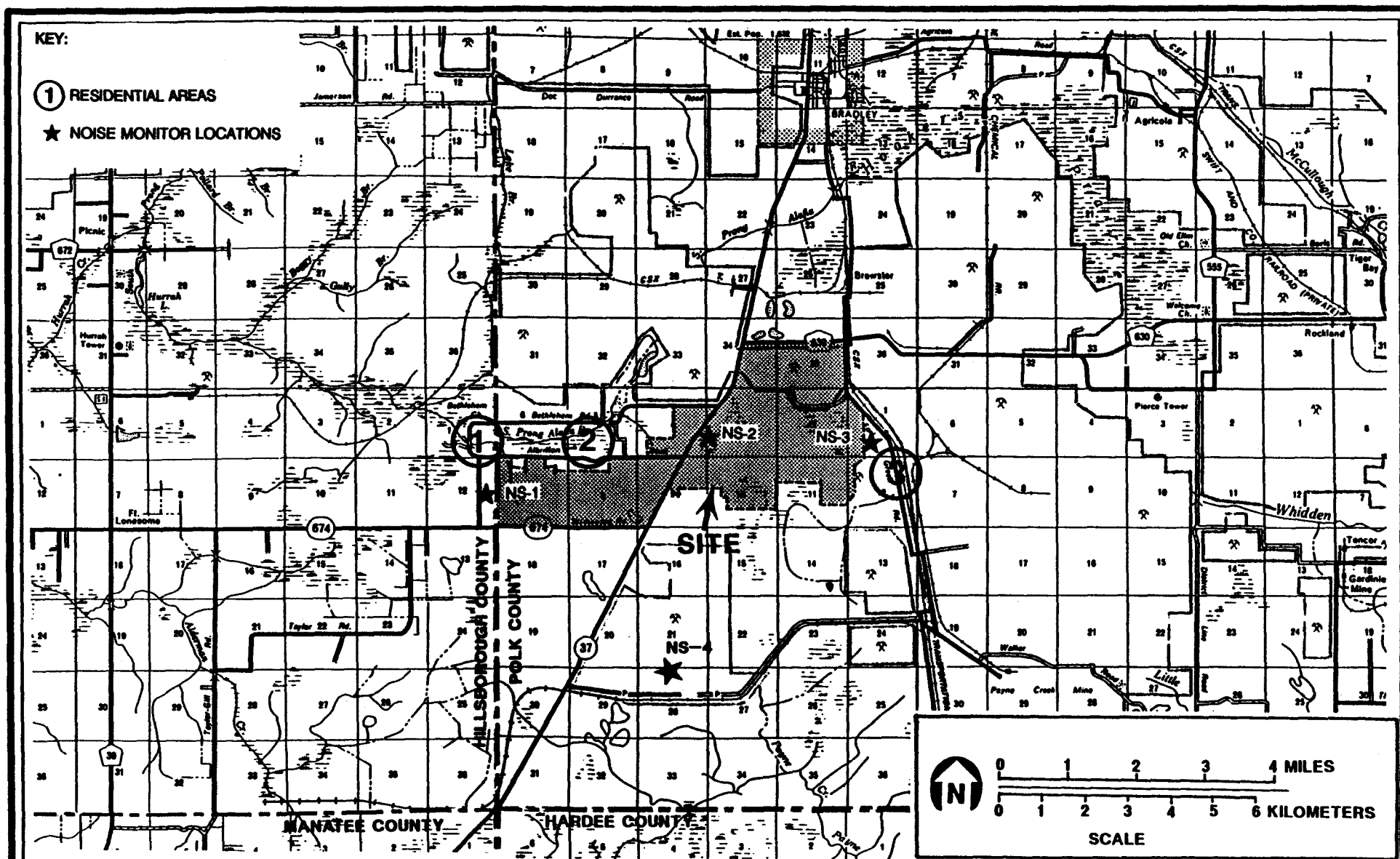


FIGURE 2.3.8-1.

LOCATIONS OF RESIDENTIAL AREAS AND NOISE MONITORS

Source: FDOT Map, FL. ECT, 1992.

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NS-4 was located at the Agrico Fort Green Mine south of the site to develop a thorough description of noise levels in the area. Other portions of the study area include citrus groves, recently mined areas, older mined areas, and reclaimed and unreclaimed areas. Draglines and the Agrico Fort Green Mine are the primary sources of industrial noise in the area. Traffic on SR 37 and the CSX railroad are major sources of noise in this area. General aviation and commercial aircraft also impact the entire study area.

Table 2.3.8-2 provides the monitored hourly equivalent noise levels from the June 1991 program. The highest $L_{eq}(24)$ and the highest L_{dn} were observed at the Agrico Fort Green area (NS-4). The influence of automobile traffic was observed at NS-2 where the $L_{eq}(24)$ and L_{dn} were slightly lower than at NS-4. At NS-1, the noise levels showed variability due to the constant operations of the dragline approximately 0.25 mile from the site. NS-3 was exposed to some automobile traffic on Fort Green Road, train traffic on the CSX, and activities in the citrus groves.

Data collected during the noise monitoring program are provided in Appendix 11.12

Table 2.3.8-2. Ambient Noise Survey Data Hourly Equivalent Sound Level (dBA)

Hour of Day	Noise Monitoring Location and Start Date			
	NS-1 06/08/91	NS-2 06/08/91	NS-3 06/09/91	NS-4 06/09/91
1000	--	55.0	--	--
1100	--	56.2	45.0	--
1200	49.9	53.8	43.1	--
1300	49.5	54.1	44.7	56.2
1400	48.1	52.8	45.1	53.3
1500	49.4	55.6	41.5	55.0
1600	50.4	54.4	41.4	53.5
1700	51.6	55.6	42.9	53.4
1800	51.6	55.5	42.7	53.8
1900	50.9	56.0	47.7	54.2
2000	49.3	56.9	44.2	55.8
2100	52.1	56.9	48.6	58.2
2200	52.3	57.3	60.1	57.1
2300	51.6	55.8	48.9	58.2
2400	50.9	53.7	48.6	57.4
0100	51.8	54.2	49.4	56.2
0200	51.4	55.1	46.2	56.8
0300	51.2	52.6	51.2	54.1
0400	50.3	48.7	52.9	53.9
0500	48.8	50.6	48.3	53.2
0600	50.4	58.5	48.3	53.5
0700	48.3	56.0	50.7	58.2
0800	49.3	56.8	43.7	55.5
0900	49.5	57.1	59.9	54.1
1000	47.8	--	55.4	56.3
1100	48.8	--	--	55.3
1200	--	--	--	55.6
L _{eq} (24)	50.4	55.4	51.7	55.7
L _{dn}	57.4	61.4	59.1	62.3

Note: -- = no monitoring data collected.

Source: ECT, 1992.

2.3.9 OTHER ENVIRONMENTAL FEATURES

The previous sections have provided detailed descriptions of the environmental features of the Polk Power Station site and surrounding areas. No other special or significant environmental features exist on the site which require additional information in this section.

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CHAPTER 3.0

THE PLANT AND DIRECTLY ASSOCIATED FACILITIES

This chapter provides descriptions of the proposed power plant facilities, the key components and systems of the plant and their operations, and the directly associated facilities which will comprise the Tampa Electric Company Polk Power Station. The descriptions include, to the extent possible, estimates of the expected character, quality, and quantity of discharges and emissions from the plant facilities and operations. Also, proposed measures and systems to control and, as necessary, treat the expected emissions and discharges are described in order to provide reasonable assurance that the plant operations comply with applicable regulatory requirements and standards. These descriptions are based on Tampa Electric Company's current plans and available engineering and design information for the proposed Polk Power Station project.

3.1 BACKGROUND

The proposed Polk Power Station project involves the phased construction and operation of electric generating units and associated facilities on a 4,348-acre site in southwest Polk County, Florida. The proposed generating units will include a nominal net 260-MW IGCC unit (i.e., Polk Unit 1), two nominal net 220-MW CC units, and six stand-alone nominal net 75-MW CT units. The construction and operation of these units will provide a total, ultimate generating capacity of approximately 1,150 MW (nominal net) at the Polk Power Station site.

Table 3.1.0-1 provides the phased schedule for construction and operation of the proposed generating units and overall site preparation and reclamation activities. As shown in this table, construction activities for the nominal net 260-MW IGCC unit will begin in January 1994 with the first component of the IGCC unit, a nominal net 150-MW advanced CT unit, scheduled to be in-service in July 1995. The schedule ends with the in-service date of the sixth and last stand-alone CT unit planned for the site in January 2010. The planned in-service dates for the generating units have

Table 3.1.0-1. Schedule for Construction and Operation of Generating Units at the Polk Power Station Site

Activity/Unit	Start Construction	Completion/ In-Service
Overall site preparation/reclamation, including cooling reservoir	January 1994*	July 1996††
150/190-MW advanced CT†	January 1994**	July 1995
CG and HRSG/ST for 260-MW IGCC unit	January 1994**	July 1996
75-MW CT	April 1998	January 1999
75-MW CT	April 1999	January 2000
HRSG/ST for conversion of two 75-MW CTs for 220-MW CC unit	April 2000	January 2001
75-MW CT	April 2001	January 2002
220-MW CC	April 2001	January 2003
75-MW CT	April 2005	January 2006
75-MW CT	April 2006	January 2007
75-MW CT	April 2007	January 2008
75-MW CT	April 2008	January 2009
75-MW CT	April 2009	January 2010

* Tampa Electric Company may request appropriate agency approvals to initiate certain site reclamation activities prior to this date.

† 150 MW when operated in simple-cycle CT or CC mode and fired on fuel oil. 190 MW when operated in IGCC mode with gasifier and air separation unit.

** Construction activities may be initiated prior to this date if all applicable regulatory approvals, licenses, and permits are obtained prior to December 1993.

†† Certain reclamation activities (e.g., vegetation planting) may extend beyond July 1996.

Source: Tampa Electric Company, 1992.

been phased to match Tampa Electric Company's power resource needs to meet its currently projected Customer demands in the 1995 through 2010 timeframe. The units have also been selected and sized to most reliably and cost-effectively meet these future Customer electricity demands. The schedule presented in Table 3.1.0-1 may be subject to some revisions in the future (i.e., the construction and in-service dates for certain units may be accelerated or delayed) based on the results of the company's ongoing Customer demand forecasting and power resource planning programs in the future as well as future orders determining the need for new generating capacity additions from the FPSC. At this time and by this SCA, Tampa Electric Company is requesting certification of the Polk Power Station site for an ultimate generating capacity of approximately 1,150 MW (nominal net).

Also, as shown in Table 3.1.0-1, overall preparation and reclamation of the Polk Power Station site are scheduled to begin in January 1994. Since the majority (i.e., more than 94 percent) of the site has been, is currently, or will be mined or disturbed by phosphate mining activities, overall site preparation involves not only activities to make the site suitable for development of the proposed generating units and associated facilities, but also required reclamation activities to comply with the mined land reclamation requirements of FDNR (Chapter 16C-16, F.A.C.) and Polk County Phosphate Mining Ordinance 88-19. Tampa Electric Company's proposed plans to comply with these requirements will require a modification of the currently-approved reclamation plans and programs for the site and are presented in Chapter 9.0 of this SCA and in a separate document submitted to FDNR and Polk County entitled Conceptual Reclamation Plan Application.

Tampa Electric Company's proposed project development plans have been selected and designed to take full advantage, environmentally and economically, of the site conditions existing after the mining activities have ceased and fulfill regulatory reclamation requirements. The main power plant facilities and structures will be developed on lands to the east of SR 37 which were not mined but disturbed by mining-related activities. Fill materials for this plant site area will be obtained from

the development activities for the cooling reservoir. The use of existing mined-out areas on the site for the cooling reservoir allows the reservoir to be developed as a primarily below-grade facility which lessens groundwater withdrawals for cooling water makeup to and water discharges from the cooling reservoir as well as reduces construction and maintenance costs for the facility. The proposed development/reclamation plans for the 1,511-acre portion of the site to the west of SR 37 will result in an environmentally significant wildlife habitat and corridor resource area in southwest Polk County. Other mined-out areas on the site will be reclaimed to uplands and wetlands and integrated into the overall stormwater runoff management plans for the proposed project. These areas will also provide wildlife habitat resource areas on the site after development of the project.

As indicated in Table 3.1.0-1, the overall site preparation and reclamation activities are currently scheduled to begin in January 1994 after receipt of the final state site certification and federal agency approvals. However, during the review process of this SCA, Tampa Electric Company may request approvals from FDER and FDNR to initiate certain site reclamation activities prior to January 1994. The earlier initiation of these activities would be advantageous to the overall project in order to meet the statutory time limitations required by FDNR to initiate reclamation of mined lands and to provide as much time as possible for reclaimed, re-vegetated wetland and upland areas to become established and develop as wildlife habitat resources. Any reclamation activities conducted prior to the final site certification by the Siting Board will be conducted in accordance with the modified reclamation plans submitted to FDNR and Polk County in conjunction with this SCA and will not adversely affect any agency programs or future use of the site should the final site certification for the Polk Power Station not be approved.

The following sections provide overall descriptions of the proposed electric generating units, the operations of major processes and systems, and other associated facilities which will comprise the Tampa Electric Company Polk Power Station project. These descriptions will provide reviewers of this SCA with a detailed understanding

of the proposed facilities and processes. Also, as appropriate, specific references are provided to other sections in this chapter and elsewhere in this SCA which present more detailed descriptions of the proposed facilities, systems, and processes.

3.1.1 INTEGRATED COAL GASIFICATION COMBINED CYCLE UNIT AND PROCESS DESCRIPTIONS

As discussed in Section 1.4.4, Tampa Electric Company will develop the proposed IGCC unit in conjunction with a cooperative agreement with DOE under the Clean Coal Technology Demonstration program. Under this agreement, DOE will provide \$120 million in partial funding for construction of the unit and its operation for 2 years to demonstrate the integration of CG and CC technologies and a new, potentially more efficient technology (i.e., HGCU) for removing sulfur from syngas prior to combustion. These demonstration aspects of the IGCC unit provide Tampa Electric Company with the opportunity to commercially demonstrate an environmentally acceptable and economical means of generating electricity using coal which is the most abundant energy resource in the United States. Therefore, if successful, this demonstration could assist in reducing future reliance on the use of foreign energy oil resources for electricity generation in the United States.

As shown in Table 3.1.0-1, the first electric generating unit and initial component of the IGCC unit at the Polk Power Station site will be a nominal net 150-MW advanced CT unit which will be placed in service in July 1995. This unit will be a GE 7F CT. This advanced CT unit will be fired on low-sulfur No. 2 fuel oil during its first year of operation and will be used up to a maximum capacity factor of 10 percent to meet Tampa Electric Company's peak demands for electricity. Annual capacity factor is defined as the actual megawatt hours produced by a generating unit versus the maximum possible megawatt hours that could be produced, expressed on a percent basis.

After the first year of operation, this advanced CT unit will be integrated with HRSG and ST generator facilities to form a CC generating unit and CG facilities to comprise the proposed nominal net 260-MW IGCC generating unit. The CG facilities will be based on the Texaco oxygen-blown, entrained flow, gasification system. The proposed IGCC unit, known as Polk Unit 1, is scheduled to be operational in July 1996 in order to meet Tampa Electric Company's baseload power resource needs as approved by the FPSC. As a baseload generating unit, the proposed IGCC

unit will be capable of operating at up to 100-percent capacity factor when fired on the syngas produced in the CG facilities. When fired on the syngas and operated with the addition of nitrogen gas from the proposed air separation unit to the CT, the advanced CT unit is expected to have a nominal net generating capacity of 190 MW.

After conversion of the advanced CT to the IGCC unit, the facilities will be designed to maintain the capability to fire No. 2 fuel oil as a backup fuel and operate in a CC mode, to provide required flexibility in meeting Customer demands in the event of unanticipated disruptions in the delivery of coal or unplanned unavailability of the CG facilities. Tampa Electric Company anticipates and is proposing to permit operations in this CC mode using the backup No. 2 fuel for a maximum annual capacity factor of 10 percent.

Air emission controls for the stand-alone advanced CT during the first year of operation and the CC module of the IGCC unit when fired on the backup No. 2 fuel oil will consist of a combination of measures. SO₂ emissions will be controlled by the use of fuel oil with a low sulfur content (i.e., maximum sulfur content of 0.05 percent). NO_x emissions will be controlled by water injection in the advanced CT which controls the combustion temperature to limit the formation of NO_x. Other potential air pollutants (e.g., CO, VOCs, PM₁₀, and trace elements) will be controlled primarily by the fuel oil characteristics (i.e., only trace contents of potential pollutants) and by the efficient design and operation of the CT unit. Section 3.4 of this SCA and the PSD Permit Application in Appendix 11.1.3 provide additional discussions on the selection and design of these proposed air emission control measures.

The IGCC unit will consist of the following major systems and processes:

- Coal grinding and slurry preparation;
- Air separation unit;
- Gasification system;
- Slag handling and storage;

- Syngas scrubbing and cooling systems;
- Gasification process black water handling and brine concentration system;
- Acid gas removal unit;
- Sulfur by-product recovery, handling, and storage;
- Tail gas treating unit;
- HGCU system and H_2SO_4 by-product handling and storage; and
- Power block.

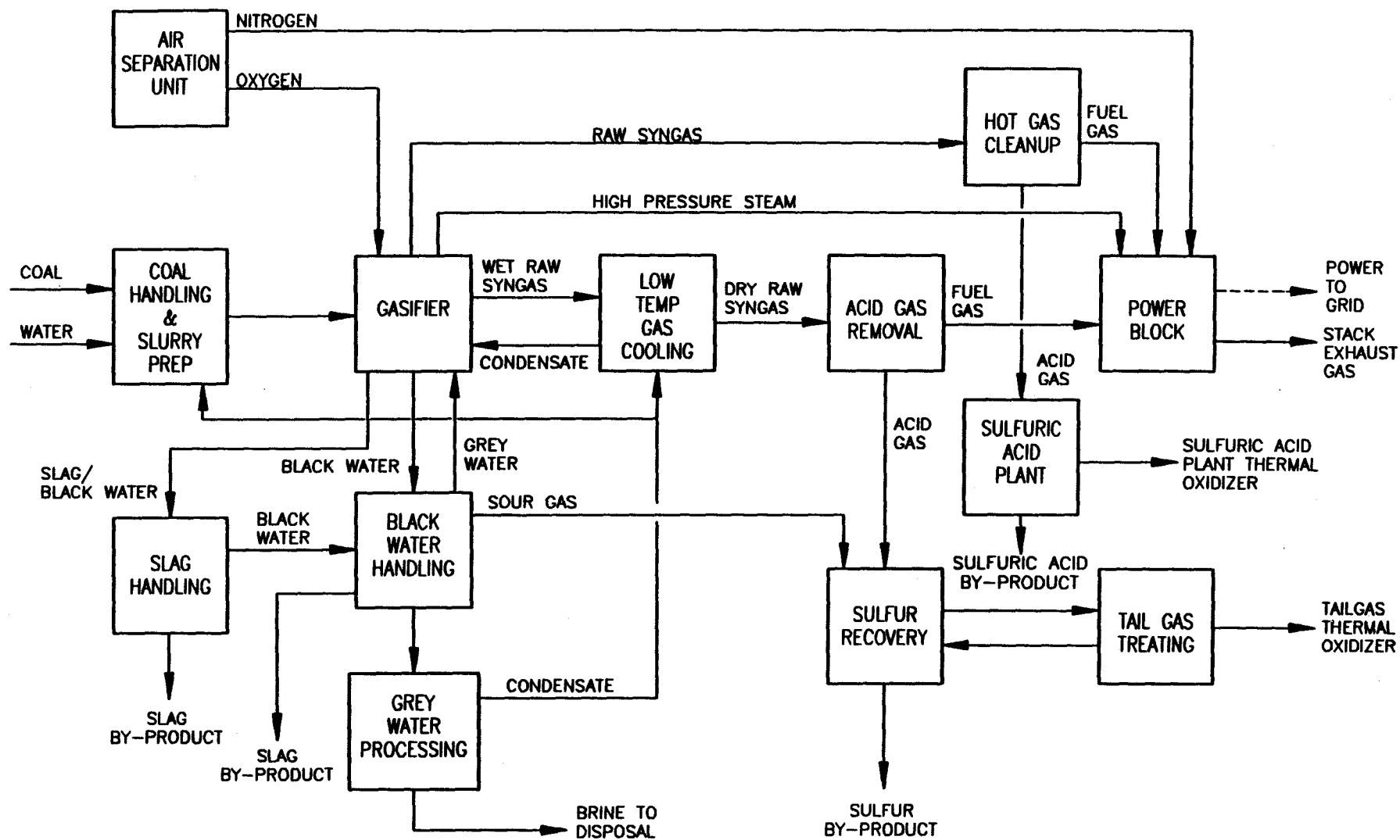
Figure 3.1.1-1 provides an overall block flow diagram of these major systems and processes. Each of these major systems and processes is described in the following subsections. General descriptions of other facilities directly associated with the IGCC unit and, in some cases, with the other generating units proposed for the site (e.g., potable and process water supply and treatment, fuel delivery and storage, cooling reservoir, and by-product storage) are provided in Section 3.1.4.

3.1.1.1 Coal Grinding and Slurry Preparation

The coal grinding and slurry preparation system for the IGCC unit will prepare the coal for input to gasifier. Figure 3.1.1-2 presents a schematic of this system.

As shown in Figure 3.1.1-2, coal will be withdrawn from the coal storage area and fed to the grinding mill with recycled process water and makeup water from the water supply system. The grinding mill may also be fed fine coal recovered by the dust collection system. ~~Ammonia may be added to the mill for pH adjustment, if necessary. The pH of the slurry will be maintained between 6 and 8 to minimize corrosion in the carbon steel equipment. A slurry additive for reducing viscosity will also be pumped continuously to the grinding mill.~~ *what is this?*

The grinding mill will reduce the feed coal to the design particle size distribution. The mill will be a conventional rod-type system with an overflow discharge of the slurry. Slurry discharged from the grinding mill will pass through a trommel screen



File:

FIG311-1

FIGURE 3.1.1-1.

GENERALIZED FLOW DIAGRAM OF IGCC SYSTEMS AND PROCESS

Source: ECT, 1992.



**POLK
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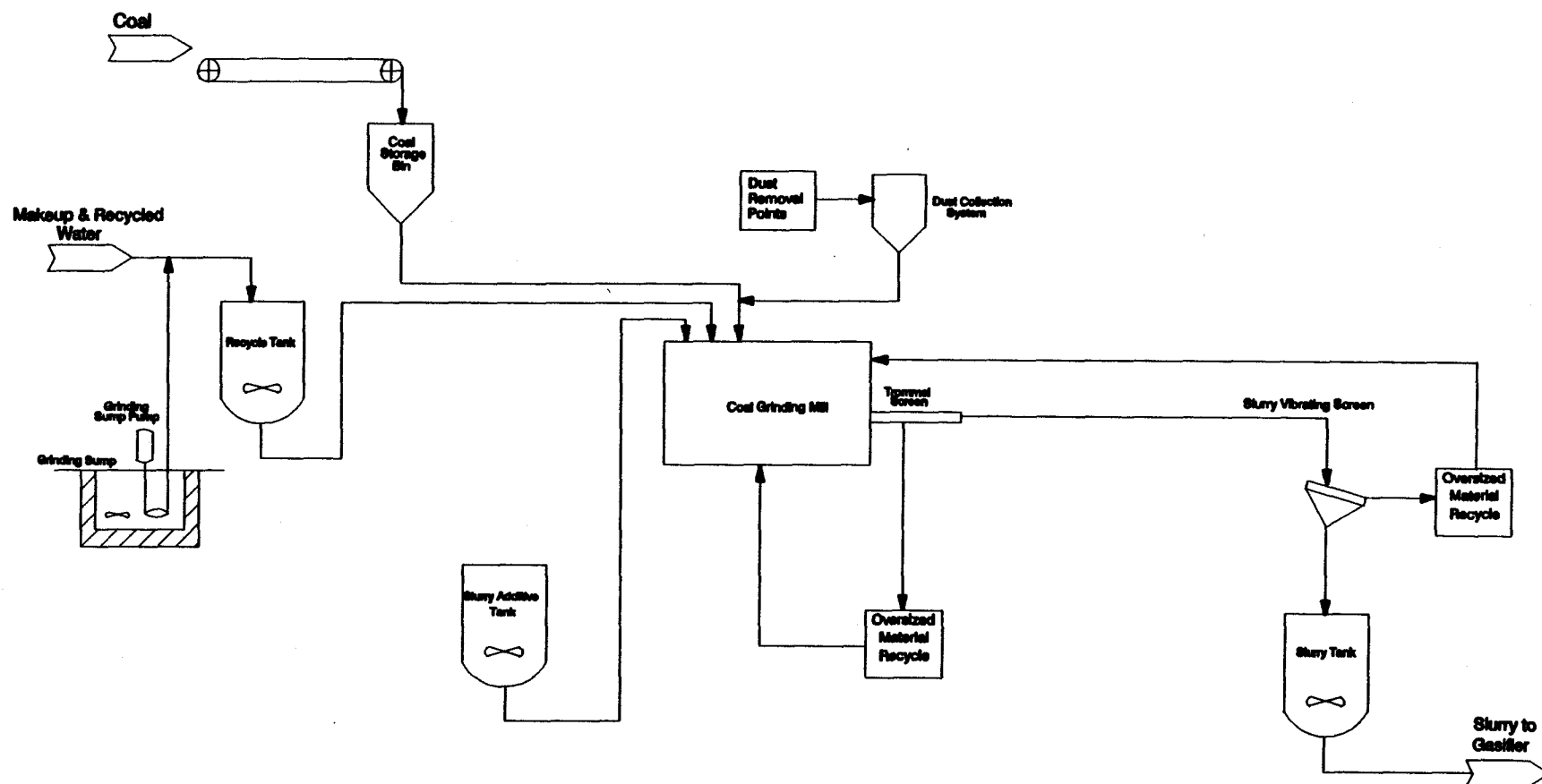


FIGURE 3.1.1-2.

COAL GRINDING AND SLURRY PREPARATION SCHEMATIC

Source: Texaco, 1992.



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and over a vibrating screen to remove any oversized particles before entering into the slurry tank. Oversized particles will be recycled to the grinding mill.

A below-grade grinding sump will be located centrally within the coal grinding and slurry preparation area to handle and collect any slurry drains or spills in the area. Materials collected in the sump will be routed to the recycle tank for reuse in the process.

Water

In order to minimize groundwater withdrawals and use, water for the slurry preparation system will be provided from several sources. Water for the system will be provided primarily by moisture contained in the coal feed, and recycled feed and grinding sump water. Additional makeup water to the slurry system will be provided from the overall plant service water system. Through the collection and recycling process, ~~there will be no water discharges from the coal grinding and slurry preparation system.~~ All water from the system is fed to the gasifier in the coal slurry.

Air

Potential particulate matter air emissions from the coal storage bin, grinding mill, and rod mill overflow discharge will primarily be controlled by the wet nature of these subsystems and by the use of enclosures for the subsystems with vents through fabric filters or baghouses. The grinding sump and slurry tank vents will each be equipped with carbon canisters for absorption of potential H_2S or ammonia (NH_3) emissions.

3.1.1.2 Air Separation Unit

The air separation unit will use ambient air to produce oxygen for use in the gasification system and sulfur recovery unit, and nitrogen which will be sent to the advanced CT. The addition of nitrogen in the CT combustion chamber has dual benefits. First, since syngas has a substantially lower heating value than natural gas, a higher fuel mass flow is needed to maintain heat input which also results in higher CT unit output. Therefore, the addition of nitrogen increases the fuel mass flow and power output of the IGCC unit. Second, the nitrogen acts to control potential NO_x

air emissions by reducing the combustor flame temperature which, in turn, reduces the formation of NO_x in the fuel combustion process. The process of using nitrogen to control the flame temperature and NO_x formation is similar to that achieved by steam or water injection NO_x control methods; however, the use of nitrogen does not require the use and consumption of water as with the water/steam injection methods.

Figure 3.1.1-3 presents process flow schematics of the air separation unit. As shown in the figure, ambient air will be filtered in a two-stage air filter designed to remove particulate material. The first filter stage will consist of a blanket roll filter; the second filter stage will consist of removable elements, which are periodically replaced. The air will then be compressed in a multistage centrifugal air compressor equipped with inter-cooling between stages and a condensate removal system.

The compressed air will be cooled and scrubbed in an aftercooler. Chilled air from the aftercooler will be fed to the molecular sieve contaminant absorbers. The molecular sieves will remove any remaining water vapor, CO_2 , and unsaturated and saturated hydrocarbons from the air. The air will then be filtered in the dust filter to remove any entrained molecular sieve particles. Regeneration of the molecular sieve adsorbent will be accomplished by heating a nitrogen stream in the regeneration heater and passing it through the off-stream bed to drive off the adsorbed contaminants. The regeneration gas will then be vented to the atmosphere.

The purified air will be fed to the cold box where it is cooled against returning gaseous product streams in a primary heat exchanger (PHX). A small fraction of the air will be extracted from the PHX at its midpoint and expanded through the compressed air turboexpander to provide refrigeration for the cryogenic process. The cooled, expanded air will then be fed to the low pressure distillation column for separation.

The remaining air will exit the cold end of the PHX a few degrees above its dew point. The air will be fed to the high pressure distillation column and then to the

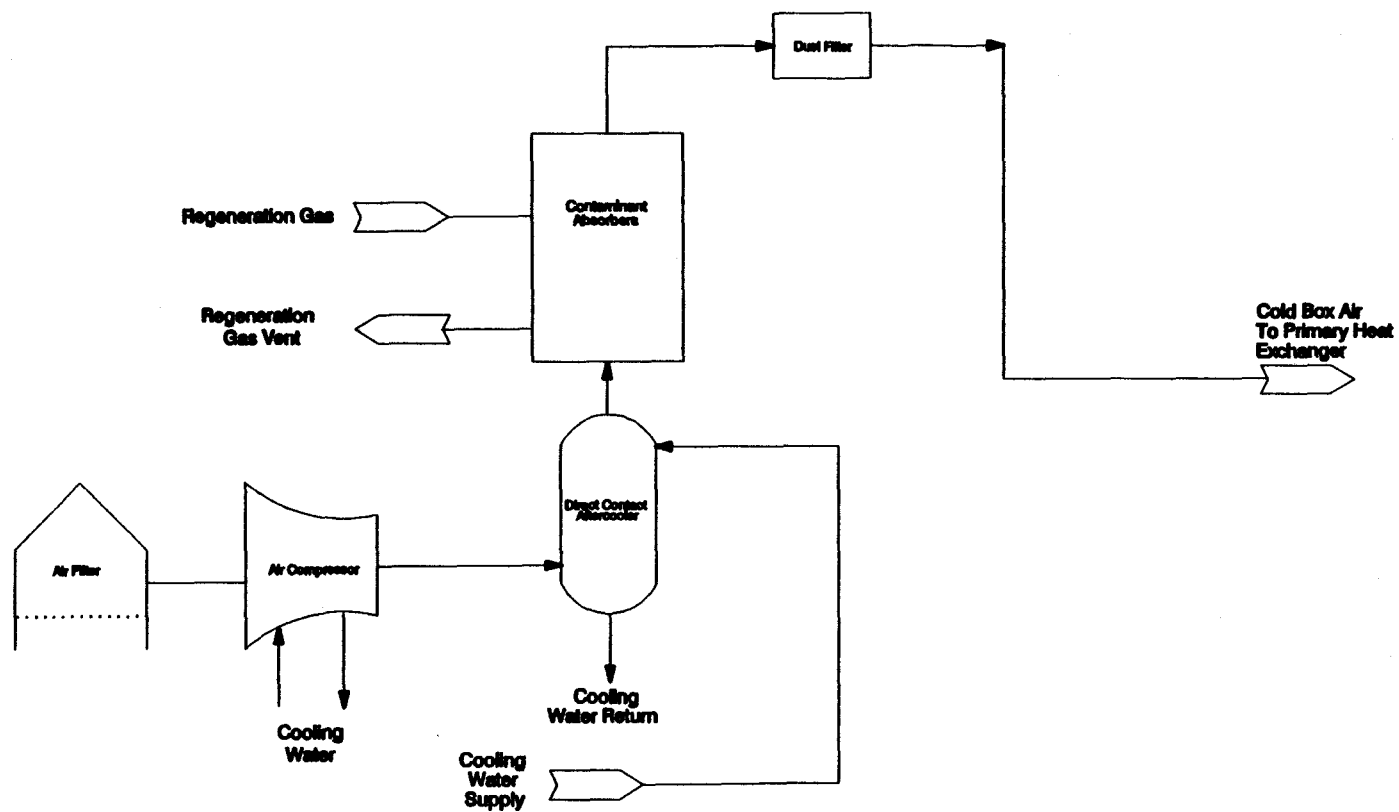


FIGURE 3.1.1-3.

AIR SEPARATION UNIT SCHEMATIC (PAGE 1 OF 2)

Source: Texaco, 1992.



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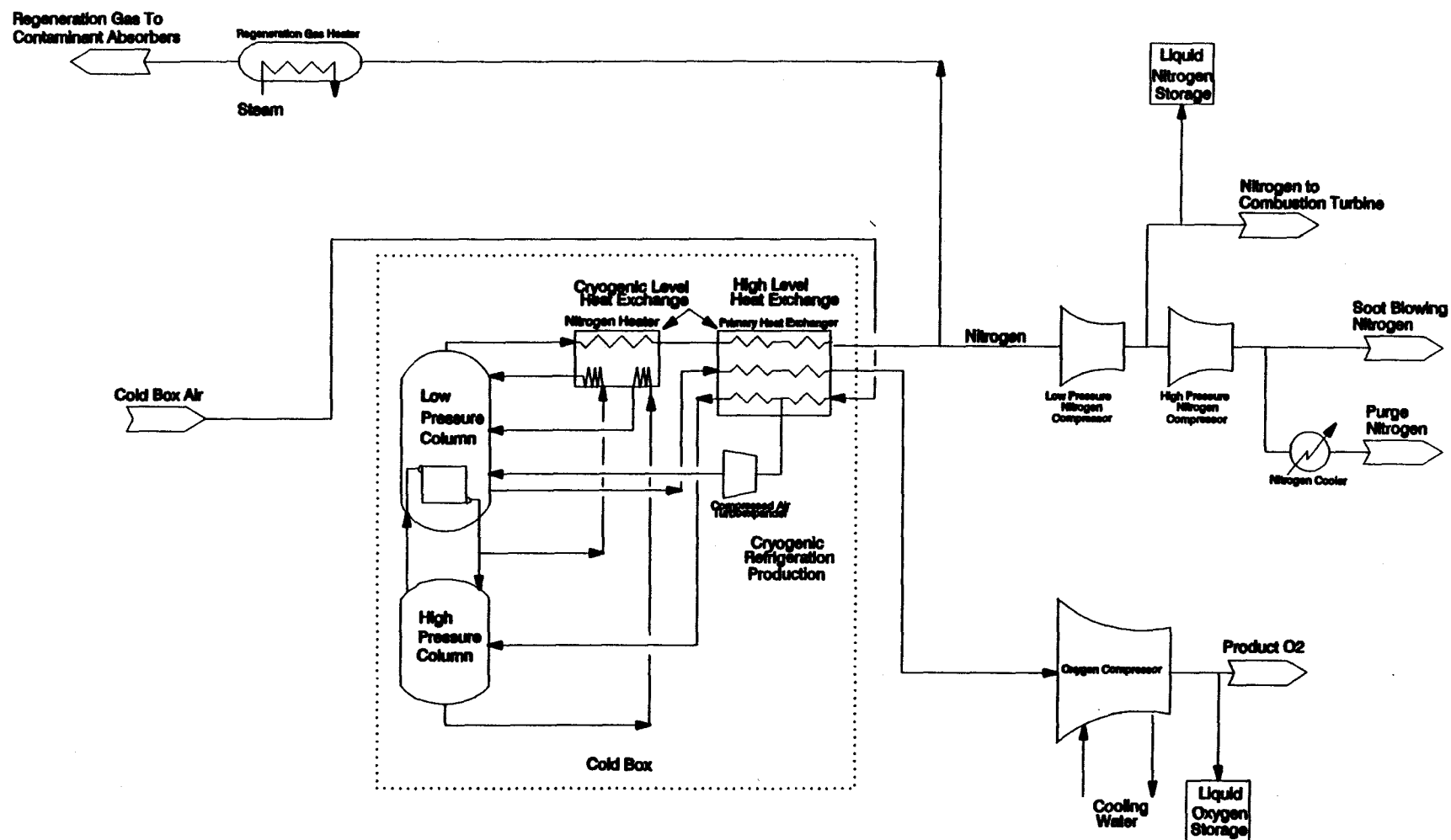


FIGURE 3.1.1-3.

AIR SEPARATION UNIT SCHEMATIC (PAGE 2 OF 2)

Source: Texaco, 1992.



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low pressure distillation column where it will be separated into a gaseous nitrogen vapor and an oxygen-enriched liquid stream. The nitrogen vapor will be condensed in the high pressure distillation column condenser against boiling liquid oxygen. The liquid nitrogen will be used as reflux in the high and low pressure distillation columns.

The liquid nitrogen reflux, kettle liquid, and turbine discharge will be fed to the low pressure distillation column where they will be separated into oxygen and nitrogen. Heat from the condensing air vapor will provide reboiler action in the liquid oxygen pool at the bottom of the low pressure distillation column. The oxygen vapor will be warmed to near-ambient temperature in the PHX and fed to the oxygen compressor, where it will be compressed to the pressure required by the gasification unit.

Nitrogen vapor from the low pressure distillation column will be warmed slightly in a superheater against subcooling nitrogen reflux liquid. The nitrogen will then be warmed to near-ambient temperature in the PHX. The nitrogen vapor will be compressed and sent to the advanced CT.

As potential backup systems to the air separation unit, liquid oxygen and nitrogen storage systems may be provided. If these systems are provided, the backup liquid oxygen and nitrogen systems will be maintained in a cold, ready-to-start state.

The air separation unit process will neither consume water nor produce or discharge wastewaters. The unit will require water only for non-contact cooling purposes which will be provided from the makeup water system and/or the cooling reservoir. Only minor, intermittent particulate matter air emissions may result from the venting of the regeneration gas.

3.1.1.3 Gasification System

The proposed IGCC unit will use the Texaco oxygen-blown, entrained flow, gasification system to produce syngas for the advanced CT. The proposed gasification system will involve a single-train gasifier which will be capable of converting approximately 2,325 tpd of coal, on a dry basis, to syngas. While the proposed gasification train will be the largest Texaco train in operation to date, the proposed system involves commercially proven technologies, processes, and equipment. Currently, licensed Texaco CG plants are being operated commercially by Tennessee Eastman in Kingsport, Tennessee; by Ube Ammonia in Ube City, Japan; and by SAR in Oberhausen, Germany. To date, these plants have gasified more than 5 million tons of coal and coke.

Also, although currently not in operation, the Texaco gasification system and a GE CT unit were successfully operated at the 120-MW Cool Water IGCC facility in Daggett, California. The Cool Water plant was developed jointly by Texaco, the Electric Power Research Institute (EPRI), Southern California Edison, Bechtel Power Corporation, GE, and a Japanese partnership.

The Cool Water facility was operated between June 1984 and June 1989 and is currently maintained in a long-term standby status. During its operation, the Cool Water IGCC plant was operated for more than 26,000 hours, generated more than 2.7 billion kilowatt hours (kwh) of electricity, and achieved a capacity factor of 87 percent in its final quarter of operation. The successful demonstration aspects of the Cool Water plant involved not only the commercial viability of the gasification technology for power generation, but also the environmental acceptability of the technology under stringent State of California and EPA regulations regarding air emissions, water quality, and solid wastes.

The Texaco gasification system has also been successfully operated in demonstration plants in Muscle Shoals, Alabama, and in Oberhausen, Germany, as well as in Texaco's gasification pilot plant and testing facilities in Montebello, California.

Figure 3.1.1-4 presents the process flow schematic for the proposed gasification system. As shown in this figure, coal slurry from the slurry feed tank and oxygen from the air separation unit will be fed to the gasifier and sent to the process burner. The gasifier will be a refractory lined vessel capable of withstanding high temperatures and pressures. The coal slurry and oxygen will react in the gasifier at high temperatures to produce syngas. The syngas will consist primarily of hydrogen, CO, water vapor, and CO₂, with small amounts of H₂S, COS, methane, argon, and nitrogen. Coal ash and unconverted carbon in the gasifier will form a liquid melt called slag.

Hot syngas and slag from the gasifier will flow downward into a radiant syngas cooler, which is a high pressure steam generator equipped with a water wall to protect the vessel shell. Heat will be transferred primarily by radiation from the hot syngas to the boiler feed water circulating in the water wall. High pressure steam produced in this boiler will be routed to the HRSG in the power block area which will supplement the heat input to the HRSG and increase the efficiency of the generating unit.

The syngas will pass over the surface of a pool of water at the bottom of the radiant syngas cooler and exit the vessel. The raw syngas will then be sent to the high temperature syngas cooling system in the CGCU system for further heat recovery and to the demonstration HGCU system. The slag will drop into the water pool and will be fed to the slag sump tank.

Gasification process water called black water will also collect with the slag in the bottom of the radiant syngas cooler and flow with the slag into the slag sump tank. The proposed system for handling and processing the black water is described in Sections 3.5.4.5 and 3.5.4.6. Potential air emissions or leaks from the gasifier to the atmosphere will be negligible since it will be designed to maintain pressure and control syngas flows.

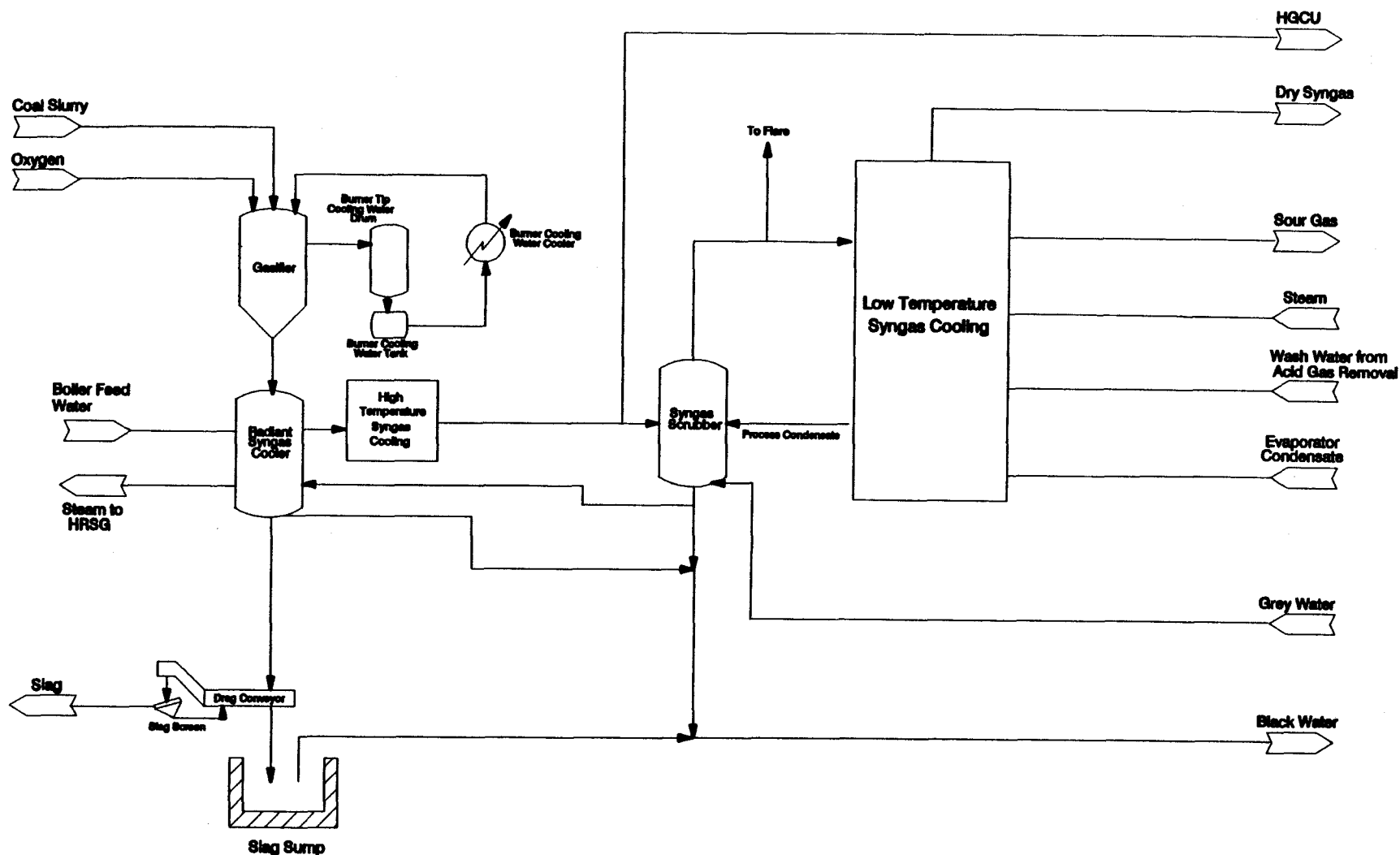


FIGURE 3.1.1-4.

GASIFICATION, SLAG HANDLING, AND SYNGAS COOLING SYSTEM SCHEMATIC

Source: Texaco, 1992.



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3.1.1.4 Slag Handling

The slag handling system will remove ungasified solids from the gasification process equipment. These solids consist of the coal ash and unconverted coal components (primarily carbon) that exit the gasifier in the solid phase. The schematic presented in Figure 3.1.1-4 also shows the slag handling process flow.

In the gasification system, coarse solids and some of the fine solids will be flushed from the radiant cooler into the slag sump tank. Solids flushed to the slag sump tank will settle onto the drag conveyor and will be carried out of the sump. Next, the solids will fall onto the slag screen where they are dewatered. The slag will then be transported by conveyors to a concrete dewatering pad. The concrete dewatering pad will be bunkered to prevent runoff from the area and have a sump to collect the dewatering water. From the dewatering pad, the slag will either be loaded into trucks for transport and use offsite or transported to the temporary, onsite slag storage area which is described in Section 3.1.4. The water removed from the slag and sumps will be pumped to the gasification process black water handling and processing system.

Again, all waters produced in this slag handling system will be collected and routed to the black water handling system for processing and reuse. Also, potential particulate matter air emissions from the system will be minimal due to the wet nature of the slag and processes.

This system will generate the coarse slag material at a maximum rate of approximately 210 short-tons per day (stpd) on a dry basis and the material will contain approximately 25-percent moisture. As discussed in Section 3.7.1.5, the slag is classified as non-hazardous and non-leachable and will be marketed and sold for various offsite commercial uses.

3.1.1.5 Syngas Scrubbing and Cooling Systems

The raw, hot syngas from the gasifier will be routed to the separate conventional CGCU and demonstration HGCU systems for appropriate treatment. The CGCU system will be designed to treat 100 percent of the syngas flows for the unit, while the HGCU system will be capable of treating approximately 50 percent of the syngas when the unit is operating at full capacity. The CGCU system is described in the following subsections, and descriptions of the HGCU system are provided in Section 3.1.1.10.

The initial treatment process for the raw syngas within the CGCU system involves the syngas scrubbing and cooling systems.

The raw, hot syngas from the gasifier will contain entrained solids or fine slag particles which must be removed to produce the clean syngas fuel. Also, the raw hot syngas needs to be cooled in order to be effectively cleaned in the acid gas removal unit or CGCU system. The flow schematic for these syngas scrubbing and cooling processes is presented in Figure 3.1.1-4.

As shown in Figure 3.1.1-4, the raw hot syngas from the gasifier will be fed through the high temperature syngas cooling system to the syngas scrubber where entrained solids are removed. The syngas will then be routed to the low temperature gas cooling section. The low temperature gas cooling section will cool the syngas by recovering its useful heat and will condense out much of the water from the syngas prior to its routing to the acid gas removal system.

During startups, shutdowns, and upsets, syngas will be routed to the flare for short periods of time.

The syngas scrubber bottoms stream will contain all the solids which were not removed in the radiant syngas cooler sump. The solids in the bottoms stream will be routed to the black water handling system.

All water used in the syngas scrubbing and cooling processes will be provided by recycled water streams. Also, all process water streams will be sent to the black water handling system and/or reused within other CG plant systems. The syngas scrubbing and cooling processes will have no potential ambient air emissions.

3.1.1.6 Gasification Process Black Water Handling and Brine Concentration System

In the gasification and slag handling systems, water removed from the slag contains fine particles of slag and ungasified solids. This process water is referred to as black water due to its coloration from the suspended particles. As discussed previously in Section 3.1.1.5, the syngas scrubber also generates black water, which contains the fine particles entrained in the syngas exiting the gasifier and removed in the scrubbing process.

All black water from the gasification and syngas cleanup processes will be collected, processed, recycled to the extent possible, and contained within the processes. There will be no liquid discharges of these process waters to other systems or to the cooling reservoir. The effluent remaining after processing of this black water will be condensed and crystallized into a solid consisting primarily of salt called brine which will be stored in lined landfill on the site with appropriately designed leachate and stormwater runoff collection and treatment systems. The black water handling, processing, and crystallization systems and processes are described in Section 3.5.4, and the brine storage area is described in Section 3.7.1.

3.1.1.7 Acid Gas Removal Unit

After removal of the entrained solids, the syngas will still contain acid gases such as CO₂ and H₂S which will be removed prior to firing the syngas in the advanced CT unit to control potential SO₂ air emissions. The acid gas removal unit will remove the acid gases from the syngas. The process flow schematic for this unit is provided in Figure 3.1.1-5.

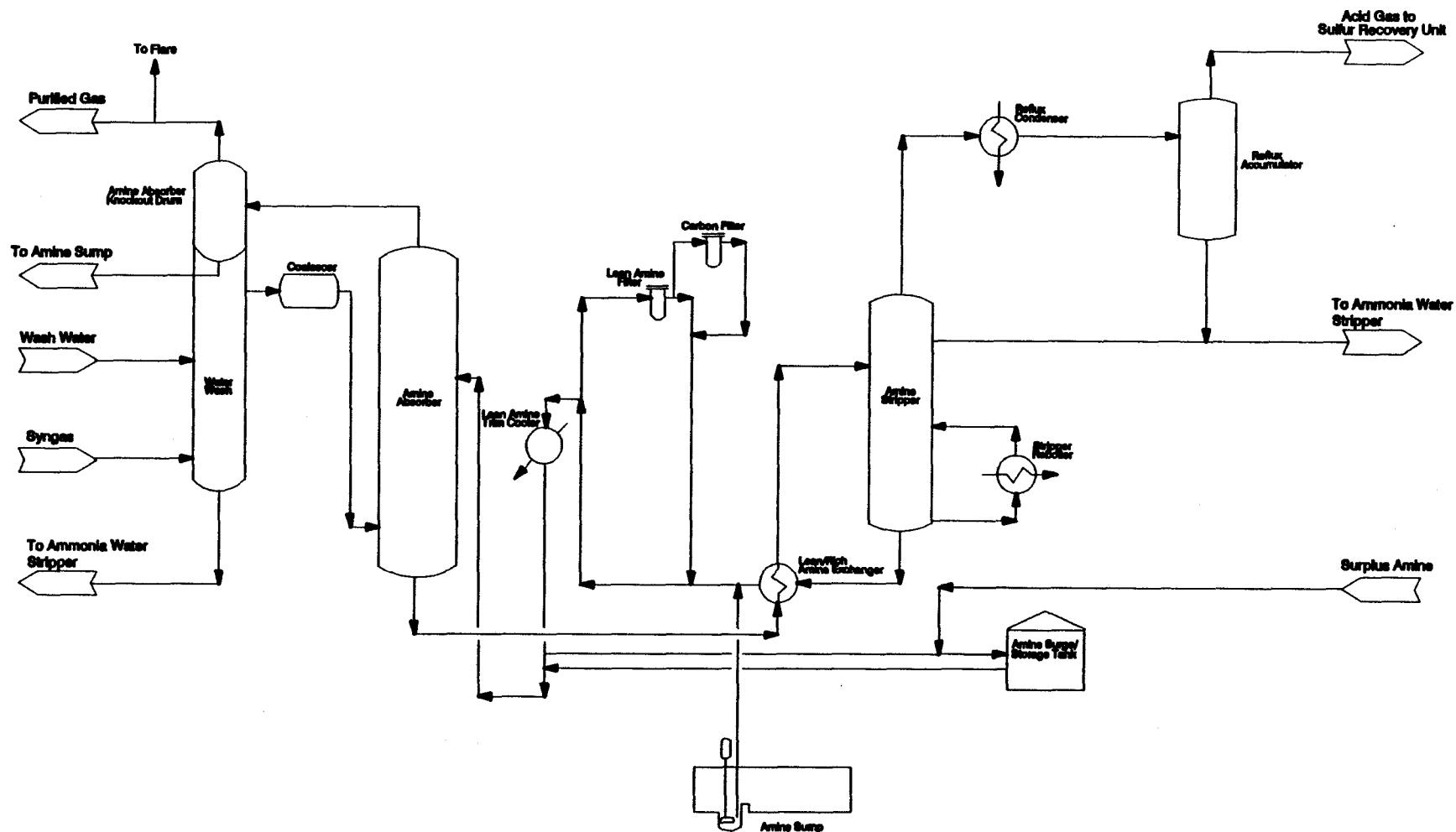


FIGURE 3.1.1-5.

ACID GAS REMOVAL UNIT SCHEMATIC

Source: Texaco, 1992.

In this unit, the cooled syngas will first be water-washed in the water wash column. Wash water will be pumped to the column to remove contaminants which would potentially degrade the amine from the syngas. The wash water from the column will be sent to the NH_3 water stripper. The washed syngas will flow through a liquid coalescer to collect entrained water droplets and then flow to the amine absorber.

The syngas will be contacted with amine in the amine absorber. Acting as a weak base, the amine will absorb acid gases such as CO_2 and H_2S by chemical reaction. The purified syngas will flow through a knock-out drum located on top of the water wash column to remove entrained amine. The recovered liquid will be returned to the amine sump.

During startups, shutdowns, and upsets, syngas will be routed to the flare for short periods of time.

The rich amine will be stripped of the acid gas in the amine stripper by steam generated in the stripper reboiler. The acid gas overhead will be partially condensed by the reflux condenser and collected in the reflux accumulator. The acid gas, primarily H_2S and CO_2 , from the reflux accumulator will go to the sulfur recovery unit, and the condensed liquid reflux will be returned to the amine stripper.

3.1.1.8 Sulfur Recovery Unit

The sulfur recovery unit, shown schematically in Figure 3.1.1-6, will convert H_2S gas to a liquid molten sulfur by-product. Approximately one-third of the feed H_2S will be oxidized in the thermal reactor to form SO_2 . The SO_2 will then be reacted with the remaining H_2S to form elemental sulfur and water. NH_3 from the NH_3 stripper will also be oxidized to nitrogen and water. Any hydrocarbons in the acid gas feed will be oxidized in the thermal reactor to CO and water.

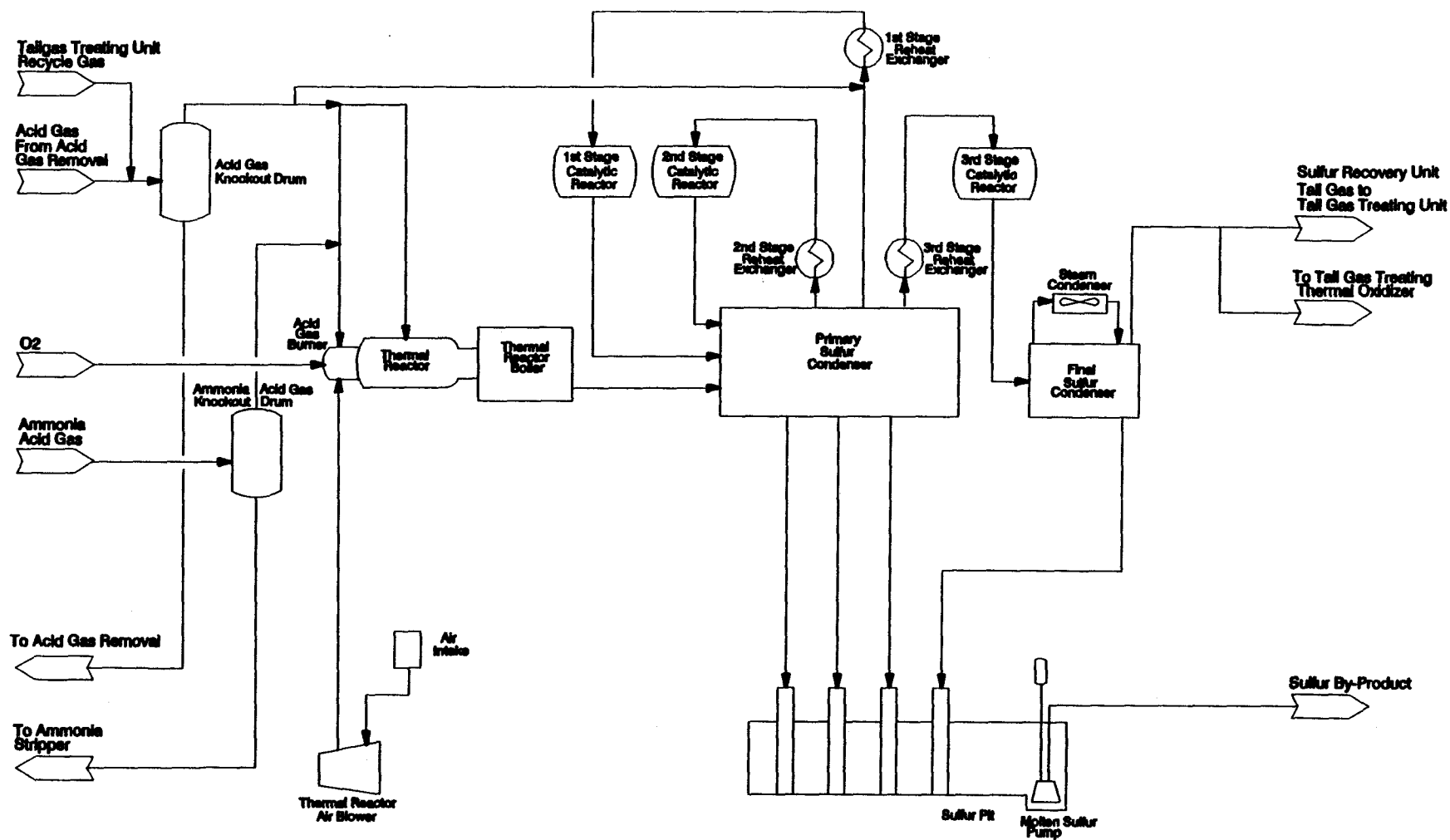


FIGURE 3.1.1-6.

SULFUR RECOVERY UNIT SCHEMATIC

Source: Texaco, 1992.

The basic reactions are:

1. $\text{H}_2\text{S} + 1.5 \text{O}_2 \rightarrow \text{SO}_2 + \text{H}_2\text{O}$, and
2. $2\text{H}_2\text{S} + \text{SO}_2 \rightarrow 1.5 \text{S}_2 + 2\text{H}_2\text{O}$.

Depending on the concentration of H_2S in the acid gas feeds, as much as half of the unit's total sulfur by-product production will come from the non-catalytic reactions in the thermal reactor. This sulfur will be condensed and removed from the stream prior to feeding the first catalytic reactor. The balance of the sulfur by-product production will be formed in the three catalytic reactors.

The acid gas knock-out drum and the NH_3 water stripper gas knock-out drum will be designed to remove entrained water and condensed hydrocarbons from the amine acid gas and the NH_3 water stripper gas feeds from the acid gas removal unit upstream of the thermal reactor. The NH_3 water stripper gas stream will be fed entirely to the thermal reactor burner located in the front chamber of the thermal reactor. The amine acid gas from the acid gas removal unit may be split to assist the reaction. Pure oxygen will be added, if necessary, to maintain the front chamber temperature to ensure NH_3 combustion. If NH_3 is not present, then lower temperatures may be used. The remainder of the amine acid gas stream will be fed to the second chamber of the thermal reactor or by-passed to the inlet of the first stage reheat exchanger. Approximately one-third of the H_2S in the feed gas will be converted to SO_2 and water in the thermal reactor. Air from the air blower and oxygen will be supplied to the thermal reactor to oxidize the H_2S in the NH_3 stripper gas to SO_2 and water, to oxidize the NH_3 to nitrogen and water, and to oxidize any hydrocarbons in the NH_3 stripper gas to CO_2 and water.

The hot combustion gas from the thermal reactor second chamber will enter the boiler where the gas is cooled. The effluent gas from the boiler will enter the primary sulfur condenser. Sulfur produced in the thermal reactor will be condensed in the primary sulfur condenser as the gas is cooled. Steam will be produced as the gas is cooled and the sulfur is condensed. The liquid sulfur will be separated from

the gas in a separator chamber at the outlet end of the primary sulfur condenser and will be drained to the sulfur seal pot. The liquid sulfur seal in the pot will prevent the process gas from escaping to the sulfur pit. The uncondensed gas from the first pass of the primary sulfur condenser will be routed to the first reheat exchanger where the gas is re-heated. The steam condensate produced from the reheat exchanger will flow to the primary sulfur condenser.

The gas from the first reheat exchanger will pass through the first catalytic reactor where the reaction of the remaining SO_2 with H_2S occurs over a fixed bed of activated alumina catalyst. The heat given off by the reaction in the first bed will be the greatest of all the catalytic reactor beds. The catalytic reactor product gas, containing the newly formed elemental sulfur, will exit the catalytic reactor and enter the second pass of the primary sulfur condenser. Sulfur formed in the first catalytic reactor will be condensed and will be drained to the sulfur seal pot.

The uncondensed gas will then be routed to the second reheat exchanger where it is heated prior to being fed to the second catalytic reactor. The second catalytic reactor will be similar in size and function to the first catalytic reactor. Since the concentration of the reactants will be lower in the second catalytic reactor feed than in the first, less reaction will take place. The second catalytic reactor effluent gas will again enter the primary sulfur condenser, where the bulk of the sulfur formed in the reactor will be condensed, and will be drained to the sulfur seal pot.

The uncondensed gas from the third pass of the primary sulfur condenser will be routed to the third catalytic reactor via the third reheat exchanger. Again, the steam condensate from this reheat exchanger will be sent to the primary sulfur condenser. Since the concentrations of H_2S and SO_2 will be low in the third catalytic reactor, only a relatively small amount of sulfur will be formed in this reactor. The sulfur formed in the third catalytic reactor will be condensed in the final sulfur condenser as the stream cools and drained to the sulfur seal pot.

The uncondensed gas (tail gas) will exit the final sulfur condenser via a mist eliminator pad and will be routed either to the tail gas treating unit or to the thermal oxidizer based on the tail gas sulfur content.

The thermal oxidizer will be designed to oxidize the tail gas from the sulfur recovery unit. Any unreacted H_2S , CS_2 , COS , elemental sulfur, and any other combustible sulfur compounds in the gas will be oxidized almost entirely to SO_2 in the thermal oxidizer. The design thermal oxidizer combustion temperature will be maintained by burning a syngas stream or a low-sulfur fuel oil or natural gas in addition to the process effluent vapor. The oxidized products will be dispersed to the atmosphere via a 199-ft high stack. Under normal operations, only the tail gas treating unit vent gas will be oxidized in the thermal oxidizer.

The sulfur by-product will be of marketable-grade quality (i.e., greater than 90 percent purity). Approximately 90 tpd of sulfur by-product will be generated from the sulfur recovery unit when the IGCC unit is operating at full load and 100 percent of the syngas for the unit is treated in the CGCU system. The sulfur recovery unit will have a sulfur day tank within a concrete pit. The tank will have approximately a 10-day storage capacity. Heat will be provided by steam coils at the bottom of the pit. The tank will have pumps to transfer the molten sulfur to either the truck loading rack or the railcar loading rack for transport offsite. Additional storage capacity for the sulfur by-product may also be provided in specially-designed rail cars.

3.1.1.9 Tail Gas Treating Unit

The sulfur recovery unit will typically convert approximately 96 percent of its H_2S feed gas to molten liquid sulfur. However, the concentration of H_2S and SO_2 in the tail gas from the sulfur recovery unit may still be too high to release to the atmosphere under normal operating conditions. The tail gas treating unit will be designed to recover this remaining H_2S and SO_2 for recycle back to the sulfur recovery unit and meet applicable emission levels in the tail gas vented to the

atmosphere. Reaction and recovery sections of the tail gas treating unit are presented schematically in Figures 3.1.1-7 and 3.1.1-8, respectively.

As shown in Figure 3.1.1-7, the sulfur recovery unit tail gas will be fed to the feed heater, and hydrogen-rich reducing gas will be added to the heated gas leaving the feed heater. The mixed gas stream will be fed to a catalytic reactor. The reactor feed gas will pass downward through the catalyst bed and virtually all of the SO_2 , sulfur, COS, and CS_2 will be converted to H_2S . In the reactor, the following basic reactions of SO_2 and elemental sulfur will take place:

1. $\text{SO}_2 + 3\text{H}_2 \rightarrow \text{H}_2\text{S} + 2\text{H}_2\text{O}$, and
2. $\text{S} + \text{H}_2 \rightarrow \text{H}_2\text{S}$.

The COS and CS_2 will be hydrolyzed by the water vapor present in the sulfur recovery unit tail gas to H_2S and CO_2 . A small portion of the COS and CS_2 may not be hydrolyzed by water vapor present and may be reduced by hydrogen directly to H_2S . To assure complete reaction of the COS and CS_2 to H_2S , a minimum excess of approximately 50 percent of the stoichiometric requirement of hydrogen-rich gas will be fed to the reactor. The CO in the sulfur recovery unit tail gas will also act like hydrogen as a reducing gas; i.e., it reacts with the water vapor in the reactor to form hydrogen and CO_2 . Therefore, minimal unreacted sulfur compounds will remain in the reactor outlet.

The hot gas leaving the reactor will be cooled in the waste heat boiler, which will generate steam. Water will be condensed out of the gas when it is further cooled by direct contact with the circulating quench water in the quench tower. The temperature of the quench water will increase as it cools the gas in the tower. The quench water bottoms will be pumped through the quench water cooler and quench water trim cooler before being returned to the top section of the quench tower. A slipstream of the quench water flow will be routed through the quench water filter to remove solids in the quench water.

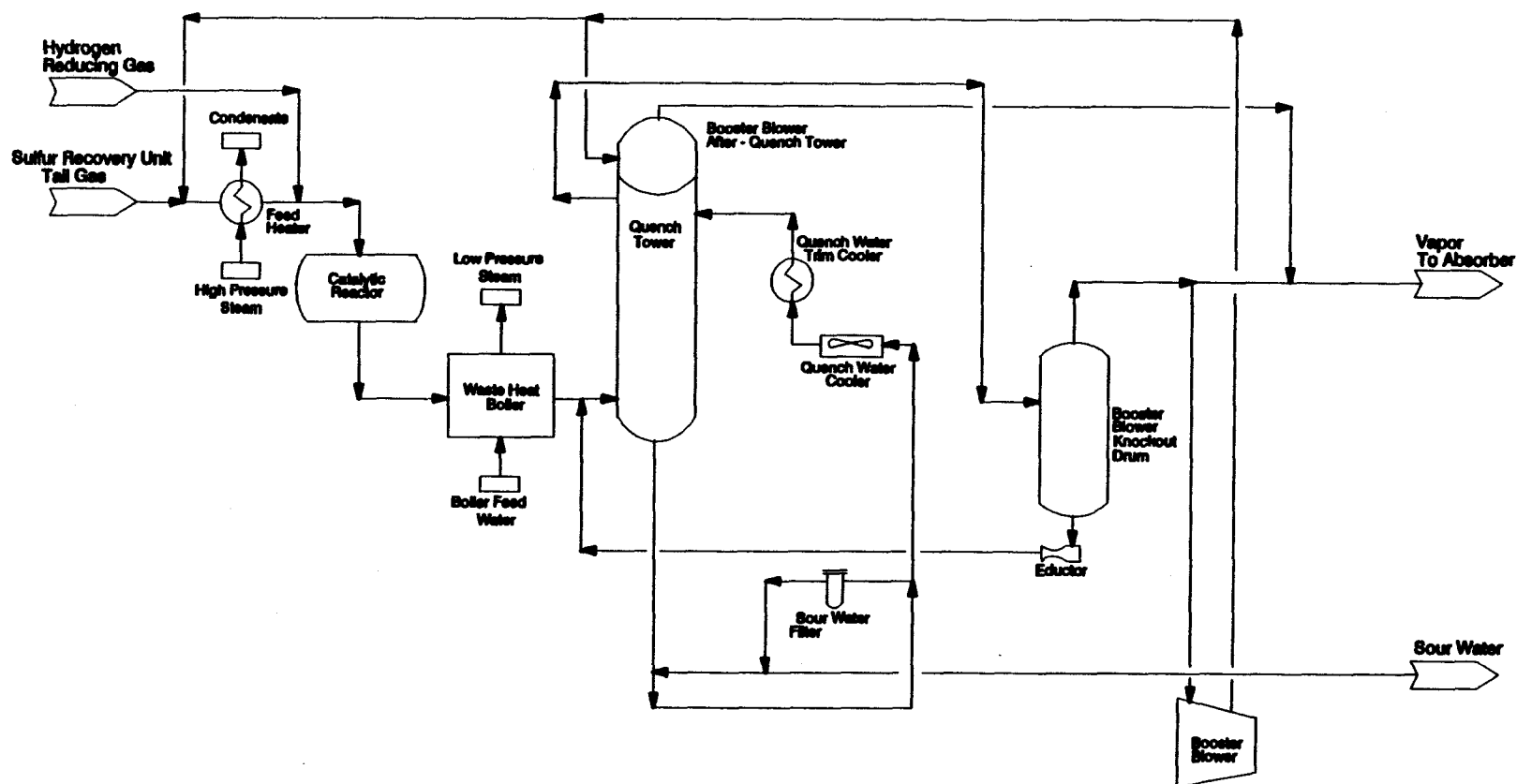


FIGURE 3.1.1-7.

TAIL GAS TREATING UNIT REACTION SECTION SCHEMATIC

Source: Texaco, 1992.



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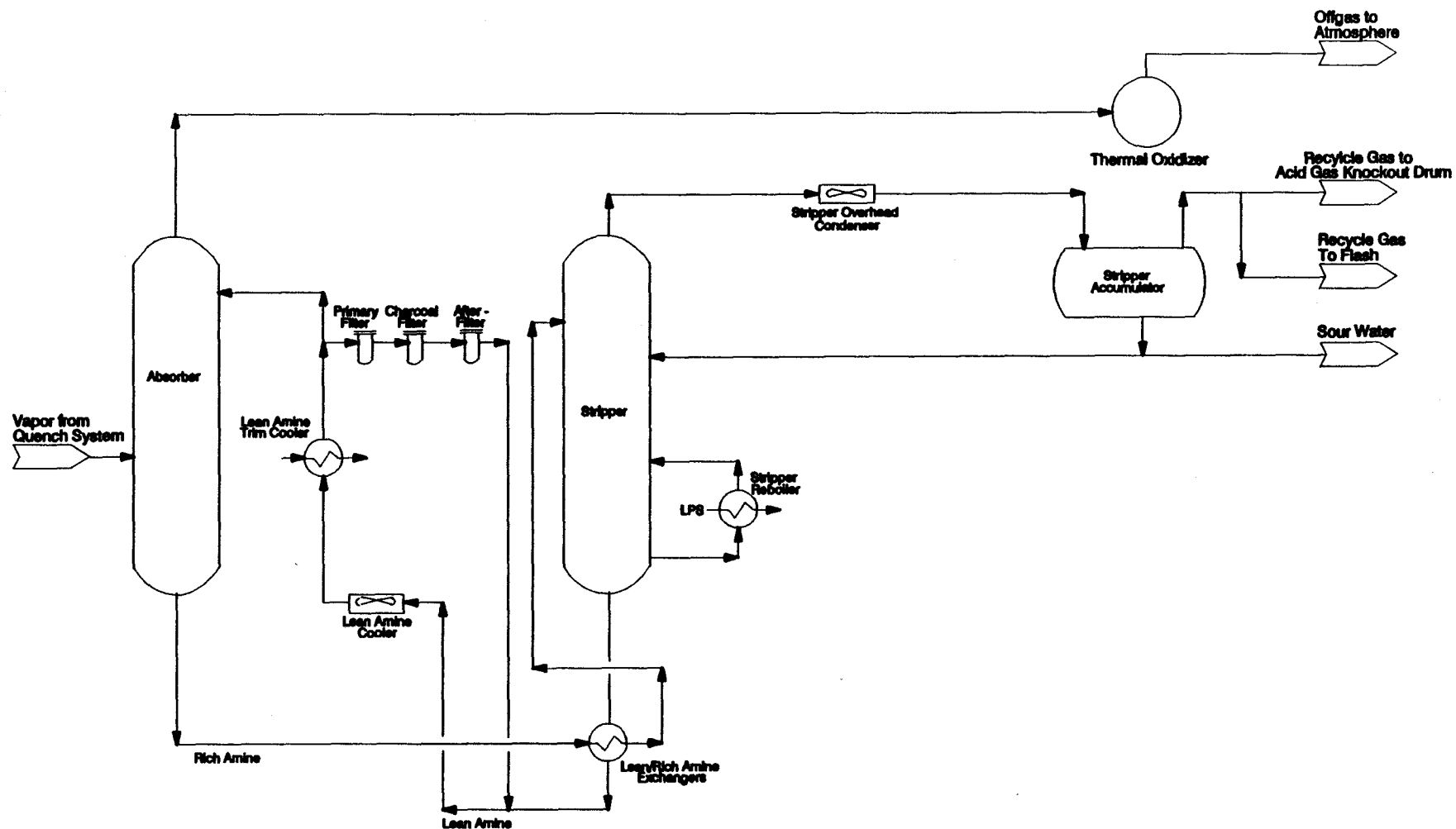


FIGURE 3.1.1-8.

TAIL GAS TREATING UNIT RECOVERY SECTION SCHEMATIC

Source: Texaco, 1992.



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The quench tower overhead gas stream will be fed to the booster blower knockout drum where any entrained liquid will be separated from the gas. The separated liquid will then be removed and returned to the quench tower bottoms above the normal liquid level. From the booster blower knockout drum, the gas normally will go to the absorber where it flows upward through the absorber through lean amine flowing downward in the absorber to remove the H_2S . The absorber overhead gas, which will have less than 260 parts per million volumetric (ppmv) of H_2S , will be fed to the thermal oxidizer. In the thermal oxidizer, H_2S and any other remaining sulfur compounds will be converted to SO_2 and vented to a stack.

3.1.1.10 Hot Gas Cleanup and Offgas Treating Systems

A schematic of the HGCU system is presented in Figure 3.1.1-9. For the system demonstration, a portion of the hot raw syngas will be routed from the gasifier to the HGCU system for cleanup prior to firing in the advanced CT.

Particulate Removal

Entrained fine particles in the syngas from the gasifier will be removed in the primary high efficiency cyclone as shown in Figure 3.1.1-9 and recycled to the black water handling system. A large fraction of the remaining PM entering the absorber will be captured by the bed, reducing particle concentration to below 30 ppm. A small amount of zinc titanate fines will be entrained from the absorber and collected in a high efficiency secondary cyclone. The high efficiency secondary cyclone will effectively capture most of the high-density zinc titanate dust and will practically eliminate all fines larger than 5 microns. Entrained particles from the regenerator will be captured in a cyclone located downstream of the regenerator. The solids from both the high efficiency secondary cyclone and the regenerator cyclone are non-hazardous and will be sent offsite for disposal. Larger fines will be sieved on screens at the regenerator sorbent outlet. Fugitive fines from the screens will be collected in a small, low temperature bag filter. The sorbent fines from both collection points will be recycled to the catalyst supplier. A high temperature barrier filter, employing

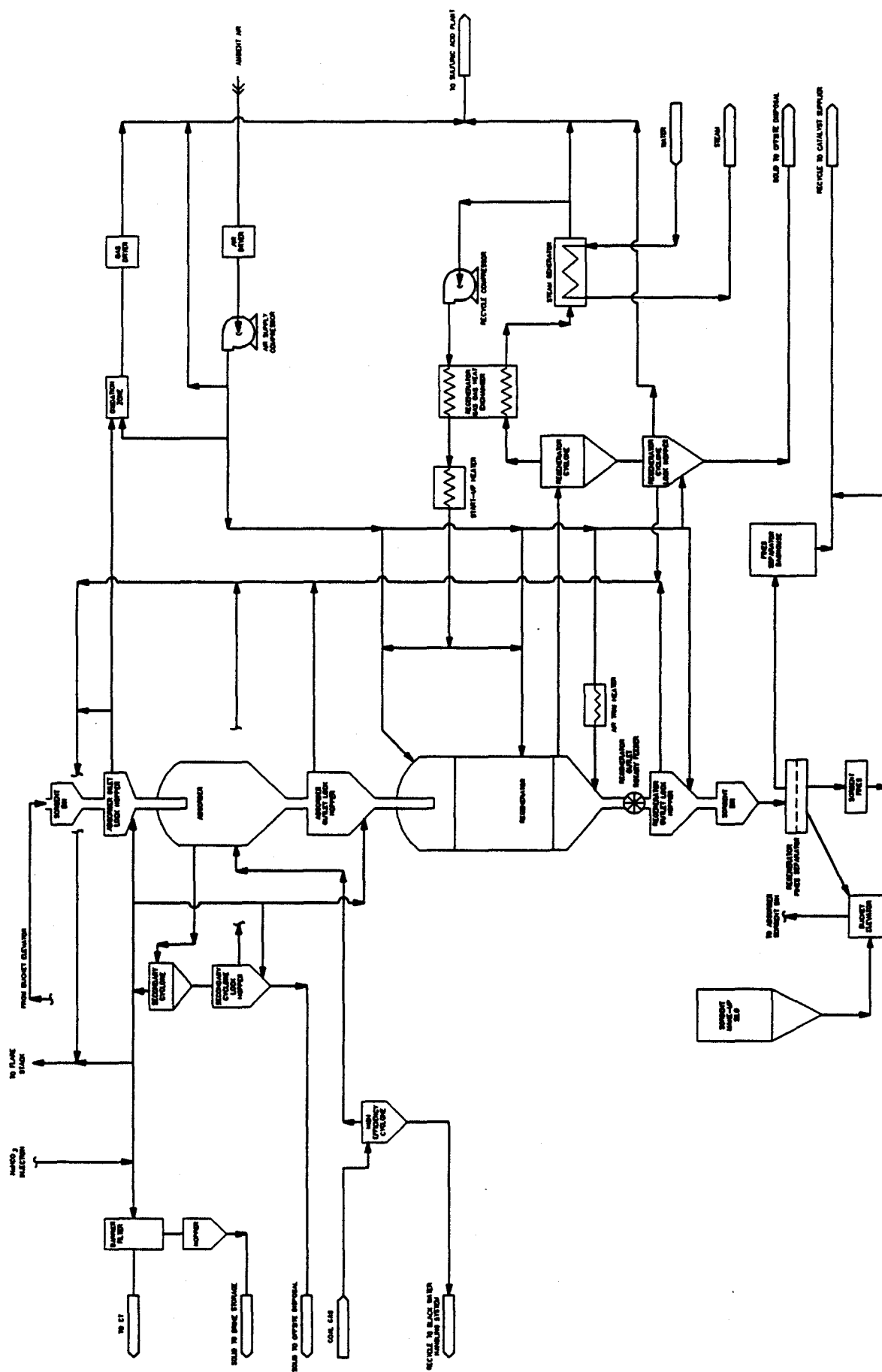


FIGURE 3.1.1-9.

HOT GAS CLEANUP SYSTEM

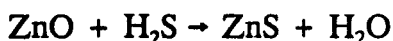
Source: GEESI, 1992.

pulse cleaning, will remove greater than 99.5 percent of the residual PM prior to the CT. The collected solids will be sent to the onsite brine disposal area.

Desulfurization

The absorber is the intermittently moving bed reactor shown schematically in Figure 3.1.1-9. The sulfur-laden coal gas from the primary cyclone will enter the absorber through a gas manifold at its bottom and flow upward countercurrent to the moving bed of zinc titanate pellets.

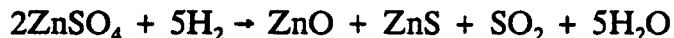
The sulfur compounds, mainly H₂S, in the syngas react with the sorbent according to:



The syngas leaving the absorber is expected to contain less than 30 ppmv of H₂S and COS.

The absorber bed will be stationary at low H₂S outlet concentrations and will be moved upon H₂S breakthrough. The H₂S breakthrough control signal will activate solids flow from the bottom of the absorber into the absorber's outlet lockhopper, causing the bed and the reaction zone to move downward by gravity. The displaced sulfided zinc titanate will be replaced by regenerated sorbent from the absorber's inlet lockhopper.

When regenerated zinc titanate sorbent is loaded into the absorber's inlet lockhopper, a slip stream of syngas can be activated. This stream will decompose any zinc sulfate residual from the regeneration step according to:

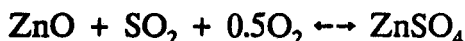
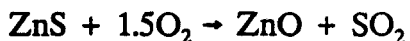


The reductive regeneration stream will flow through the absorber's inlet lockhopper until complete sulfate decomposition, detected by low SO₂ concentration, is achieved. The amount of sulfate in the regenerated zinc titanate will depend on the quality of the regeneration step, and is expected to be very small.

Regeneration

The ability to regenerate and recycle the sorbent is essential for economically viable hot syngas desulfurization. The regeneration step is a highly exothermic oxidation process requiring careful temperature control. Too high a temperature will sinter and destroy the sorbent structure and reduce its ability to react with sulfur in consecutive absorption steps. Low temperature will result in sulfate formation and a loss of reactive sorbent to the desulfurization process.

In order to effectively control the reaction and achieve a complete regeneration, the reactor will be divided into up to three zones. As the sorbent moves down the reactor zones, the reaction proceeds in a controlled atmosphere. Nearly continuous sorbent movement in the regenerator will be controlled by the rotary feeder at its bottom. The chemical reactions in the regenerator are:



The sulfation reaction will be reversible and favor the formation of sulfate at low temperatures in the presence of oxygen. Zinc sulfate will be formed in the initial stage of regeneration, but will decompose under the high-temperature, low oxygen concentration conditions at the lower end of the regenerator prior to introduction of the pure air stream.

Sulfided zinc titanate will be fed from the absorber's outlet lockhopper to the top of the regenerator where partial oxidation of the sulfided sorbent occurs. The sorbent will move down the reactor in cocurrent flow with the regeneration gas. The regeneration gas will flow downward from the top of the regenerator into the second-stage regeneration zone. Oxygen concentration will be controlled to limit the gas temperature. Under these conditions, no thermal damage will occur to the sorbent. The relatively low temperature in the first regeneration stage will result in the formation of some sulfate. This sulfate will decompose at the higher temperature during further regeneration.

The sorbent and the regeneration gas, mixed with the gas stream from the primary stage, will flow concurrently downward into the final regeneration stage. The oxygen concentration will be controlled by the ratio of air to recycle gas to limit the temperature in the bed. The recycle flow rate will be controlled to maintain oxygen concentration at the gas outlet from the regenerator. The high outlet temperature of the gas and sorbent at the end of secondary regeneration will ensure complete sulfate decomposition.

The final polishing phase of regeneration will be accomplished at the lower end of the reactor where dry air flows countercurrent to the sorbent. This stream will cool the sorbent to a temperature acceptable for downstream equipment, purge the SO₂-rich gas, and ensure complete regeneration. The gas streams from the cocurrent and countercurrent flows will mix to form the recycle gas stream.

Regeneration Gas Recycle Subsystem

The regeneration gas recycle is shown in Figure 3.1.1-9 and operates in a closed loop with dry air as an input and an SO₂-rich gas as a product output. The regeneration gas recycle loop will be designed as an internal diluent that will reduce the oxygen concentration in the air to the desired levels without the use of externally provided diluents such as steam or nitrogen. Using recycle rather than external inert diluent will also enrich the SO₂ concentration of the product stream.

The heat exchangers in the recycle loop will be designed to control the temperature of the regenerator inlet streams. The steam generator will remove the heat generated during the regeneration reaction by cooling the recycle gas stream. The recycle compressor will operate at a sufficient suction temperature to avoid H₂SO₄ condensation and a regenerative gas heat exchanger will reheat the compressed gas for recycle to the regeneration process. The heat of combustion of the sulfur will be transferred to the CC power block through the steam generated prior to recycle compression of the recycle gas stream.

Halogen Removal

Commercial grade sodium bicarbonate, trade named Nahcolite, will be injected with a small quantity of high temperature nitrogen, upstream of the barrier filter as shown in Figure 3.1.1-9. Chloride and fluoride species will be removed by direct contact reaction and on the barrier filter media with the sodium bicarbonate forming stable solids. These salts will be routed to the barrier filter hoppers for disposal in the onsite brine disposal area.

Sulfuric Acid Plant

In the HGCU process, an offgas is produced which has a high SO_2 concentration. For the proposed project, this offgas will be treated by converting the SO_2 to H_2SO_4 . The conversion involves a multi-step catalytic process based on proven technology in widespread commercial use, especially within the chemical fertilizer industry in central Florida. The liquid H_2SO_4 produced by this process is commercial grade and will be marketed and sold by Tampa Electric Company for offsite uses.

A skid-mounted H_2SO_4 unit will be constructed adjacent to the CG facilities on the site. The facilities will include an aboveground tank to provide for temporary storage of the H_2SO_4 by-product and appropriate handling and loading equipment. The H_2SO_4 will be transported offsite for commercial use in specially-designed rail cars or trucks. Assuming the HGCU system is used to cleanup approximately 50 percent of the syngas for the IGCC unit at 100-percent generating capacity, the unit would produce approximately 45,000 tons per year (tpy) of liquid H_2SO_4 by-product.

3.1.1.11 Power Production

The power production system for the IGCC unit is illustrated in Figures 3.1.1-10 and 3.1.1-11. The key components are the advanced CT, HRSG, and ST generator. The advanced CT will be a GE 7F. The unit will be designed for low- NO_x emissions firing syngas, with low sulfur fuel oil for startup and as backup fuel.

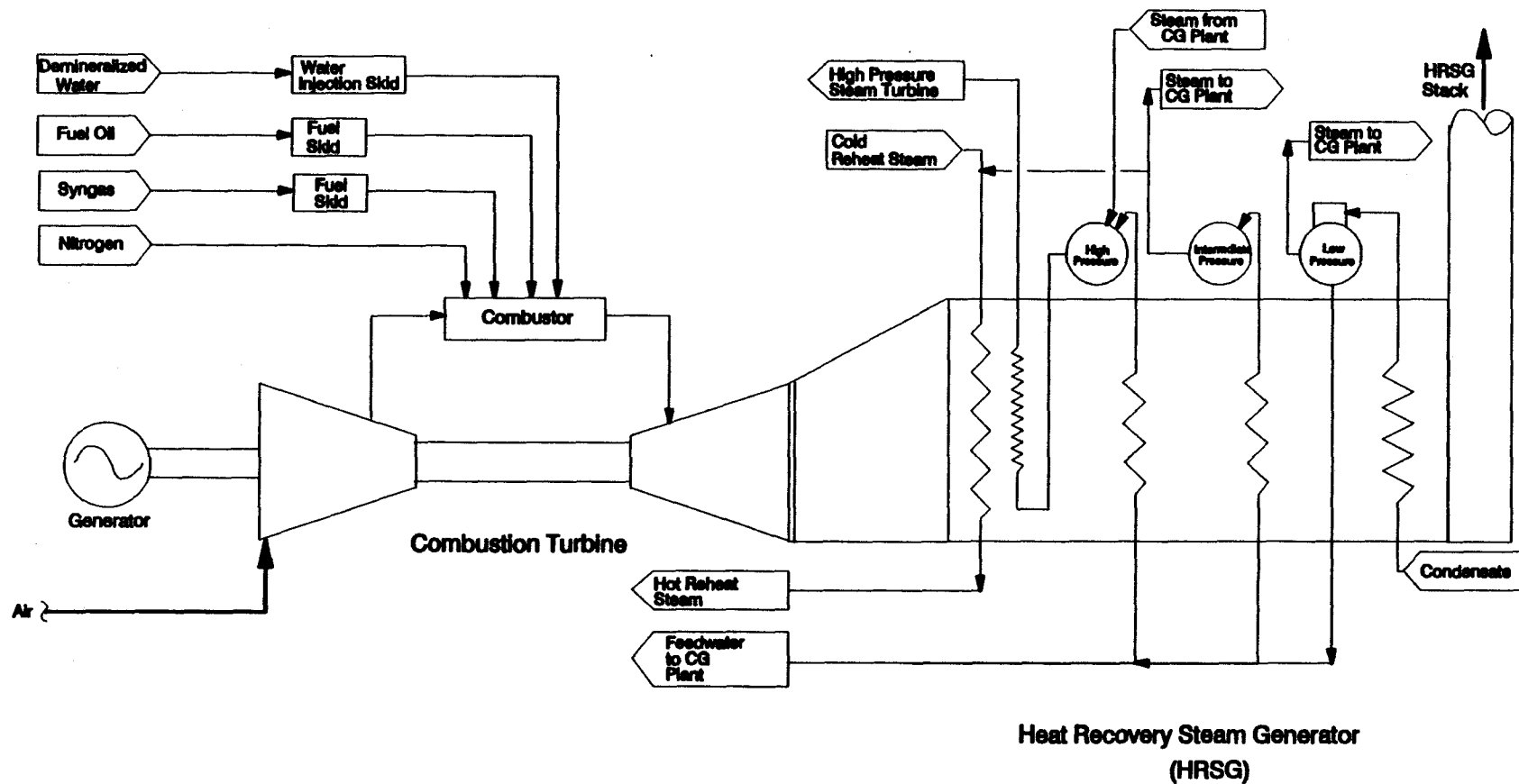


FIGURE 3.1.1-10.

COMBUSTION TURBINE PROCESS FLOW SCHEMATIC

Source: GE, 1992.



**POLK
POWER
STATION**

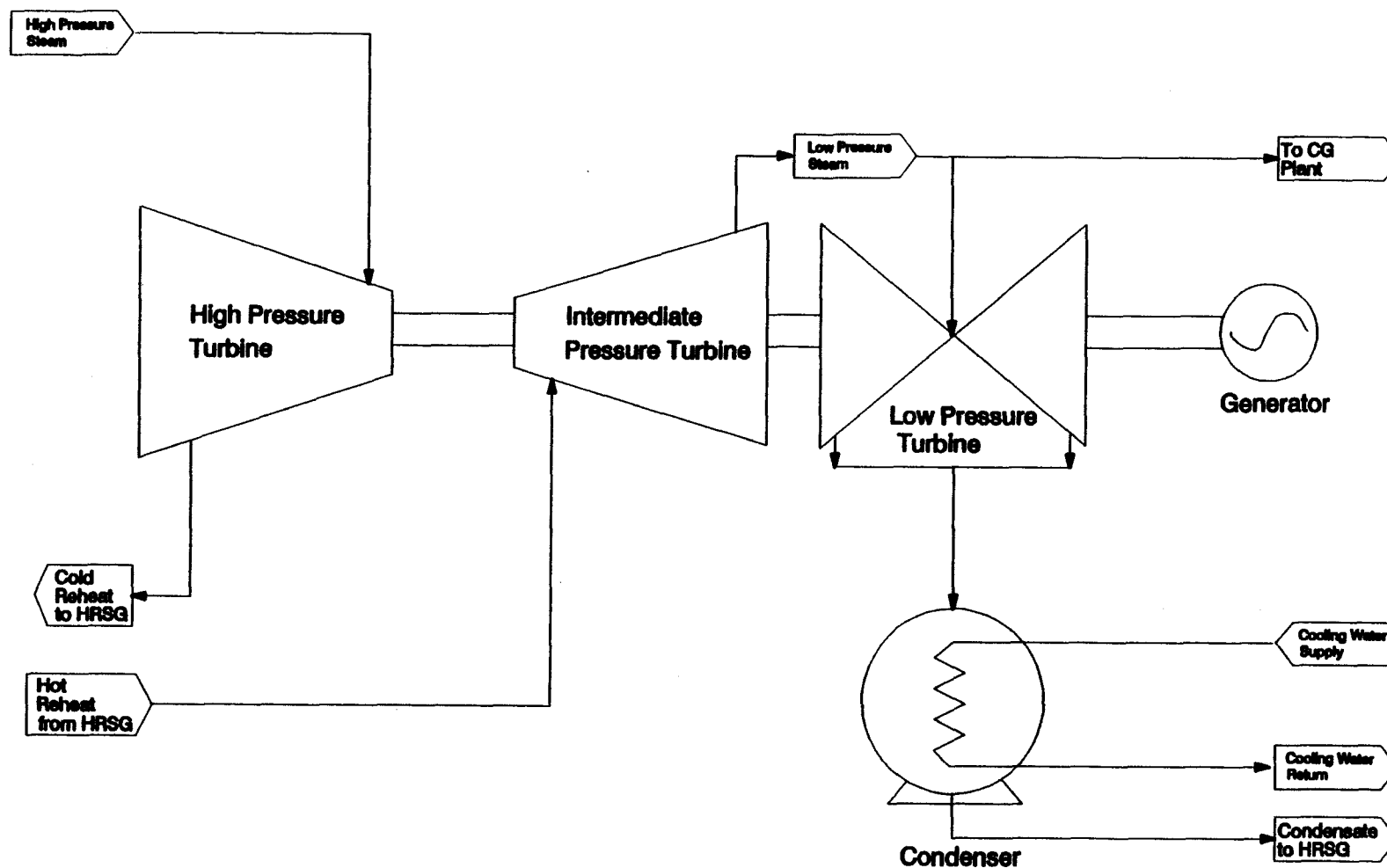


FIGURE 3.1.1-11.

STEAM TURBINE PROCESS FLOW SCHEMATIC

Source: GE, 1992.



**POLK
POWER
STATION**

One HRSG will be employed to recover the CT exhaust heat and generate steam to power the ST. The HRSG will be a three-pressure level, reheat, natural circulation design. The HRSG will produce high pressure superheated steam for the high pressure ST, and will reheat the high pressure turbine exhaust steam for admission into the intermediate pressure ST. The HRSG will also produce intermediate pressure steam which is combined with high pressure turbine exhaust steam (cold reheat steam). Low pressure steam will be produced for supply to the CG facilities for process use. The HRSG will receive additional high pressure steam and heat energy from the CG facilities to supplement the steam cycle power output. No auxiliary firing is proposed within the HRSG system.

The ST will be designed as a double flow reheat with low pressure crossover extraction. The ST generator will be designed specifically for highly efficient CC operation with nominal turbine inlet throttle steam conditions of approximately 1,450 psig and 1,000°F with 1,000°F reheat inlet temperature.

The operation of the CC power plant will be coordinated with the startup and operation of the CG process plant. The initial startup of the power plant will be carried out on low-sulfur distillate fuel oil. Transfer to syngas will occur upon establishment of fuel production from the CG plant.

Under normal operation, syngas and nitrogen from the air separation unit will be provided to the CT. The syngas/nitrogen mix in the CT combustion chamber will be regulated by the CT control system to control the NO_x emission levels from the unit.

Hot exhaust from the CT will be channeled through the HRSG to recover the CT exhaust heat energy. The HRSG high pressure steam production will be augmented by high pressure steam production from the CG plant. All high pressure steam will be superheated in the HRSG before delivery to the high pressure ST.

Cold reheat steam from the high pressure turbine exhaust and HRSG intermediate pressure steam will be combined before reheating in the HRSG and subsequent admission to the intermediate pressure ST. Some intermediate pressure steam will also be supplied from the HRSG to the sulfur recovery unit.

Additional low level energy integration will occur between the HRSG and the CG plant. Low pressure steam will be provided by the HRSG to the CG facilities for process use, and some low level waste heat in the CG facilities will be used for condensate heating for the HRSG. Extraction steam from the low pressure crossover will be available to supplement the HRSG low pressure steam production for the CG facilities when necessary. The low pressure turbine will exhaust to a water cooled condenser which will receive cooling water from the cooling reservoir. Condensate from the ST condenser will be returned to the HRSG/integral deaerator by way of the CG facilities, where some condensate preheating occurs.

Emissions from power production will result from the combustion of fuels in the advanced 7F CT. During the first year of operation (i.e., prior to conversion to IGCC), the CT emissions will exit via a temporary CT stack. After conversion, the temporary CT stack will be removed, and emissions will exhaust via the HRSG stack.

3.1.2 COMBINED CYCLE UNIT DESCRIPTIONS

General descriptions of the CC and CT unit electric generating technologies were provided in Section 1.5.

As shown in Table 3.1.0-1, the proposed Polk Power Station will include two nominal net 220-MW CC units. Each of the CC units is expected to be comprised of two 75-MW CTs, two HRSGs, and one ST generator. The CTs will be designed with dry low-NO_x combustors to control NO_x air emissions when firing natural gas which will be the primary fuel for the units. NO_x emission control will be by water injection when the units are fired on the backup low-sulfur distillate fuel oil. SO₂ air emissions from the units will be controlled by the use of fuels with low sulfur contents (i.e., natural gas with trace sulfur content and fuel oil with a maximum sulfur content of 0.05 percent). The CTs will also be designed with by-pass exhaust stacks to be capable of operating in both CC and simple-cycle modes.

For each CC unit, two HRSGs (one per CT) will be employed to recover exhaust heat from the CTs and produce steam to power the ST generator. The HRSG/ST generator facilities will have a nominal net 70 MW generating capacity.

The two CC units will be capable of operation of up to a 100-percent capacity factor annually when fired on natural gas and up to a 25-percent annual capacity factor when fired on the backup, low-sulfur distillate fuel oil.

The CC units will require water for the steam generating cycle (i.e., boiler makeup and condenser cooling) and other plant uses as well as air emissions control when fired on backup fuel oil (see Section 3.5.4.1). Makeup water for the HRSG boiler, emission control, and other plant process water will be provided by treated waters from onsite wells in the Floridan aquifer. When fired on backup fuel oil, water injected into the CTs for NO_x emission control is evaporated and creates no wastewater. All process wastewaters from the facilities will be treated, as appropriate, in the onsite industrial wastewater treatment system and routed to the cooling

reservoir for reuse. A description of the industrial wastewater treatment system is provided in Section 3.5.4.3.

Water for condenser cooling will be provided from and returned to the cooling reservoir. Descriptions of the cooling reservoir and its operations are provided in Section 3.5.1.

3.1.3 COMBUSTION TURBINE UNIT DESCRIPTIONS

The proposed Polk Power Station will also include six stand-alone, simple-cycle CT units. Each of the CTs will have a nominal net generating capacity of 75 MW, similar to the CTs comprising the CC units. Also, like the CTs in CC mode, the stand-alone CTs will be designed with dry low-NO_x combustors to control NO_x air emissions when firing natural gas, the proposed primary fuel for the units. NO_x emission control will again be accomplished by water injection when the units are fired on the backup distillate fuel oil. SO₂ air emissions from the CTs will be controlled by the use of low sulfur fuels (i.e., natural gas with only trace sulfur content and distillate fuel oil with a maximum sulfur content of 0.05 percent).

The CT units will be capable of operating up to a 50-percent annual capacity factor when fired on natural gas and 10 percent when fired on the backup fuel oil.

When fired on fuel oil, the CTs will require demineralized water for NO_x emission control by water injection. The injected water is evaporated in this emission control process and creates no wastewater. The CTs will require water for periodic and low volume uses such as non-chemical cleaning, washdowns, pump and equipment gland seals, and flushes. Wastewaters from these uses will be collected and appropriately treated in the industrial wastewater treatment system.

3.1.4 ASSOCIATED FACILITIES DESCRIPTIONS

To support the overall operations of the proposed electric generating units for the Polk Power Station project, various associated facilities and reclaimed areas will be constructed and operated on the site and certain associated facilities will be developed offsite. In addition to the facilities previously described in this section, the proposed directly associated facilities and areas will include the following:

- Access roadways and rail spur;
- Coal delivery, handling, and storage facilities;
- Natural gas and fuel oil delivery and storage facilities;
- Process, service, and potable water supply facilities;
- Domestic and industrial wastewater treatment systems;
- Cooling reservoir and discharge facilities;
- By-product slag, sulfur, and H₂SO₄ handling, temporary storage, and shipping facilities;
- Stormwater collection and management systems;
- Substation and associated electric transmission line facilities; and
- Wildlife management/corridor area.

These associated facilities are described in the following subsections or references are provided to appropriate sections of this SCA which contain descriptions of these facilities and their processes and operations.

3.1.4.1 Access Roadways and Rail Spur

Roadway access to the main power plant facilities will be provided by two entrances on SR 37 and an entrance from Fort Green Road. All entrance roads will include appropriate geometric improvements at the intersections with the existing roadways in order to maintain acceptable LOS standards on the existing roadway network. Also, all entrance roads will have security gates to control access to the site. The southernmost entrance from SR 37 will be the main and employee entrance to the facilities. The northern entrance from SR 37, opposite Bethlehem Road, and the

entrance from Fort Green Road will be used primarily for deliveries and for construction and operational contractor access to the site.

A railroad spur will be constructed from the existing CSX Railroad line which runs along the east side of Fort Green Road on the eastern boundary of the Polk Power Station site to the main power plant facilities area. Except for an approximately 200-ft segment to cross Fort Green Road, the rail spur will be located within the boundaries of the site. On the site, the rail spur will be approximately 1.5 miles with a rail loop at the end to provide for turning and storage of trains. The rail spur access to the site will be used for the delivery of coal and other materials and equipment to the site during construction and operation and for transport offsite of by-products (i.e., slag, sulfur, and H_2SO_4) from the IGCC facilities.

3.1.4.2 Fuel Delivery, Handling, and Storage Facilities

The coal handling system will receive, store, reclaim, and transport coal from unit railroad cars and/or trucks to the coal preparation system serving the IGCC unit. The coal will be stored in an approximately 10-acre area on the site, including the surrounding berm and runoff basin. The coal storage area will be lined with a synthetic material or other material with similar low-permeability characteristics and include leachate and stormwater collection systems. The onsite coal handling and storage facilities are described in detail in Section 3.3.1.

Natural gas will be used as the primary fuel for the stand-alone CT and CC units planned for the Polk Power Station. Natural gas will be delivered to the site via a pipeline from either the existing or future natural gas transmission system in the region. Natural gas will not be stored on the Polk Power Station site. The proposed natural gas supply and delivery plans are described in Sections 3.3.2 and 6.2.

Initially, No. 2 fuel oil will be used as a primary fuel for the advanced CT unit planned for the Polk Power Station during its first year of operation, after which the CT will be converted to the IGCC unit. Fuel oil will be delivered to the site by

tanker truck and/or rail. Based on current fuel cost forecasts, Tampa Electric Company anticipates that fuel oil will serve primarily as a backup fuel for the stand-alone CT and CC units and IGCC unit in CC mode after the initial project phase. Tampa Electric Company's proposed plans for fuel oil supply, delivery, and storage are described in Section 3.3.3.

3.1.4.3 Water Supply Facilities

Water to supply the potable, process, and cooling reservoir makeup needs for the operations of the Polk Power Station will be provided from groundwater withdrawn from the Floridan aquifer through onsite wells. After full build-out of the proposed facilities, the onsite wellfield to provide these operational water requirements will ultimately consist of two 10-inch and two 24-inch production wells which will be screened within the Floridan aquifer starting at a depth of approximately 300 ft bls to approximately 900 to 1,000 ft bls. Also, after full build-out, the total estimated groundwater withdrawals for potable, process, and cooling water makeup uses will be approximately 9.3 MGD on a maximum daily basis and approximately 6.6 MGD under average annual operating conditions. These estimated withdrawals are based on the use of water injection for NO_x control for the stand-alone CC and CT units when fired on the backup fuel oil.

Descriptions of the water supply requirements for the Polk Power Station operations and proposed treatment systems to provide water of suitable quality for the required uses are provided in Section 3.5 of this SCA.

3.1.4.4 Domestic and Industrial Wastewater Treatment Systems

Domestic Waste Treatment System

Discharges from domestic water uses such as from showers, wash basins, bathrooms, and drinking fountains are expected to result in approximately 10,500 gpd of combined sanitary wastewater flow on an average daily basis. This wastewater flow will be treated in an extended aeration-type package unit which will be constructed on the site. After appropriate treatment, effluent from this proposed sanitary waste

treatment system will be discharged to the cooling reservoir for reuse in the heat dissipation system. Sludge will be periodically removed from this system by vacuum truck for offsite disposal in an appropriately licensed landfill. Section 3.5.2 provides a detailed description of proposed sanitary wastewater treatment system and processes.

Industrial Wastewater Treatment System

An overall industrial wastewater treatment (IWT) system will be constructed on the site to collect and appropriately treat process and service wastewater from the stand-alone CC and CT units and the CC module of the IGCC unit (e.g., non-chemical cleaning wastes and boiler blowdown from HRSG); stormwater runoff from the coal, slag, sulfur, IWT sludge, brine, and H₂SO₄ storage areas; runoff from the power block equipment areas of the IGCC, CC, and CT units; and potable and process water treatment (filter backwash water and demineralizer regeneration waste). As discussed previously in Section 3.1.1.6, a separate zero liquid discharge water handling system will be provided for process waters from the CG and syngas cleanup systems. Also, wastewaters produced from the periodic chemical cleaning of equipment (i.e., HRSG boilers) will be collected and temporarily stored in a holding tank prior to being trucked offsite by a licensed contractor for appropriate treatment and disposal.

The proposed IWT system will be designed to treat wastewater on a continuous basis and will be comprised of the following basins and units:

- Oil/water separation;
- Wastewater equalization basin (in addition to the coal pile, slag pile, brine, and IWT sludge storage area runoff basins),
- Wastewater neutralization/oxidation tank,
- Clarification,
- Chemical restabilization tank,
- Filtration, and
- Sludge handling system.

After treatment, the effluent from the IWT system will be routed to the cooling reservoir for reuse in the heat dissipation and condenser cooling system. The sludge filter cake produced by the system will be temporarily stored onsite in a lined area with a stormwater collection system prior to transport offsite for commercial use or disposal in a licensed landfill. The proposed temporary sludge storage area will be capable of storing up to 5 years of sludge generated by the treatment system.

Sections 3.5.4.3 and 3.5.4.4 provide detailed descriptions of the process wastewater sources and the overall IWT system and processes.

3.1.4.5 Cooling Reservoir

The steam electric generating components of the proposed IGCC unit and two CC units require water to cool or condense the exhaust steam from the STs. The waste heat transferred to the cooling water must then be rejected to the atmosphere. The proposed cooling/heat rejection system for the Polk Power Station will be a cooling reservoir.

The proposed cooling reservoir will be constructed in areas which have been mined for phosphate and currently consist of water-filled mine cuts between rows of overburden spoil piles. The reservoir will occupy an area of approximately 860 acres, including the areas of the surrounding and internal earthen berms. The reservoir will be a primarily below-grade facility after final contouring and development of the site. The maximum elevation of the bottom of the reservoir will be approximately 120 ft-NGVD and the top of the surrounding and internal berms will be 145 ft-NGVD. The finish grade on the main power plant facility area will be between 140 and 145 ft-NGVD. Under normal operating conditions, water levels in the reservoir will be approximately 136 ft-NGVD, and the total water surface area will be approximately 727 acres.

The top of the earthen berms, both surrounding and internal, will be approximately 25 ft wide to provide access for inspection and maintenance purposes. The berms

will be constructed with gentle slopes (4 ft horizontal to 1 ft vertical) to minimize potential erosion and visual quality effects. The berms will also be re-vegetated after construction and the vegetation will be appropriately controlled and maintained to prevent future erosion.

Intake and discharge structures to provide and subsequently discharge the condenser cooling water will be constructed within the cooling reservoir. The estimated circulating, condenser cooling water flow requirements are approximately 115,800 gpm for the IGCC unit, including the air separation unit, and a total of approximately 247,000 gpm after build-out of the two CC units. The discharged circulating water will have a higher temperature than the intake water. This warmed water will be routed throughout the reservoir area by the internal berm system and cooled through evaporation prior to intake and reuse in the system.

Water lost from the cooling reservoir by both naturally-occurring and forced (i.e., heat rejection) evaporative processes will be replaced by several water sources in order to minimize groundwater withdrawals for makeup purposes. The cooling reservoir makeup sources will include rainfall directly to the reservoir and runoff from the surrounding and internal berms; treated wastewater from the sanitary and IWT systems, including treated runoff from the coal, slag, and sulfur storage areas and power block areas; and groundwater seepage from the surficial aquifer. Additional makeup water will be provided from onsite wells in the Floridan aquifer. The pumped groundwater makeup requirements are estimated to be approximately 5.0 MGD on an annual average basis and 6.5 MGD on a maximum daily basis.

The cooling reservoir will be designed with an outfall control structure to provide for the discharge of water from the reservoir for water quality management, berm and vegetation maintenance, and unanticipated emergency purposes. Surface water discharges from the reservoir are estimated to be approximately 3.1 MGD on an annual average basis. The discharge will be routed to the reclaimed lake on the eastern edge of the site and then offsite to the Little Payne Creek system.

Section 3.5.1 provides a detailed description of the cooling reservoir heat dissipation system and processes, while Section 5.1 describes the expected effects of the system operations and discharges.

3.1.4.6 By-Product Slag, Sulfur, and Sulfuric Acid Storage Facilities

By-products from the CG and syngas cleanup processes will include slag, sulfur, and H_2SO_4 . Each of these by-products have commercial uses and will be marketed and sold by Tampa Electric Company for those offsite uses. Therefore, only temporary storage facilities for these by-products will be provided on the Polk Power Station site and the proposed project will include facilities for the handling, loading, and transport of these by-products from the site.

Slag Storage Area

Slag will be produced in the CG process and fine slag filter cake material will be produced in the water scrubbing process to remove entrained solids from the syngas. Slag material is a vitrified or glass-like solid which is non-leachable and salable as an abrasive, roof material, industrial filler, aggregate for concrete, or road base material. Tampa Electric Company is currently seeking long-term contracts for the sale of the slag by-product.

In the event that the slag by-product cannot be sold for offsite uses in a timely manner, a temporary storage area will be developed on the site. Initially, an area will be developed to be capable of storing slag generated by approximately 1 year of operation of the IGCC unit at full capacity. Additional 1-year storage areas will be developed as needed in the unexpected event that sales of the slag for offsite uses are less than the slag production rates. The temporary slag storage area shown on the site layouts in Figures 3.2.0-1 and 3.2.0-2 would provide sufficient capacity for developing storage cells for up to 5 years of slag production from the IGCC unit operating at 100-percent capacity. The slag storage area will include a stormwater runoff collection basin and surrounding berm to prevent runoff from the area. Both the slag storage area and the runoff collection basin will be lined with a synthetic

material or other materials with similar low permeability characteristics. The runoff basin will be designed to contain runoff water volumes equivalent to 1.5 times the 25-year, 24-hour storm event. Water collected in the runoff basin will be pumped to the overall IWT system.

Sulfur Storage Facilities

An elemental sulfur by-product will be produced in the proposed sulfur recovery process which will be used to treat the acid gas removed from the syngas and to treat tail gas from the sulfur recovery unit in the overall CGCU system. These systems were described previously in Sections 3.1.1.8 and 3.1.1.9. This sulfur by-product will also be marketable for offsite use, especially with the central Florida chemical fertilizer industry. Approximately 90 tpd of sulfur in a molten state will be produced in the sulfur recovery system, assuming that 100 percent of the syngas fuel for the IGCC is being treated in the CGCU system at a 100-percent generating capacity.

Temporary storage of the molten sulfur by-product will be provided on the site in tanks which will be contained within a concrete-lined pit. The sulfur will be maintained in a molten state by heat provided from steam coils at the bottom of the pit. The proposed temporary storage tankage will be capable of storing up to approximately 30 days of sulfur produced from the recovery system. The proposed sulfur handling system will include loading facilities to specifically designed tanker trucks or railcars for transport offsite. Specifically designed railcars could also be used to provide additional temporary, onsite storage capacity, if needed.

Stormwater runoff from the concrete-lined sulfur storage area and handling and loading facilities will be collected and routed to the IWT system for treatment.

Sulfuric Acid Facilities

Similar to the CGCU acid gas treatment system, the demonstration HGCU system produces an off-gas containing sulfur compounds which will require treatment. This off-gas will be treated by converting the sulfur compounds in the gas to H_2SO_4 which

is again a marketable by-product especially with the central Florida chemical fertilizer industry.

The H_2SO_4 by-product will be produced in a skid-mounted plant. Approximately 45,000 tpy of H_2SO_4 will be produced in this plant, assuming that the demonstration HGCU system is being used to treat the 50 percent of the syngas fuel for operation of the IGCC unit at a 100-percent capacity factor. As necessary, the H_2SO_4 will be temporarily stored onsite in a tank or in specially-designed railcars prior to shipment offsite. These storage tanks will provide for up to approximately 30 days of temporary storage on the site.

Stormwater runoff from the H_2SO_4 storage, handling, and loading area will be collected and pumped to the IWT system for appropriate treatment prior to being routed to the cooling reservoir for reuse.

Additional descriptions of these slag, sulfur, and H_2SO_4 by-product storage areas are provided in Section 3.7.1.

3.1.4.7 Stormwater Management Systems

As discussed previously, stormwater runoff from the coal, slag, sulfur, H_2SO_4 , and brine handling and storage areas and from the immediate areas of the power blocks for all the proposed generating units and structure and equipment areas associated with CG facilities will be collected and routed to the proposed overall IWT system. Stormwater runoff from the other areas associated with industrialized activity on the main power plant facilities site will be collected and routed to the two stormwater retention basins which will be constructed on the site. The primary stormwater retention basin will be approximately 26 acres and will receive the majority of runoff from the main power plant facility area. A small stormwater management basin will also be constructed to receive runoff from the area of the administration and general services building and associated parking lot.

Both of these stormwater management basins will be designed to detain in excess of the first inch of runoff resulting from the 25-year, 24-hour storm event in accordance with applicable SWFWMD and Polk County stormwater management regulatory requirements. Overflow discharges from these basins will be routed through a series of reclaimed wetland and lake areas prior to flowing offsite to the Little Payne Creek drainage system.

3.1.4.8 Substation and Associated Electric Transmission Line Facilities

To connect the proposed Polk Power Station with the Tampa Electric Company and Florida electric transmission grid, an onsite substation and four 230-kV transmission line circuits will be needed. The onsite substation will be constructed within an approximately 1,000-ft by 500-ft (i.e., approximately 11.5 acres) area to the north of the main power plant facilities.

Two of the 230-kV circuits from the substation will be constructed within a 400-ft wide transmission line corridor which will be located entirely within the Polk Power Station site boundaries and interconnect with the existing Tampa Electric Company 230-kV Hardee-Pebbledale transmission line which runs along the eastern border of the site. The other two circuits will be located within a corridor which runs west on the site from the substation to SR 37, then north along SR 37 approximately 5 miles, and interconnects with Tampa Electric Company's existing Mines-Pebbledale 230-kV transmission line at a point to the west of the community of Bradley Junction. Detailed descriptions of these associated transmission line corridors and the expected effects of their construction and operation are provided in Section 6.1 of this SCA.

3.1.4.9 Site Reclamation and Environmentally Enhanced Land Areas

In conjunction with the overall development of the Polk Power Station site, Tampa Electric Company will reclaim onsite lands previously mined or disturbed by phosphate mining activities as required under FDNR mined-land reclamation requirements (Section 211, F.S., and Chapter 16C-16, F.A.C.).

As part of these reclamation activities, Tampa Electric Company is proposing to create several areas which will develop into significant wildlife habitat and corridor areas and resources in the southwest Polk County region. The approximately 1,511-acre portion of the site located to the west of SR 37 will be reclaimed to an integrated system of forested and non-forested wetlands and uplands. After reclamation by Tampa Electric Company and with the company's planned controlled access to the area, this reclaimed area will develop into a wildlife habitat/corridor system between the headwater areas of the Little Manatee River and Payne Creek and South Prong Alafia River systems. The proposed wildlife habitat/corridor system will provide significantly enhanced environmental qualities to the area relative to conditions which existed prior to mining or which would have resulted from currently approved reclamation plans for the area.

In addition to the property to the west of SR 37, Tampa Electric Company's proposed reclamation/development plans include the creation of other environmentally enhanced areas on mined-out lands on the portion of the site to the east of SR 37. Again, these areas will include integrated, ecological systems of wetlands and upland wildlife habitats, including specifically designed areas for bird feeding and nesting.

Tampa Electric Company's proposed plans for reclamation of the Polk Power Station site are described in more detail in Section 9.0 of this SCA and in the Conceptual Reclamation Plan Application submitted separately to FDNR.

3.2 SITE LAYOUT

The proposed site layout plan for the entire 4,348-acre Polk Power Station site is presented in Figure 3.2.0-1. A more detailed scale map (i.e., 1 inch equals 1,000 ft) of this figure is provided in Appendix 11.16. This figure shows the locations of the proposed electric generating units and associated facilities on the site after full build-out (i.e., 1,150-MW capacity) as well as the proposed land use/land cover classifications of the site areas which will be reclaimed by Tampa Electric Company or will not be changed from existing conditions and will not include power plant facilities. These reclaimed, undeveloped areas will provide a combination of buffer, water management, and wildlife habitat/corridor functions on the site. Table 3.2.0-1 provides a summary of the approximate areas of the proposed power plant facilities and other land use/land cover classifications on the site after full build-out of the project.

As shown in Figure 3.2.0-1, the main power plant facilities will be located in the central area of the portion of the site to the east of SR 37. This plant site area was not mined for phosphate, but has been disturbed by the surrounding mining activities. The main power plant facilities (i.e., power blocks and fuel and by-product storage areas) will be located more than 2,500 ft from offsite properties and more than 1.5 miles from residential areas to the west along Bethlehem Road and 2.8 miles from residential areas to the southeast along Mills Road. Also, as shown in the figure, a vegetated buffer area will be provided along public roadways surrounding the eastern site tract (i.e., SR 37, CR 630, and Fort Green Road).

The proposed cooling reservoir will be constructed in mined-out areas located to the east and south of the main facility site. The other mined-out portions of the eastern site tract to the west and north of the main facilities will be reclaimed/developed into a series of wetlands and uplands which will be used for management of stormwater runoff from the plant site and to restore pre-mining drainage conditions for the Little Payne Creek system. The remaining areas of the eastern tract (i.e., the southwest corner, the 775-acre area north of the main plant site and cooling reservoir

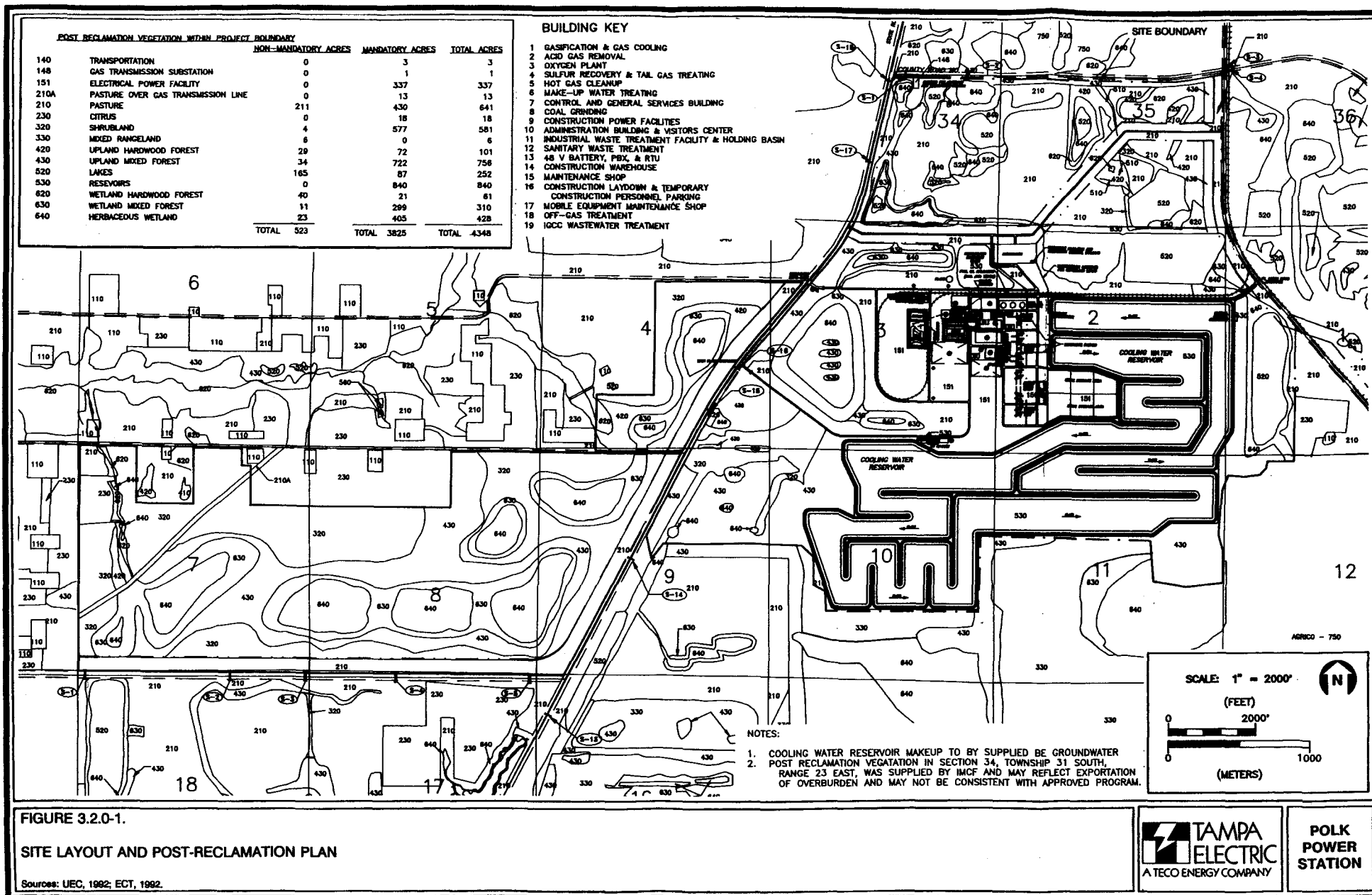


Table 3.2.0-1. Acreages of Land Use/Land Cover on Polk Power Station Site After Full Build-Out

Code	Land Use/Land Cover Classification*	Acres	Percent
140	Transportation	3	0.1
148	Gas transmission pipeline	14	0.3
151	Electrical power facilities	337	7.8
152	Electrical transmission line	141	3.2
210	Pastureland	500	11.5
230	Citrus grove	18	0.5
310	Grassland	0	0
320	Shrub and brushland	581	13.4
330	Mixed rangeland	6	0.1
410	Coniferous forest	0	0
420	Upland hardwood forest	101	2.3
430	Upland mixed forest	756	17.4
520	Lakes	252	5.8
530	Reservoirs	840	19.3
620	Wetland hardwood forest	61	1.4
630	Wetland mixed forest	310	7.1
640	Herbaceous wetland	428	9.8
	TOTAL	4,348	100

*The FLUCCS, 1976 was used for the land use and cover classification on the Tampa Electric Company Polk Power Station project. Level II FLUCCS is used for 200 to 600 series classifications, while urban or built-up (100) uses are classified at Level III.

Source: ECT, 1992.

extending to CR 663, and the reclaimed lake to the east of the reservoir) will not be significantly altered by the proposed project. The two proposed transmission line corridors will run through the northern site area.

As discussed previously, the 1,511-acre portion of the site to the west of SR 37 will be reclaimed to a wildlife habitat/corridor system consisting of an integrated series of forested and non-forested wetlands and uplands. No power plant facilities will be located on this tract and, after reclamation, the area will develop into a wildlife corridor between the headwater areas of the Little Manatee River and Payne Creek and the South Prong Alafia River system.

Figure 3.2.0-2 presents the proposed arrangement of the power plant and associated facilities on the eastern portion of the site at a more detailed scale, and Figure 3.2.0-3 presents the same arrangement on an aerial photograph showing the current conditions on the site. Figure 3.2.0-4 provides a conceptual rendering of the proposed IGCC facilities. As indicated in Table 3.2.0-1, approximately 337 acres (i.e., approximately 8 percent) of the entire site, excluding the cooling reservoir, will be classified for power plant facilities after full build-out of the proposed Polk Power Station. As shown on Figure 3.2.0-2, of this 337 acres, approximately 150 acres will actually be used for the main power plant facilities and structures, including the coal, fuel oil, by-product, and brine storage areas, and IWT systems.

Figure 3.2.0-2 also shows the proposed location of the outfall control structure for discharges from the cooling reservoir to the reclaimed lake on the eastern portion of the site (i.e., point of discharge No. 001) and the second point of discharge (i.e., No. 002) for stormwater runoff discharges from the plant site area. Water discharges from the Polk Power Station site offsite to the Little Payne Creek system will occur at the southern edge of the reclaimed lake to a man-made ditch which runs along the western side of Fort Green Road.

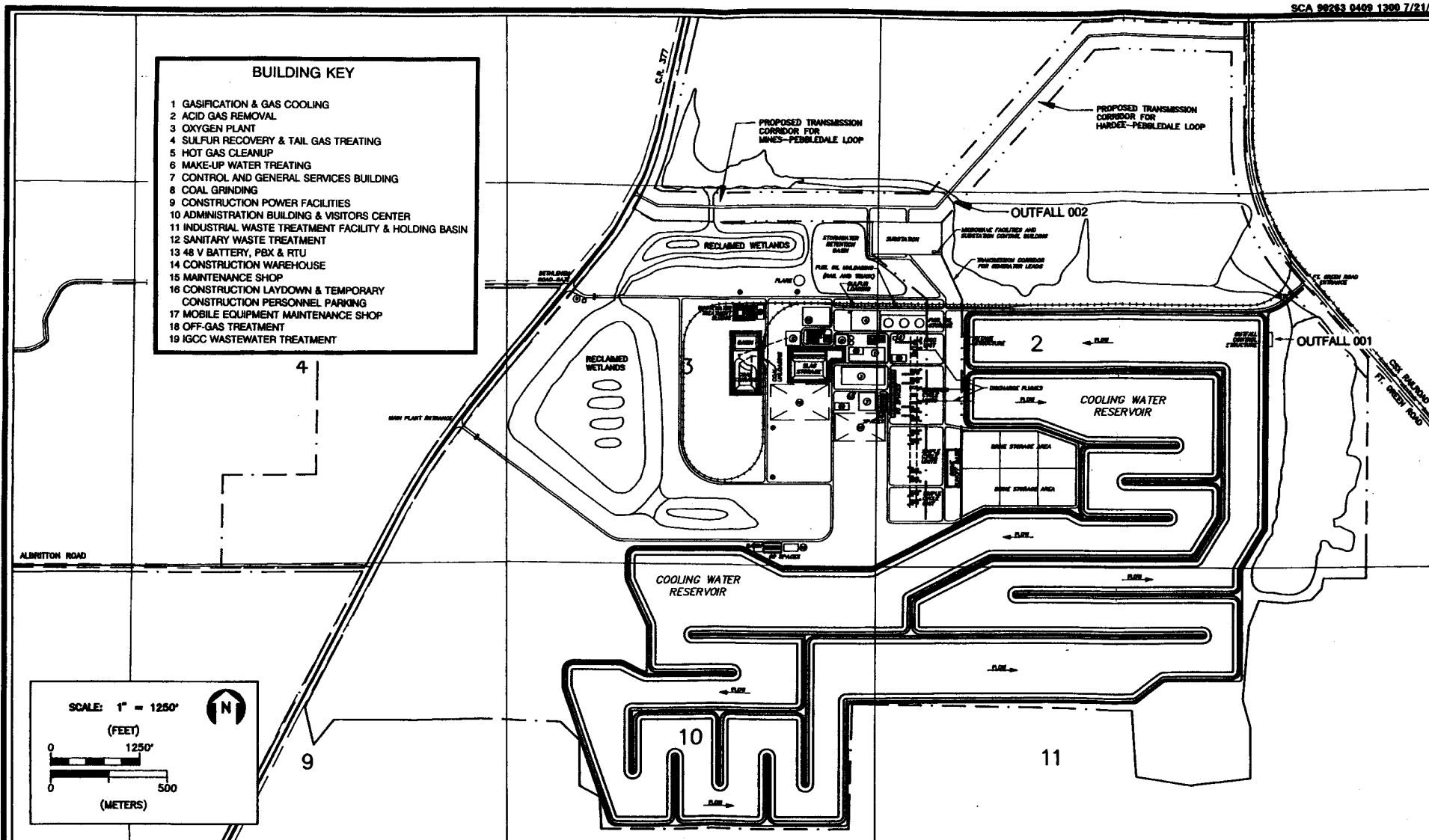


FIGURE 3.2.0-2

POWER BLOCK AND DIRECTLY ASSOCIATED FACILITIES ARRANGEMENT

SOURCES: UEC, 1992; ECT, 1992.

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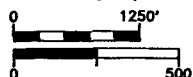
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BUILDING KEY

- 1 GASIFICATION & GAS COOLING
- 2 ACID GAS REMOVAL
- 3 OXYGEN PLANT
- 4 SULFUR RECOVERY & TAIL GAS TREATING
- 5 HOT GAS CLEANUP
- 6 MAKE-UP WATER TREATING
- 7 CONTROL AND GENERAL SERVICES BUILDING
- 8 COAL GRINDING
- 9 CONSTRUCTION POWER FACILITIES
- 10 ADMINISTRATION BUILDING & VISITORS CENTER
- 11 INDUSTRIAL WASTE TREATMENT FACILITY & HOLDING BASIN
- 12 SANITARY WASTE TREATMENT
- 13 48 V BATTERY, PBX & RTU
- 14 CONSTRUCTION WAREHOUSE
- 15 MAINTENANCE SHOP
- 16 CONSTRUCTION LAYDOWN & TEMPORARY
CONSTRUCTION PERSONNEL PARKING
- 17 MOBILE EQUIPMENT MAINTENANCE SHOP
- 18 OFF-GAS TREATMENT
- 19 IGCC WASTEWATER TREATMENT

SCALE: 1" = 1250'

(FEET)



(METERS)



FIGURE 3.2.0-3

AERIAL PHOTOGRAPH WITH PROPOSED FACILITY ARRANGEMENT

SOURCES: SRMC, 1992; UEC, 1992; ECT, 1992.

3.2.0-6

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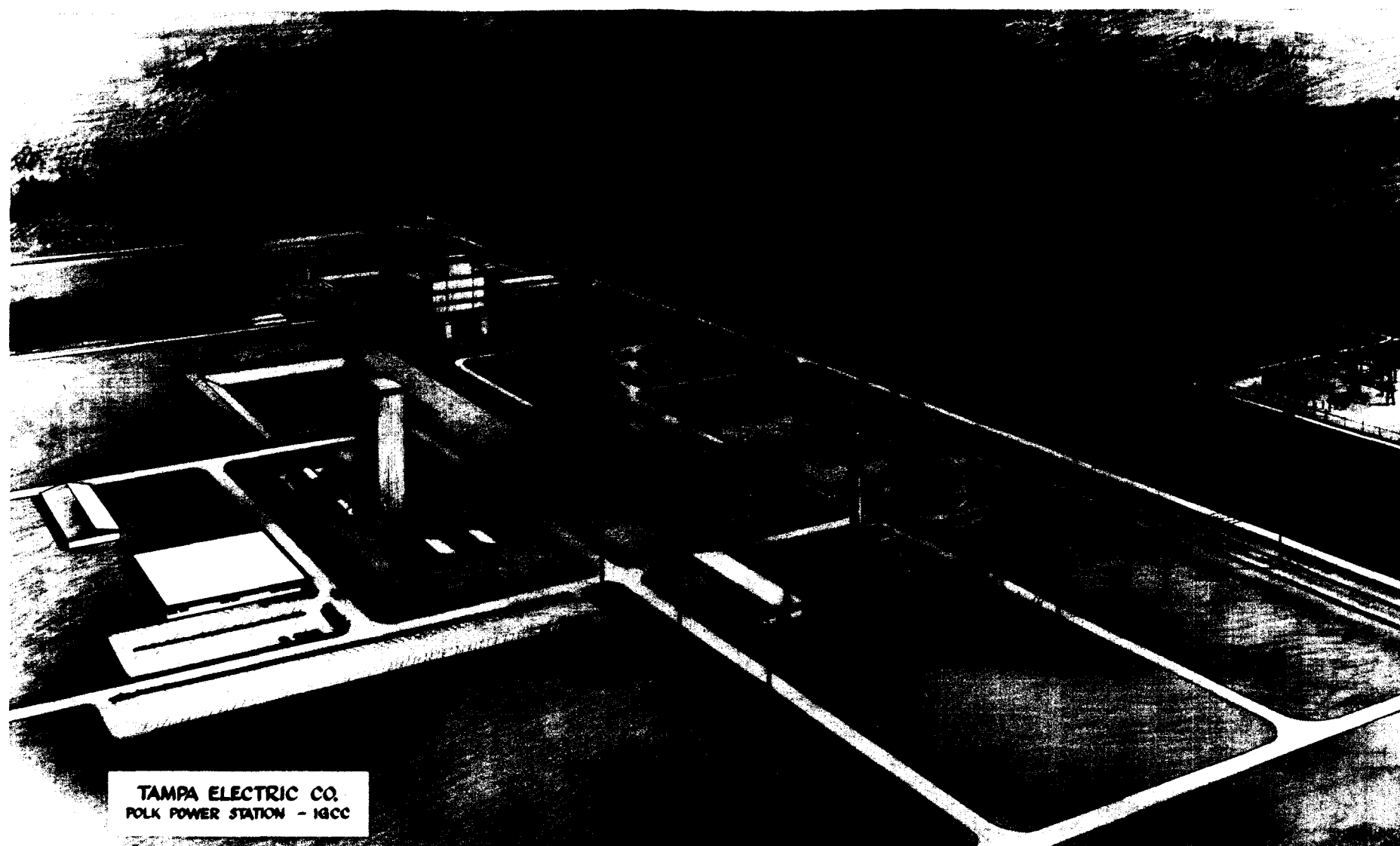


FIGURE 3.2.0-4.

CONCEPTUAL RENDERING OF PROPOSED IGCC FACILITIES

Source: Tampa Electric Company, 1992.



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Table 3.2.0-2 presents a listing and the dimensions of the proposed buildings and structures on the site which are expected to exceed 50 ft in height and the proposed exhaust air emission stacks. The locations of the exhaust stacks and other proposed combustion sources of air emissions are shown on Figure 3.2.0-5.

Table 3.2.0-2. Dimensions of All Structures Exceeding 50 Ft in Height and Exhaust Stacks on the Polk Power Station Site

Elements	Building Dimensions		
	Length (ft)	Width (ft)	Height (ft)
Gasifier structure	90	60	250
Syngas cooling deck	50	35	175
Oxygen plant cold box	75	50	190
Coal grinding structure	125	35	175
HRSG	150	40	80
Tail gas treatment unit absorbers (2)	10	10	70
Tail gas treatment unit strippers (2)	10	10	120
Quench towers (2)	10	10	60
Acid gas removal stripper	10	10	140
Acid gas removal flash tower	10	10	140
Acid gas removal absorber	10	10	140
One day coal storage bin	25	25	70

Exhaust Stacks	Stack Height (ft)	Stack Diameter (ft)	
IGCC HRSG stack	150	19	
CC HRSG stacks (4)	150	14.5	
Thermal oxidizer	199	5	
Auxiliary boiler	20	5	
Flare	75	4	
CC/bypass stacks (10)	75	18 *	
H ₂ SO ₄ acid plant stack	199	3.6	

*Equivalent diameter. Stack is usually square.

Source: Texaco, 1992.

3.3 FUEL

The proposed electric generating facilities at the Polk Power Station will primarily utilize three types of fuels: natural gas, fuel oil, and coal. The CG facilities will also be capable of using petroleum coke and a coke/coal mixture as fuel. The nominal net 150-MW advanced CT, which will be used for the IGCC Polk Unit 1, will use No. 2 fuel oil during the first year of operation. Upon completion of the CG and HRSG facilities, the CT will be fired by coal-derived syngas with No. 2 fuel oil then serving as backup fuel when the unit is operated in a CC mode. The two CC units and six stand-alone CT units will use natural gas as the primary fuel and No. 2 fuel oil as backup. In addition to these fuels, the project will require electrical energy to run motors which power pumps, blowers, grinders, conveyor belts, and other machinery. Gasoline and diesel fuels will be used to fuel vehicles and certain other equipment within the site.

Also, in order to prevent refractory thermal shock, the gasifier and sulfur recovery unit will be preheated using a clean fuel (i.e., liquid propane or liquid or gaseous natural gas) prior to IGCC unit initial startup, cold startup, or after an extended shutdown (e.g., for maintenance purposes). Therefore, liquid propane or liquid natural gas fuel may be used on the site for short time periods (i.e., 2 to 3 days) for preheating purposes. As needed, these fuels will be delivered to the site by tanker truck and the fuel will be provided to the preheat systems directly from the truck tanks. These fuels will not be permanently stored on the site. Due to the short duration of fuel use, the clean quality of the fuels, and the fact that other emissions from the IGCC unit will not occur during these preheating activities, potential air emissions resulting from the use of these clean fuels will be negligible.

The quantities and qualities of the primary fuels which will be used at the Polk Power Station and the proposed fuel delivery, handling, and storage facilities are described in the following sections.

3.3.1 COAL SUPPLY AND DELIVERY, HANDLING, AND STORAGE

3.3.1.1 Coal Fuel Supply and Quality

In accordance with its cooperative agreement with DOE under the Clean Coal Technology Demonstration program, Tampa Electric Company will be required to use coal from various sources for the IGCC unit during the 2-year demonstration period. Also during the demonstration period, Tampa Electric Company will be required to gather extensive information on the performance of the overall IGCC unit and the HFCU system when using the various coals. The performance information will include data on the overall plant efficiency and cost-effectiveness in generating electricity as well as environmental data on emissions rates and characteristics. The potential coal supply sources during the demonstration period are expected to be from coal seams in the eastern and midwestern United States.

At the present time, Tampa Electric Company has not selected the specific coal supply source(s) for the long-term operation of the IGCC unit after the demonstration period. The company will consider and evaluate various sources based on economic, engineering, and environmental factors. The performance information obtained during the demonstration project will also provide valuable inputs to Tampa Electric Company's ultimate selection of the coal supply source(s) for the unit.

Based on its current analyses of potential coal source seams required for the DOE demonstration project and other potential sources for long-term operation of the IGCC unit, Tampa Electric Company has determined that coal supplied from the Illinois No. 6 seam would be most representative of coal properties with margins added for certain properties (i.e., heat content, chlorine, and certain trace elements) to encompass the range of properties expected in other potential coal supply sources. Table 3.3.1-1 presents the properties of this modified Illinois No. 6 coal which will be used as the assumed coal for the IGCC unit for environmental licensing purposes. From an environmental licensing perspective in terms of potential SO₂ air emissions, amount of coal delivered and used, and by-product volumes (i.e., slag, sulfur, and H₂SO₄), the key properties of this assumed coal on an as-received basis are the heat

Table 3.3.1-1. Assumed Properties of Modified Illinois No. 6 Coal

Property	Maximum Content (on as-received basis)
<u>Proximate Analysis</u>	
Moisture	15.00 percent
Ash	11.00 percent
Sulfur	3.05 percent
Volatile matter	32.20 percent
Fixed carbon	42.20 percent
Heating value	11,035 Btu/lb (minimum)
<u>Ultimate Analysis</u>	
Moisture	15.00 percent
Carbon	58.70 percent
Hydrogen	4.00 percent
Nitrogen	1.11 percent
Chlorine	0.20 percent
Sulfur	3.05 percent
Ash	11.00 percent
Oxygen	7.90 percent
<u>Trace Elements</u>	
Arsenic (As)	12.59 ppm
Beryllium (Be)	4.73 ppm
Cadmium (Cd)	1.93 ppm
Chromium (Cr)	28.00 ppm
Fluoride (F)	81.00 ppm
Mercury (Hg)	0.28 ppm
Lead (Pb)	4.70 ppm

Note: Percentages for proximate and ultimate analyses do not add to 100 percent since assumed properties are based on a combination of contents for several coals.

Source: Tampa Electric Company, 1992.

content of 11,035 British thermal units per pound (Btu/lb), sulfur content of 3.05 percent, and ash content of 11 percent.

Based on the properties of this assumed coal, the proposed IGCC unit will require approximately 2,325 tons of coal per day, on a dry basis, when operating at full load. This peak coal fuel input to the CG facilities will result in the production and firing of approximately 6.4 million standard cubic feet (scf) per hour of coal-derived syngas in the advanced CT unit of the overall IGCC generating facility.

The coal-derived syngas produced in the gasification process will be treated in the conventional CGCU system or the demonstration HGCU system prior to being fired in the advanced CT unit. The CGCU system will be capable of treating up to 100 percent of the syngas under full load conditions for the IGCC unit, while the demonstration HGCU system will be designed to treat up to approximately 50 percent of the syngas at full load operation of the unit. At this time, the quality of the syngas resulting from the conventional, proven CGCU system can be estimated with a greater degree of confidence than the quality of the syngas from the HGCU system since this system has not been demonstrated at a commercial scale. However, based on small-scale demonstrations, the HGCU system has the potential to exceed the estimated sulfur removal efficiency of the CGCU system, while also increasing the overall efficiency (i.e., cost-effectiveness) of the IGCC unit in generating electricity.

Table 3.3.1-2 presents the composition of the coal-derived syngas resulting from the CGCU system and based on the assumed coal fuel. If petroleum coke or a coke/coal mixture is used as fuel for the IGCC unit, the resulting syngas for firing in the CT will have an equivalent composition as that shown in Table 3.3.1-2.

3.3.1.2 Coal Delivery, Handling, and Storage Facilities

The purpose of the coal handling system is to receive, stack-out, store, reclaim, and transport coal from unit train railroad cars and/or from trucks to the coal

Table 3.3.1-2. Composition of Coal-Derived Syngas to the Combustion Turbine

Component	Mole Percent (by volume)
CO	45.38
H ₂	33.94
CO ₂	12.87
Water	0.36
Methane	0.18
Argon	1.19
Nitrogen	6.03
H ₂ S	0.02
COS	0.03

Note: Composition prior to nitrogen addition at the CT

Source: Texaco, 1992.

preparation system serving the IGCC unit Polk Power Station Unit 1. Figure 3.3.1-1 presents a flow diagram of the coal receiving and handling system.

Coal will be delivered to the plant site by unit trains and/or trucks. The unit trains will consist of approximately 70 to 100, 100-ton capacity rapid discharge, bottom dump rail cars. If all coal was delivered by rail, approximately two unit trains per week would be needed to meet the fuel requirements of the IGCC unit. The rail cars will be unloaded in motion with the train moving over an enclosed track hopper. If all coal was delivered by truck, delivery will be made by approximately 80 to 100 specialized bottom-dump trucks per day, each truck having a 28-ton payload. The trucks will be equipped with covers to minimize fugitive dust emissions and will unload utilizing the enclosed, below-grade, rail unloading track hopper which will be arranged to permit truck drive-over. A dust collection system will be provided to collect dust from all of the feeder and conveyor transfer points in the unloading hopper area. Dust suppression with water sprays will be employed at the top of the hopper.

The track hopper will be equipped with four outlets, four manually operated rack and pinion slide gates and four belt feeders. Two belt feeders will discharge coal onto the track hopper feeder collecting belt conveyor and the remaining two feeders onto a second track hopper feeder collecting belt conveyor. Collecting belt conveyors will transport the coal to the stack-out conveyor. The stack-out conveyor is a radial stacker equipped with a telescopic chute and water spray dust suppression. The radial stacker will be used to build a kidney-shaped active coal pile. Mobile equipment (i.e., bulldozers) will be used to build an inactive storage pile and to reclaim coal from the active storage pile. Coal reclaimed by mobile equipment will be pushed into a below-grade hopper and fed by a vibrating feeder onto the IGCC plant transfer conveyor.

Control of particulate emissions from coal handling operations will be achieved by a combination of wet dust suppression, chemical treatment of the coal pile,

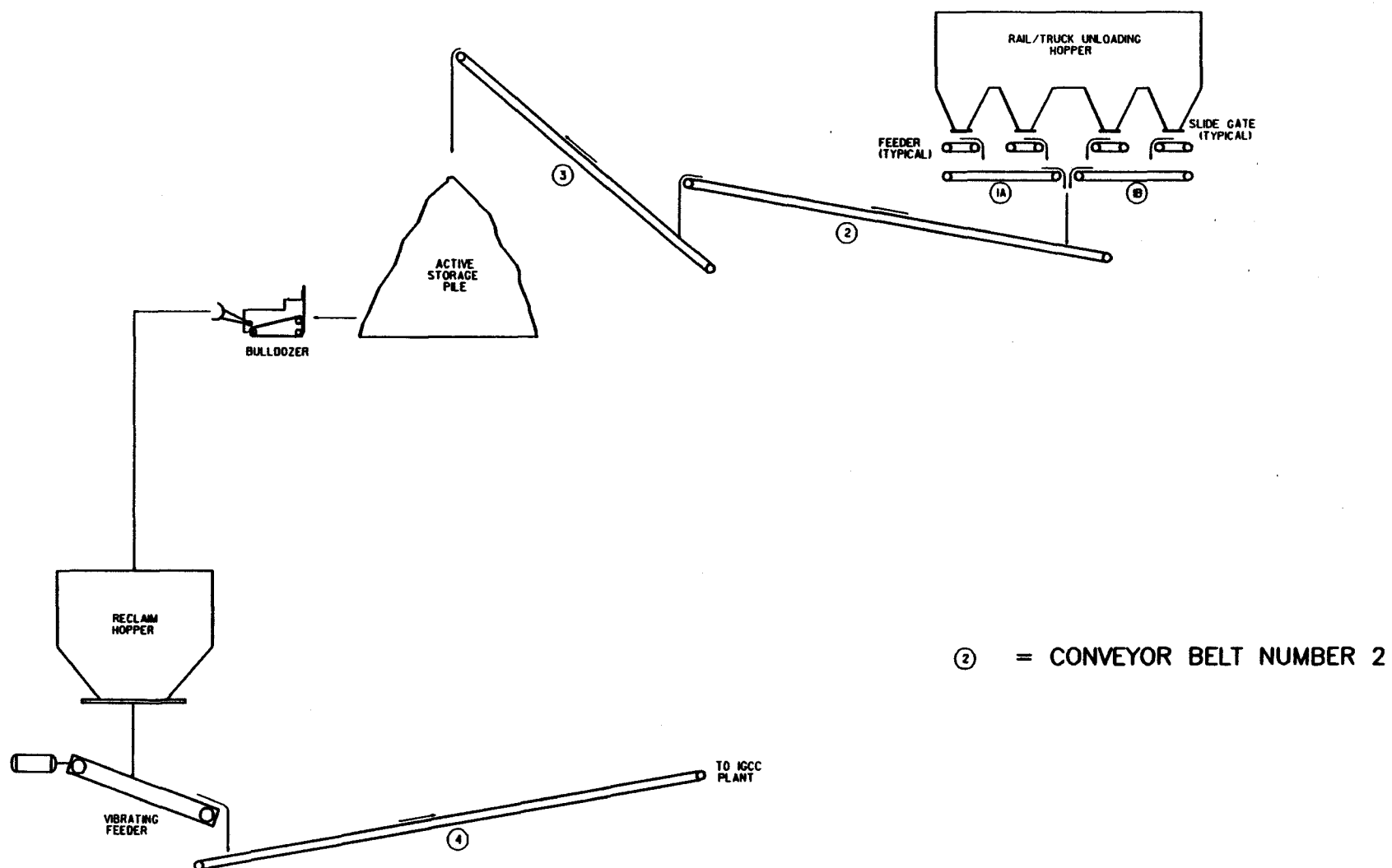


FIGURE 3.3.1-1.

COAL HANDLING SCHEMATIC

Source: UEC, 1992; ECT, 1992.



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equipment enclosures, and dry dust collection systems located at the major dust emissions sources. Wet dust suppression systems employing either foam or water sprays with a wetting agent will be employed at the railcar and truck receiving hopper and at the stacker discharge to the coal pile.

Conveyors and transfer points will be provided with enclosures and water spray systems to contain dust and to minimize emissions to the atmosphere. Coal handling equipment and transfer points will be provided dust-tight enclosures and dry type dust collectors, which will maintain a slight negative pressure within the equipment enclosure to minimize emissions. The dust collection equipment will consist of pulse-jet baghouses, centrifugal exhaust fans, rotary air lock valves, dust return chutes, and control devices. The baghouses will be sized for a maximum air to cloth ratio of 6 to 1 at design air flow and will have a removal efficiency not less than 99.9 percent.

The coal storage pile will be segregated into active and inactive portions. Fugitive dust emissions from the active portion of the pile will be controlled by water sprays and/or the application of chemical dust suppression agents. The inactive portion of the pile will be sealed with a crusting agent to control dust emissions.

The coal storage area will occupy an area of approximately 10 acres, including the coal pile runoff basin and berm surrounding the entire area to prevent stormwater runoff from the area. The aggregate storage capacity of approximately 105,000 tons for both the active and inactive storage piles will be sufficient to supply coal fuel for 45 days of IGCC unit operation at full generating capacity.

The coal pile storage area and the runoff basin will be lined with a synthetic material or other materials with similar low permeability characteristics to prevent leachate and runoff from entering the surficial groundwater system. The coal storage area will also include appropriately designed leachate and stormwater collection systems which will route collected water to the lined coal pile runoff basin. The basin will be capable of containing coal pile runoff resulting from in excess of the 25-year, 24-hour

design storm event. The coal pile runoff basin will function to collect coal pile runoff and leachate, to allow sedimentation of solids in the collected waters, and then transfer the runoff at a controlled rate to the wastewater equalization basin associated with the overall IWT system for further treatment. Thus, all runoff water discharges from the coal storage area will be appropriately controlled and treated with no direct discharges to groundwater or surface waters.

3.3.2 NATURAL GAS SUPPLY AND DELIVERY

Natural gas will be used as the primary fuel for the stand-alone CT and CC units planned for the Polk Power Station. Natural gas will be delivered to the site via a pipeline from the existing and future natural gas transmission system in the region. Natural gas will not be stored on the Polk Power Station site. Table 3.3.2-1 presents a typical composition for the natural gas fuel. The CC and stand-alone CT units will use a total of approximately 11 million cubic feet per hour (ft³/hr) of natural gas fuel if all units were operating at full load and at a worst-case ambient temperature of 20°F.

As discussed in Section 6.2, Tampa Electric Company is currently evaluating the various alternatives to supply natural gas to the Polk Power Station. Therefore, specific interconnection points to the existing or planned future gas transmission system in the site area and, in turn, the pipeline route or alternative routes to the Polk Power Station site have not been determined at this time. Once the proposed pipeline route has been determined, Tampa Electric Company will submit appropriate supplemental application and supporting information to the SCA for the Polk Power Station for agency review and approval of the proposed natural gas pipeline corridor from the transmission system to the site.

Table 3.3.2-1. Typical Natural Gas Composition

Component	Mole Percent (by volume)
<u>Gas Composition</u>	
Hexane +	0.018
Propane	0.190
I-butane	0.010
N-butane	0.007
Pentane	0.002
Nitrogen	0.527
Methane	96.195
CO ₂	0.673
Ethane	2.379
<u>Other Characteristics</u>	
Heat content	1,022 Btu/ft ³ with 14.73 psia, dry
Real specific gravity	0.5776
Sulfur content (maximum)	10 gr/100 scf

Note: Btu/ft³ = British thermal units per cubic foot.
 psia = pounds per square inch absolute.
 gr/100 scf = grains per 100 standard cubic foot.

Source: Tampa Electric Company, 1992.

3.3.3 FUEL OIL SUPPLY AND DELIVERY, HANDLING, AND STORAGE FACILITIES

3.3.3.1 Fuel Oil Supply and Quality

Initially, No. 2 fuel oil will be used as a primary fuel for the advanced CT unit planned for the Polk Power Station. Fuel oil will be delivered to the site by tanker truck and/or railcar. This will occur during the first year of operation, after which the CT will be converted to the IGCC unit. At this time, Tampa Electric Company anticipates that fuel oil will serve primarily as a backup fuel for the stand-alone CT and CC units and the advanced CT component of the IGCC unit in CC mode after the initial project phase.

Table 3.3.3-1 presents a typical fuel analysis for the low-sulfur No. 2 fuel oil which will be used as backup fuel for the Polk Power Station. The stand-alone CC and CT units will use a total of approximately 77,000 gallons of No. 2 fuel oil per hour if all units were operating at full load and at the worst-case ambient temperature of 20°F. If the CG facilities were unavailable to provide syngas and the CC component of the IGCC unit was fired on the backup fuel oil, this unit would use an additional 13,500 gallons of No. 2 fuel oil per hour at full load and at the worst-case ambient temperature of 20°F.

3.3.3.2 Fuel Oil Delivery, Handling, and Storage Facilities

GATX is currently proposing to construct a new fuel oil pipeline in the site region. The proposed pipeline would parallel Fort Green Road and the CSX Railroad located adjacent to the eastern boundary of the Polk Power Station site. When constructed, fuel oil could be delivered to the site via a pipeline from the proposed GATX pipeline to the onsite fuel oil storage tanks. The corridor for this supply pipeline would be located within the boundaries of the Polk Power Station site and, therefore, would not affect offsite land uses or resources. Tampa Electric Company will submit appropriate supplemental application and supporting information to the SCA for the Polk Power Station for agency review and approval prior to construction of the onsite pipeline to supply fuel oil to the site.

Table 3.3.3-1. Typical No. 2 Fuel Oil Analysis

Parameter	Value
Specific gravity @ 60°F (maximum)	0.876
Viscosity, saybolt (SUS) @ 100°F	
Minimum	40.2
Maximum	32.6
Flash point, °F (minimum)	100
Pour point, °F (minimum)	0
Minimum gross heating value, Btu/gal	
LHV	129,811
HHV	137,600
Water and sediment, percent by volume (maximum)	0.05
Ash, percent by weight (maximum)	0.01
Sulfur, percent by weight (maximum)	0.05
Fuel-bound nitrogen, percent by weight (maximum)	0.015
Trace constituents, ppm (maximum)	
Lead	1.0
Sodium	1.0
Vanadium	0.5

Note: SUS = Saybolt Universal Seconds.
 Btu/gal = British thermal units per gallon.
 LHV = lower heating value.
 HHV = higher heating value.

Source: Tampa Electric Company, 1992.

Whether or not the fuel oil pipeline is constructed, the capability to deliver the backup fuel oil by tanker truck or railcar will be provided on the site.

Fuel oil will ultimately be stored in three aboveground storage tanks on the site at full build-out of the Polk Power Station. The construction of these three tanks will be phased over time to match fuel oil needs as additional generating units are developed on the site. The tanks will be constructed of steel and each tank will have a storage capacity of 3 million gallons of fuel oil. Therefore, after full build-out, the total onsite storage capacity will be 9 million gallons of fuel oil. Each tank will be approximately 128 ft in diameter and 32 ft in height.

The storage tank area will be surrounded by a berm which will be appropriately designed to contain any unexpected spills or failures of the tanks. The area design will also include appropriate systems and safeguards to prevent, control, and recover any potential spills in accordance with federal and state regulatory requirements for aboveground storage tanks. The berms will be constructed of earthen materials primarily excavated from the overburden spoil piles in the mined-out areas of the site. The earthen berms will be covered with sealed asphalt or comparable sealer material to prevent any spilled fuel oil from penetrating or contaminating the berms or groundwater.

Stormwater runoff from the fuel oil storage will be collected and routed to an oil/water separator which will be designed to reduce any potential oil and grease content in the water to a level not exceeding 15 mg/L. The oil/grease and solids sediment will be collected and hauled offsite by a contractor for appropriate disposal. The treated effluent from the oil/water separators will be routed to the cooling reservoir.

A preliminary Spill Prevention, Control, and Countermeasure (SPCC) Plan has been developed for the fuel oil storage and handling systems according to the requirements

of 40 CFR 112, including emergency response procedures for controlling and handling any unexpected spills (see Appendix 11.13.1).

3.4 AIR EMISSIONS AND CONTROLS

3.4.1 AIR EMISSION TYPES AND SOURCES

This section describes the types and sources of air pollutants that will be emitted from Polk Power Station. The maximum emission rates for the larger sources are also quantified. Additional details on both the description of emission sources and quantification of emission rates are provided in the PSD permit application, which is included as Appendix 11.1.3 of this SCA.

Air emissions associated with the proposed facility fall into three broad categories: combustion emissions, process emissions, and fugitive emissions. The combustion sources are:

- The advanced CT integral to the IGCC unit;
- The IGCC unit tail gas treating unit thermal oxidizer;
- The IGCC unit H₂SO₄ plant thermal oxidizer;
- The IGCC unit emergency flare;
- A small auxiliary boiler associated with the IGCC unit;
- The four CTs associated with the two CC units; and
- The six stand-alone, simple-cycle CTs.

The primary source of emissions from the IGCC unit is combustion of syngas in the advanced CT (GE 7F). The exhaust gas from the CT will be emitted to the atmosphere via the HRSG stack. Emissions from the HRSG stack are primarily NO_x and SO₂, with lesser quantities of CO, VOC, particulate matter (PM), and other trace constituents present in the fuel. Table 3.4.1-1 presents the estimated maximum hourly emission rates for this source. As shown in the table, emissions of some pollutants may vary with the type of syngas cleanup technology employed. The emission control capabilities of the HGCU system are yet to be fully demonstrated; therefore, some emission estimates are higher compared to estimated emissions from the CGCU system. However, after the completion of the 2-year demonstration period, the lower emission rates from the CGCU system will be achieved. Estimated emissions firing low-sulfur No. 2 distillate fuel oil are also provided in Table 3.4.1-1

Table 3.4.1-1. Maximum Emissions from the IGCC Unit's CT (all values lb/hr)

Pollutant	Syngas		No. 2 Fuel Oil
	Post-Demonstration*	Demonstration†	
Particulate matter**	72	72	27
SO ₂	518	518	92
NO _x	223	664	311
CO	98	99	99
VOCs	3	3	32
Lead	0.0035	0.023	0.10
H ₂ SO ₄ mist	55	55	10
Fluorides	0.21	0.21	0.062
Mercury	0.0034	0.025	0.0057
Beryllium	0.0001	0.0001	0.0048
Arsenic	0.0006	0.080	0.31
Cadmium	0.0009	0.020	0.020
Chromium	0.0004	0.0005	0.17

* Maximum emissions after the 2-year demonstration period, based on emissions achievable with CGCU. Utilization of HGCU to be based on ability to achieve maximum post-demonstration emission rates.

† Maximum emissions during the 2-year demonstration period, based on up to 50 percent utilization of HGCU. Maximum post-demonstration emission rates to be achieved thereafter.

** Includes H₂SO₄ mist.

Sources: GE, 1992.
Texaco, 1992.
ECT, 1992.

since: (1) the advanced CT will operate initially (i.e., prior to the integration with the CG facilities) as an oil-fired simple-cycle CT; and (2) after the IGCC conversion, the CT may still operate in CC mode on oil during periods when syngas is not available.

Approximately 96 percent of the sulfur present in the coal will be removed by the CGCU and HGCU systems. The sulfur-laden gas produced in the CGCU and HGCU systems will be treated onsite and converted to a saleable sulfur and/or H_2SO_4 by-products. Small amounts of the sulfur in the tail gas that is not converted in the CGCU system process will be combusted and emitted as SO_2 through the tail gas treating unit thermal oxidizer. Estimated emissions from the thermal oxidizer are presented in Table 3.4.1-2 assuming that 100 percent of the syngas is being treated within the CGCU system.

When the HGCU system is in use, off-gases from this system will be routed to a H_2SO_4 plant. Estimated emissions from the acid plant thermal oxidizer are presented in Table 3.4.1-3. When this system is in use to treat up to approximately 50 percent of the syngas, the use of the CGCU system, and hence the thermal oxidizer emissions, will decrease correspondingly.

The emergency flare will operate only during gasifier startup and shutdown, and during infrequent, unanticipated interruptions of the gasifier's operating cycles. On a routine basis, emissions from the flare will result from the pilot flame, and these emissions will be negligible.

Similarly, the small oil-fired auxiliary boiler will operate only during startup and shutdown of the IGCC unit, or when steam from the IGCC unit's HRSG is unavailable. Estimated maximum emissions from this source are summarized in Table 3.4.1-4.

Table 3.4.1-2. Maximum Tail Gas Treating Unit Thermal Oxidizer Emissions

Pollutant	Emissions (lb/hr)*
Particulate matter	13.1
SO ₂	52.0
NO _x	2.6
CO	1.4
VOC	0.8
Lead	0.002
H ₂ SO ₄ mist	0
Fluorides	0.001
Mercury	0.002
Beryllium	0.001
Arsenic	0.001
Cadmium	0.001
Chromium	0.105
H ₂ S	0.4

*Maximum emissions are for 100 percent CGCU operations; emissions from this source would be less with 50 percent CGCU and 50 percent HGCU.

Source: Texaco, 1992.

Table 3.4.1-3. Maximum Expected Emissions from the H₂SO₄ Plant Thermal Oxidizer

Pollutant	Emissions* (lb/hr)
Particulate matter	2.6
SO ₂	10.1
NO _x	1.14
CO	0.61
VOC	0.35
Lead	0.001
H ₂ SO ₄ mist	0
Fluorides	0
Mercury	0.001
Beryllium	0.001
Arsenic	0.001
Cadmium	0.001
Chromium	0.052
H ₂ S	0.23

*Maximum emissions are for 50 percent CGCU and 50 percent HGCU; this source would have no emissions with 100 percent CGCU.

Source: Texaco, 1992.

Table 3.4.1-4. Auxiliary Boiler Emissions

Pollutant	Emissions (lb/hr)
Particulate matter	3.0
SO ₂	2.6
NO _x	7.9
CO	4.3
VOC	2.4
Lead	0.003

Source: Texaco, 1992.

The stand-alone CC units and CTs will emit stack gases resulting from the combustion of natural gas or backup fuel oil. The principal pollutants will be NO_x and SO₂, with lesser quantities of CO, VOC, PM, and other trace pollutants. Table 3.4.1-5 presents the estimated maximum hourly emissions from an individual CT in either CC or simple-cycle mode.

Process and fugitive emissions will result from other facility and process operations associated primarily with the IGCC unit. Fugitive particulate emissions will be generated by material handling and storage, principally coal and slag. The coal handling and slag systems will be designed to effectively control fugitive emissions of PM. For coal handling, the dust control system involves a combination of controls, including rail car and truck unloading in enclosed buildings, enclosure of certain coal conveyors, baghouse particulate control at transfer points, wetting of the coal pile, and wet grinding in the rod mills. Slag will be conveyed wet in conveyors which will greatly minimize or eliminate potential fugitive dust emissions.

Minor, intermittent emissions of gaseous-phase pollutants may be generated within the gasification plant. The potential sources will be process vents, and leaks (fugitive emissions) from equipment such as valves, compressor seals, and flanges. The predominant gases that may be emitted include H₂S and NH₃. A small amount of particulates may also be emitted from vent sources. These emissions will be minimized by good operational and maintenance practices.

Table 3.4.1-5. Maximum Emissions from Individual Stand-Alone CT and CC Units
(all values lb/hr)*

Pollutant	Fuel	
	Natural Gas	Fuel Oil
Particulate matter†	11	21
SO ₂	36	53
NO _x	35	181
CO	59	71
VOC	10	10
Lead	0	0.059
H ₂ SO ₄ mist	4	6
Fluorides	0	0.036
Mercury	0.012	0.0033
Beryllium	0	0.0028
Arsenic	0	0.18
Cadmium	0	0.012
Chromium	0	0.10

* Emission rates given are for an individual CT in either CC or simple-cycle mode.

† Includes H₂SO₄ mist.

Sources: GE, 1992.
ECT, 1992.

3.4.2 AIR EMISSION CONTROLS

Air emission controls planned for the Polk Power Station are summarized in Tables 3.4.2-1 and 3.4.2-2 for the IGCC facility and stand-alone CTs (CC or simple-cycle mode), respectively. Brief descriptions of the control systems proposed for the Polk Power Station are provided in the following sections. A complete description of the Polk Power Station air emission control systems is included in the PSD permit application contained in Appendix 11.1.3.

3.4.2.1 Particulate Matter and Heavy Metals

PM and trace heavy metals (including lead, mercury, and beryllium) controls planned for the IGCC facility consist of water scrubbing, use of clean fuels and operational practices to achieve efficient combustion. A water scrubber to remove PM from the syngas stream is an integral component of the conventional CGCU process. The scrubbed syngas is cooled prior to entering the acid gas removal system which results in the condensation of trace volatile heavy metals and further reduction in syngas particulate levels. The demonstration HGCU technology employs a high temperature barrier filter to remove 99.5 percent or more of the PM contained in the treated syngas stream.

The IGCC 7F CT will be operated in simple-cycle mode during the first year of operation (prior to installation of the CG facilities) using distillate fuel oil. The primary fuel after conversion to IGCC will be syngas; distillate fuel oil will serve as a secondary fuel source when operating in the CC mode. Syngas and distillate fuel oil are both low in ash and sulfur content resulting in low PM emissions.

Fugitive PM emissions due to the handling of coal in the IGCC facility will be controlled using a comprehensive system of equipment enclosure, fabric filter dust collection, application of water/chemical dust suppression and crusting agents, and the paving of roads within the Polk Power Station site.

Table 3.4.2-1. Summary of Air Emission Controls for the IGCC Facility

Pollutant	Fuel Type	
	Syngas	Distillate Fuel Oil
PM and heavy metals	Low ash/sulfur fuel, efficient combustion--all combustion sources Equipment enclosure, fabric filter dust collection, water/chemical dust suppression, crusting agents, paved roads--fugitive sources	Low ash/sulfur fuel, efficient combustion--all combustion sources
CO and VOC	Advanced combustion equipment and efficient combustion--all combustion sources	Advanced combustion equipment and efficient combustion--all combustion sources
SO ₂ and H ₂ SO ₄	Acid gas recovery and sulfur recovery/tail gas treating/thermal oxidation--CGCU Zinc titanate absorption and H ₂ SO ₄ plant/thermal oxidation--HGCU Low sulfur (≤ 0.07 weight percent) fuel--all combustion sources	Low sulfur (≤ 0.05 weight percent) fuel--all combustion sources
NO _x	Nitrogen injection--CT, low-NO _x burners/combustion practices--all other combustion sources	Wet injection--CT, low-NO _x burners/combustion techniques--all other combustion sources

Sources: GE, 1992.
Texaco, 1992.
ECT, 1992.

Table 3.4.2-2. Summary of Air Emission Controls for Stand-Alone CC and CT Units

Pollutant	Fuel Type	
	Natural Gas	Distillate Fuel Oil
PM and heavy metals	Low ash/sulfur fuel, efficient combustion	Low ash/sulfur fuel, efficient combustion
CO and VOC	Advanced combustion equipment and efficient combustion	Advanced combustion equipment and efficient combustion
SO ₂ and H ₂ SO ₄	Low sulfur (≤ 10 gr/scf) fuel	Low sulfur (≤ 0.05 weight percent) fuel
NO _x	Dry low-NO _x burners	Water injection

Sources: GE, 1992.
ECT, 1992.

The stand-alone CCs and CTs will be fired primarily with natural gas with distillate fuel oil as a backup fuel source. These fuels are low in sulfur and ash content resulting in low PM emissions.

3.4.2.2 Carbon Monoxide and Volatile Organic Compounds

CO and VOC emissions from the IGCC facility and stand-alone CCs and CTs will be controlled by the use of advanced combustion equipment and operational practices to obtain efficient combustion. Highly efficient combustion will, in turn, result in low CO and VOC emission rates.

3.4.2.3 Sulfur Oxides and Sulfuric Acid Mist

Sulfur oxides and H_2SO_4 mist emission control is integral to the IGCC unit. Using conventional CGCU technology, H_2S and COS present in the syngas leaving the gasifier will be removed using a promoted amine process in the acid gas removal unit. The treated low sulfur syngas stream, containing approximately 0.07 weight percent sulfur compounds, will then be burned in the advanced CT for power production. Sulfur compounds will be stripped from the amine solution and treated by the sulfur recovery/tail gas treating units which will recover more than 99 percent of the inlet sulfur. Any sulfur compounds remaining in the tail gas treating unit exhaust will be converted to SO_2 in the thermal oxidizer. The demonstration HGCU technology will react H_2S present in the syngas stream with zinc titanate sorbent in a moving bed absorber. Regeneration of the absorber will yield a concentrated SO_2 stream which will then be converted to H_2SO_4 in a H_2SO_4 production plant. Sulfur removal efficiency of the HGCU technology will meet or exceed that of conventional CGCU technology.

SO_2 and H_2SO_4 mist emissions from the IGCC combustion sources will be controlled by the use of low-sulfur fuels. The advanced 7F CT, during its initial year of simple-cycle operation, will be fired with low-sulfur distillate fuel oil. Sulfur content of syngas and distillate fuel oil will be 0.07 and 0.05 weight percent, respectively.

SO₂ emissions from the future stand-alone CC and CT units will be controlled by the use of low-sulfur natural gas and distillate fuel oil. Natural gas sulfur content will be less than 10 gr/100 scf. Distillate fuel oil will contain a maximum of 0.05 weight percent sulfur.

3.4.2.4 Nitrogen Oxides

The advanced CT in the IGCC unit will use nitrogen addition to control NO_x emissions during syngas firing. Nitrogen acts as a diluent to lower peak flame temperatures and reduce NO_x formation without the water consumption and treatment/disposal requirements associated with water or steam injection NO_x control methods. Nitrogen used for injection will be provided by the air separation unit used to generate oxygen for the gasification process. Maximum nitrogen diluent will be injected to minimize NO_x exhaust concentrations consistent with safe and stable operation of the CT. Water injection will be employed to control NO_x emissions when backup distillate fuel oil is used and during the first year of the 7F CT simple-cycle operation and when the unit is operated in CC mode. NO_x emissions from the remaining IGCC facility combustion sources will be controlled using low-NO_x burners and/or combustion practices that reduce NO_x formation.

The stand-alone CC and CT units will be equipped with dry low-NO_x burners when fired on natural gas and water injection when fired on backup distillate fuel oil to abate NO_x emissions.

3.4.3 BEST AVAILABLE CONTROL TECHNOLOGY

Best available control technology (BACT) represents an emission limitation that reflects the maximum degree of pollutant reduction achievable, determined on a case-by-case basis, with consideration given to energy, environmental, and economic impacts. BACT emission limitations must be no less stringent than any applicable NSPS (40 CFR 60), National Emission Standard for Hazardous Air Pollutants (NESHAPS) (40 CFR 61), and state emission standards (Chapter 17-2, Part VI, Emission Limiting and Performance Standards, F.A.C.).

A complete BACT evaluation for the Polk Power Station project is contained in the PSD permit application in Appendix 11.1.3. Proposed BACT emission limitations for the IGCC facility and stand-alone CC and CT units are summarized in Tables 3.4.3-1 and 3.4.3-2, respectively. An abbreviated discussion of the BACT review is provided in the following sections.

3.4.3.1 Methodology

The BACT analysis was performed in accordance with the EPA *top-down* method. The first step in the top-down BACT procedure was the identification of all available control technologies. Alternatives considered included process designs and operating practices that reduce the formation of emissions, post-process stack controls that reduce emissions after they are formed, and combinations of these two control categories. Following the identification of available control technologies, the next step in the analysis was to determine which technologies may be technically infeasible. Technical feasibility was evaluated using the criteria contained in Chapter B of the EPA New Source Review (NSR) Workshop Manual (EPA, 1990b). The third step in the top-down BACT process was the ranking of the remaining technically feasible control technologies from high to low in order of control effectiveness. Assessment of energy, environmental, and economic impacts was then performed. The economic analyses of the technologies used procedures found in the Office of Air Quality Planning and Standards (OAQPS) Control Cost Manual (EPA, 1990c). The fifth and final step was the selection of a BACT emission limitation

Table 3.4.3-1. Proposed BACT Limitations for the IGCC Facility

Emission Source	Fuel Type	Pollutant	BACT Emission Limitation			
			lb/hr	lb/MMBtu	lb/MW	ppmvd
CT (simple cycle)	Distillate fuel oil	PM*	27.0	0.014	0.180	NA
CT/HRS	Syngas (100% CGCU)	PM*	72.0	0.037†	0.296**	NA
	Syngas (50% CGCU/50% HGPU)	PM*	72.0	0.037†	0.296**	NA
Auxiliary boiler	Distillate fuel oil	PM*	3.0	0.061	NA	NA
Tail gas treating unit thermal oxidizer	Distillate fuel oil	PM*	13.1	NA	NA	NA
H ₂ SO ₄ thermal oxidizer	Distillate fuel oil	PM*	2.6	NA	NA	NA
CT/HRS	Syngas (100% CGCU)	PM††	17.0	0.013†	0.116**	NA
	Syngas (50% CGCU/50% HGPU)	PM††	17.0	0.013†	0.116**	NA
Auxiliary boiler	Distillate fuel oil	PM††	3.0	0.061	NA	NA
Tail gas treating unit thermal oxidizer	Distillate fuel oil	PM††	13.1	NA	NA	NA
H ₂ SO ₄ thermal oxidizer	Distillate fuel oil	PM††	2.6	NA	NA	NA
CT (simple cycle)	Distillate fuel oil	CO	99.0	0.086	1.320	40.0
CT/HRS	Syngas (100% CGCU)	CO	98.0	0.044†	0.382**	25.0
	Syngas (50% CGCU/50% HGPU)	CO	99.0	0.044†	0.386**	25.0
Auxiliary boiler	Distillate fuel oil	CO	4.3	0.087	NA	108.0
Tail gas treating unit thermal oxidizer	Distillate fuel oil	CO	1.4	NA	NA	29.0

3.4.3-2

Table 3.4.3-1. Proposed BACT Limitations for the IGCC Facility (Continued, Page 2 of 3)

Emission Source	Fuel Type	Pollutant	BACT Emission Limitation			
			lb/hr	lb/MMBtu	lb/MW	ppmvd
H ₂ SO ₄ thermal oxidizer	Distillate fuel oil	CO	0.61	NA	NA	29.0
CT (simple cycle)	Distillate fuel oil	VOC	32.0	0.028	0.427	20.0
CT/HRSG	Syngas (100% CGCU)	VOC	3.0	0.0013†	0.012**	1.0
	Syngas (50% CGCU/50% HGCU)	VOC	3.0	0.0013†	0.012**	1.0
Auxiliary boiler	Distillate fuel oil	VOC	2.4	0.0485	NA	27.0
Tail gas treating unit thermal oxidizer	Distillate fuel oil	VOC	0.8	NA	NA	37.0
H ₂ SO ₄ thermal oxidizer	Distillate fuel oil	VOC	0.35	NA	NA	29.0
CT (simple cycle)	Distillate fuel oil	SO ₂	92.2	0.048	0.615	NA
CT/HRSG	Syngas (100% CGCU)	SO ₂	518.0	0.236†	2.073**	NA
	Syngas (50% CGCU/50% HGCU)	SO ₂	518.0	0.236†	2.073**	NA
Auxiliary boiler	Distillate fuel oil	SO ₂	2.6	0.053	NA	NA
Tail gas treating unit thermal oxidizer	Distillate fuel oil	SO ₂	52.0	NA	NA	NA
H ₂ SO ₄ thermal oxidizer	Distillate fuel oil	SO ₂	10.1	NA	NA	NA
CT (simple cycle)	Distillate fuel oil	H ₂ SO ₄	9.7	0.005	0.065	NA
CT/HRSG	Syngas (100% CGCU)	H ₂ SO ₄	55.0	0.024†	0.212**	NA
	Syngas (50% CGCU/50% HGCU)	H ₂ SO ₄	55.0	0.024†	0.212**	NA

3.4.3-3

Table 3.4.3-1. Proposed BACT Limitations for the IGCC Facility (Continued, Page 3 of 3)

Emission Source	Fuel Type	Pollutant	BACT Emission Limitation			
			lb/hr	lb/MMBtu	lb/MW	ppmvd
Auxiliary boiler	Distillate fuel oil	H ₂ SO ₄	0.0	NA	NA	NA
Tail gas treating unit thermal oxidizer	Distillate fuel oil	H ₂ SO ₄	0.0	NA	NA	NA
H ₂ SO ₄ thermal oxidizer	Distillate fuel oil	H ₂ SO ₄	0.0	NA	NA	NA
CT (simple cycle)	Distillate fuel oil	NO ₂	311.0	0.163	2.073	NA
CT/HRS	Syngas (100% CGCU)	NO ₂	222.5	0.099†	0.866**	25.0
	Syngas (50% CGCU/50% HGCU)	NO ₂	664.0	0.292†	2.564**	81.0
Auxiliary boiler	Distillate fuel oil	NO ₂	7.9	0.159	NA	123.0
Tail gas treating unit thermal oxidizer	Distillate fuel oil	NO ₂	2.6	NA	NA	42.0
H ₂ SO ₄ thermal oxidizer	Distillate fuel oil	NO ₂	1.14	NA	NA	33.0

Note: For distillate fuel oil, emission estimates based on following properties: (1) maximum ash content of 0.01 weight percent, (2) maximum sulfur content of 0.05 weight percent, and (3) maximum fuel-bound nitrogen of 0.015 weight percent [for fuel-bound nitrogen levels greater than 0.015 weight percent, emission limits are adjusted in accordance with the fuel-bound nitrogen allowance contained in 40 CFR 60(GG)].

*Including H₂SO₄ emissions.

†Based on heat input (HHV) to coal gasifier and includes emissions from tail gas treating unit thermal oxidizer.

**Includes emissions from tail gas treating unit thermal oxidizer.

††Excluding H₂SO₄ emissions.

Sources: GE, 1992.
Texaco, 1992.

Table 3.4.3-1. Proposed BACT Limitations for the IGCC Facility (Continued, Page 2 of 3)

Emission Source	Fuel Type	Pollutant	BACT Emission Limitation			
			lb/hr	lb/MMBtu	lb/MW	ppmvd
H ₂ SO ₄ thermal oxidizer	Distillate fuel oil	CO	0.61	NA	NA	29.0
CT (simple cycle)	Distillate fuel oil	VOC	32.0	0.028	0.427	20.0
CT/HRSG	Syngas (100% CGCU)	VOC	3.0	0.0013†	0.012**	1.0
	Syngas (50% CGCU/50% HGCU)	VOC	3.0	0.0013†	0.012**	1.0
Auxiliary boiler	Distillate fuel oil	VOC	2.4	0.0485	NA	27.0
Tail gas treating unit thermal oxidizer	Distillate fuel oil	VOC	0.8	NA	NA	37.0
H ₂ SO ₄ thermal oxidizer	Distillate fuel oil	VOC	0.35	NA	NA	29.0
CT (simple cycle)	Distillate fuel oil	SO ₂	92.2	0.048	0.615	NA
CT/HRSG	Syngas (100% CGCU)	SO ₂	518.0	0.236†	2.073**	NA
	Syngas (50% CGCU/50% HGCU)	SO ₂	518.0	0.236†	2.073**	NA
Auxiliary boiler	Distillate fuel oil	SO ₂	2.6	0.053	NA	NA
Tail gas treating unit thermal oxidizer	Distillate fuel oil	SO ₂	52.0	NA	NA	NA
H ₂ SO ₄ thermal oxidizer	Distillate fuel oil	SO ₂	10.1	NA	NA	NA
CT (simple cycle)	Distillate fuel oil	H ₂ SO ₄	9.7	0.005	0.065	NA
CT/HRSG	Syngas (100% CGCU)	H ₂ SO ₄	55.0	0.024†	0.212**	NA
	Syngas (50% CGCU/50% HGCU)	H ₂ SO ₄	55.0	0.024†	0.212**	NA

3.4.3-3

Table 3.4.3-1. Proposed BACT Limitations for the IGCC Facility (Continued, Page 3 of 3)

Emission Source	Fuel Type	Pollutant	BACT Emission Limitation			
			lb/hr	lb/MMBtu	lb/MW	ppmvd
Auxiliary boiler	Distillate fuel oil	H ₂ SO ₄	0.0	NA	NA	NA
Tail gas treating unit thermal oxidizer	Distillate fuel oil	H ₂ SO ₄	0.0	NA	NA	NA
H ₂ SO ₄ thermal oxidizer	Distillate fuel oil	H ₂ SO ₄	0.0	NA	NA	NA
CT (simple cycle)	Distillate fuel oil	NO ₂	311.0	0.163	2.073	NA
CT/HRSG	Syngas (100% CGCU)	NO ₂	222.5	0.099†	0.866**	25.0
	Syngas (50% CGCU/50% HGPU)	NO ₂	664.0	0.292†	2.564**	81.0
Auxiliary boiler	Distillate fuel oil	NO ₂	7.9	0.159	NA	123.0
Tail gas treating unit thermal oxidizer	Distillate fuel oil	NO ₂	2.6	NA	NA	42.0
H ₂ SO ₄ thermal oxidizer	Distillate fuel oil	NO ₂	1.14	NA	NA	33.0

Note: For distillate fuel oil, emission estimates based on following properties: (1) maximum ash content of 0.01 weight percent, (2) maximum sulfur content of 0.05 weight percent, and (3) maximum fuel-bound nitrogen of 0.015 weight percent [for fuel-bound nitrogen levels greater than 0.015 weight percent, emission limits are adjusted in accordance with the fuel-bound nitrogen allowance contained in 40 CFR 60(GG)].

*Including H₂SO₄ emissions.

†Based on heat input (HHV) to coal gasifier and includes emissions from tail gas treating unit thermal oxidizer.

**Includes emissions from tail gas treating unit thermal oxidizer.

††Excluding H₂SO₄ emissions.

Sources: GE, 1992.

Texaco, 1992.

corresponding to the most stringent technically feasible control technology that was not eliminated based on adverse energy, environmental, or economic grounds. Control technology analyses using the five step *top-down* BACT method were prepared for combustion products, products of incomplete combustion, and acid gases, respectively. In the following sections, the BACT analyses are discussed separately for: (a) the IGCC facility, and (b) the stand-alone CC and CT units since these emission sources are two distinct processes with differing available control technologies.

3.4.3.2 Particulate Matter and Trace Heavy Metals

Control technologies available for the IGCC facility (advanced CT and ancillary combustion sources) include use of clean fuels and efficient combustion and conventional post-combustion stack controls such as electrostatic precipitators, fabric filters, and wet scrubbers. A wet scrubber to remove PM from the syngas will be an integral part of the CGCU process. The scrubbed syngas will then be cooled prior to entering the acid gas removal unit which will result in the condensation of trace volatile heavy metals and further reduction in syngas particulate levels. The demonstration HGCU technology will employ a high temperature barrier filter to remove 99.5 percent or more of the PM contained in the syngas stream. The end product of the CG process, for both CGCU and HGCU technologies, will be a treated syngas stream which is low in PM. The low PM content of the treated syngas stream, coupled with high CT excess air rates, will produce an exhaust gas with very low PM concentrations; i.e., 0.010 grains per standard cubic foot (gr/scf) or less. Use of backup low sulfur distillate fuel oil in the advanced CT will also result in low exhaust PM concentrations, 0.0048 gr/scf or less. This low exhaust PM concentration will also occur for the 7F CT during its initial first year, distillate fuel oil-fired, simple-cycle mode operation and when operated in CC mode when syngas is unavailable. Control of exhaust stream PM concentrations of such low magnitude using available post-combustion technologies is not feasible since removal efficiencies would be unreasonably low and costs excessive. Since post-process stack controls for PM are not appropriate for the IGCC facility, the use of wet scrubbing (integral to

Table 3.4.3-1. Proposed BACT Limitations for the IGCC Facility (Continued, Page 2 of 3)

Emission Source	Fuel Type	Pollutant	BACT Emission Limitation			
			lb/hr	lb/MMBtu	lb/MW	ppmvd
H ₂ SO ₄ thermal oxidizer	Distillate fuel oil	CO	0.61	NA	NA	29.0
CT (simple cycle)	Distillate fuel oil	VOC	32.0	0.028	0.427	20.0
CT/HRSG	Syngas (100% CGCU)	VOC	3.0	0.0013†	0.012**	1.0
	Syngas (50% CGCU/50% HGPU)	VOC	3.0	0.0013†	0.012**	1.0
Auxiliary boiler	Distillate fuel oil	VOC	2.4	0.0485	NA	27.0
Tail gas treating unit thermal oxidizer	Distillate fuel oil	VOC	0.8	NA	NA	37.0
H ₂ SO ₄ thermal oxidizer	Distillate fuel oil	VOC	0.35	NA	NA	29.0
CT (simple cycle)	Distillate fuel oil	SO ₂	92.2	0.048	0.615	NA
CT/HRSG	Syngas (100% CGCU)	SO ₂	518.0	0.236†	2.073**	NA
	Syngas (50% CGCU/50% HGPU)	SO ₂	518.0	0.236†	2.073**	NA
Auxiliary boiler	Distillate fuel oil	SO ₂	2.6	0.053	NA	NA
Tail gas treating unit thermal oxidizer	Distillate fuel oil	SO ₂	52.0	NA	NA	NA
H ₂ SO ₄ thermal oxidizer	Distillate fuel oil	SO ₂	10.1	NA	NA	NA
CT (simple cycle)	Distillate fuel oil	H ₂ SO ₄	9.7	0.005	0.065	NA
CT/HRSG	Syngas (100% CGCU)	H ₂ SO ₄	55.0	0.024†	0.212**	NA
	Syngas (50% CGCU/50% HGPU)	H ₂ SO ₄	55.0	0.024†	0.212**	NA

3.4.3-3

Table 3.4.3-1. Proposed BACT Limitations for the IGCC Facility (Continued, Page 3 of 3)

Emission Source	Fuel Type	Pollutant	BACT Emission Limitation			
			lb/hr	lb/MMBtu	lb/MW	ppmvd
Auxiliary boiler	Distillate fuel oil	H ₂ SO ₄	0.0	NA	NA	NA
Tail gas treating unit thermal oxidizer	Distillate fuel oil	H ₂ SO ₄	0.0	NA	NA	NA
H ₂ SO ₄ thermal oxidizer	Distillate fuel oil	H ₂ SO ₄	0.0	NA	NA	NA
CT (simple cycle)	Distillate fuel oil	NO ₂	311.0	0.163	2.073	NA
CT/HRSG	Syngas (100% CGCU)	NO ₂	222.5	0.099†	0.866**	25.0
	Syngas (50% CGCU/50% HGCU)	NO ₂	664.0	0.292†	2.564**	81.0
Auxiliary boiler	Distillate fuel oil	NO ₂	7.9	0.159	NA	123.0
Tail gas treating unit thermal oxidizer	Distillate fuel oil	NO ₂	2.6	NA	NA	42.0
H ₂ SO ₄ thermal oxidizer	Distillate fuel oil	NO ₂	1.14	NA	NA	33.0

Note: For distillate fuel oil, emission estimates based on following properties: (1) maximum ash content of 0.01 weight percent, (2) maximum sulfur content of 0.05 weight percent, and (3) maximum fuel-bound nitrogen of 0.015 weight percent [for fuel-bound nitrogen levels greater than 0.015 weight percent, emission limits are adjusted in accordance with the fuel-bound nitrogen allowance contained in 40 CFR 60(GG)].

*Including H₂SO₄ emissions.

†Based on heat input (HHV) to coal gasifier and includes emissions from tail gas treating unit thermal oxidizer.

**Includes emissions from tail gas treating unit thermal oxidizer.

††Excluding H₂SO₄ emissions.

Sources: GE, 1992.

Texaco, 1992.

Table 3.4.3-2. Proposed BACT Limitations for Stand-Alone CC and CT Units

Emission Source	Fuel Type	Pollutant	BACT Emission Limitation			
			lb/hr	lb/MMBtu	lb/MW	ppmvd
CC unit (per unit)	Natural gas	PM*	22.0	0.010	0.100	NA
	Distillate fuel oil	PM*	41.0	0.018	0.186	NA
CTs (per CT)	Natural gas	PM*	11.0	0.010	0.147	NA
	Distillate fuel oil	PM*	20.5	0.018	0.273	NA
CC unit (per unit)	Natural gas	PM†	14.0	0.007	0.064	NA
	Distillate fuel oil	PM†	30.0	0.013	0.136	NA
CTs (per CT)	Natural gas	PM†	7.0	0.007	0.093	NA
	Distillate fuel oil	PM†	15.0	0.013	0.200	NA
CC unit (per unit)	Natural gas	CO	118.0	0.055	0.536	25.0
	Distillate fuel oil	CO	142.0	0.064	0.645	30.0
CTs (per CT)	Natural gas	CO	59.0	0.055	0.787	25.0
	Distillate fuel oil	CO	71.0	0.064	0.945	30.0
CC unit (per unit)	Natural gas	VOC	20.0	0.0093	0.091	7.0
	Distillate fuel oil	VOC	20.0	0.0090	0.091	7.0
CTs (per CT)	Natural gas	VOC	10.0	0.0093	0.133	7.0
	Distillate fuel oil	VOC	10.0	0.0090	0.133	7.0
CC unit (per unit)	Natural gas	SO ₂	72.0	0.034	0.327	NA
	Distillate fuel oil	SO ₂	107.4	0.047	0.488	NA
CTs (per CT)	Natural gas	SO ₂	36.0	0.034	0.480	NA
	Distillate fuel oil	SO ₂	53.7	0.047	0.716	NA
CC unit (per unit)	Natural gas	H ₂ SO ₄	8.0	0.0037	0.026	NA
	Distillate fuel oil	H ₂ SO ₄	11.0	0.0049	0.050	NA

3.4.3-5

Table 3.4.3-2. Proposed BACT Limitations for Stand-Alone CC and CT Units (Continued, Page 2 of 2)

Emission Source	Fuel Type	Pollutant	BACT Emission Limitation			
			lb/hr	lb/MMBtu	lb/MW	ppmvd
CTs (per CT)	Natural gas	H ₂ SO ₄	4.0	0.0037	0.053	NA
	Distillate fuel oil	H ₂ SO ₄	5.5	0.0049	0.073	NA
CC unit (per unit)	Natural gas	NO ₂	70.0	0.033	0.318	9.0
	Distillate fuel oil	NO ₂	362.0	0.162	1.645	42.0
CTs (per CT)	Natural gas	NO ₂	35.0	0.033	0.467	9.0
	Distillate fuel oil	NO ₂	181.0	0.162	2.413	42.0

Note: For distillate fuel oil, emission estimates based on following properties: (1) maximum ash content of 0.01 weight percent, (2) maximum sulfur content of 0.05 weight percent, and (3) maximum fuel-bound nitrogen of 0.015 weight percent [for fuel-bound nitrogen levels greater than 0.015 weight percent, emission limits are adjusted in accordance with the fuel-bound nitrogen allowance contained in 40 CFR 60(GG)].

*Including H₂SO₄ emissions.

†Excluding H₂SO₄ emissions.

Source: GE, 1992.

3.4.3-6

corresponding to the most stringent technically feasible control technology that was not eliminated based on adverse energy, environmental, or economic grounds. Control technology analyses using the five step *top-down* BACT method were prepared for combustion products, products of incomplete combustion, and acid gases, respectively. In the following sections, the BACT analyses are discussed separately for: (a) the IGCC facility, and (b) the stand-alone CC and CT units since these emission sources are two distinct processes with differing available control technologies.

3.4.3.2 Particulate Matter and Trace Heavy Metals

Control technologies available for the IGCC facility (advanced CT and ancillary combustion sources) include use of clean fuels and efficient combustion and conventional post-combustion stack controls such as electrostatic precipitators, fabric filters, and wet scrubbers. A wet scrubber to remove PM from the syngas will be an integral part of the CGCU process. The scrubbed syngas will then be cooled prior to entering the acid gas removal unit which will result in the condensation of trace volatile heavy metals and further reduction in syngas particulate levels. The demonstration HGCU technology will employ a high temperature barrier filter to remove 99.5 percent or more of the PM contained in the syngas stream. The end product of the CG process, for both CGCU and HGCU technologies, will be a treated syngas stream which is low in PM. The low PM content of the treated syngas stream, coupled with high CT excess air rates, will produce an exhaust gas with very low PM concentrations; i.e., 0.010 grains per standard cubic foot (gr/scf) or less. Use of backup low sulfur distillate fuel oil in the advanced CT will also result in low exhaust PM concentrations, 0.0048 gr/scf or less. This low exhaust PM concentration will also occur for the 7F CT during its initial first year, distillate fuel oil-fired, simple-cycle mode operation and when operated in CC mode when syngas is unavailable. Control of exhaust stream PM concentrations of such low magnitude using available post-combustion technologies is not feasible since removal efficiencies would be unreasonably low and costs excessive. Since post-process stack controls for PM are not appropriate for the IGCC facility, the use of wet scrubbing (integral to

the IGCC process), good combustion practices and clean fuels is considered to be BACT. The Polk Power Station IGCC project will use the latest CT burner technology to maximize combustion efficiency and minimize PM emission rates. Project fuels will consist of coal-derived syngas and low sulfur distillate fuel oil.

Ancillary equipment associated with the IGCC facility that emit PM include the auxiliary steam boiler, coal handling facilities, H_2SO_4 plant (HGCU technology) thermal oxidizer, and the sulfur recovery unit (CGCU technology) tail gas thermal oxidizer. The auxiliary boiler, H_2SO_4 thermal oxidizer, and sulfur recovery tail gas thermal oxidizer will all use low ash, low-sulfur fuels. Due to low exhaust stream PM concentrations, BACT for PM emissions from these emission sources is considered to be the use of clean fuels and good combustion practices.

Coal handling fugitive PM emissions will be controlled by a combination of wet dust suppression, equipment enclosure, and fabric filter dust collection systems located at the major dust emission points. Trucks and railcars will unload at a receiving hopper equipped with a dust collection system to collect dust from all conveyor transfer points in the dump pit area. Wet dust suppression systems using either foam, or water sprays with a wetting agent, will also be employed at the truck/railcar receiving hopper. Conveyors will be hooded to minimize dust emissions. Enclosures and dust abatement equipment (fabric filters) will be employed to control PM emissions from coal handling equipment and transfer points. A wet suppression system will be used at the stacker discharge to the coal pile. Wind blown PM emissions from the active and inactive coal piles will be controlled by the application of water/chemical dust suppressants and crusting agents, respectively. All roads within the Polk Power Station complex will be paved, except for the infrequently used transmission line service roads. Use of wet suppression, hoods and enclosures, paved roads, and fabric filters is considered to be BACT for PM emissions from coal handling operations.

Exhaust PM concentrations from the stand-alone CC and CT units are inherently low due to the combustion of clean fuels (natural gas and low sulfur distillate fuel oil)

and high exhaust gas flow rates. Estimated maximum PM exhaust concentrations (including H_2SO_4 mist) from the individual stand-alone CTs in simple-cycle or CC mode using natural gas and backup distillate fuel oil are 0.0033 and 0.0065 gr/scf, respectively. Due to these low exhaust concentrations, post-process stack controls are not feasible since PM removal efficiencies would be unreasonably low and costs excessive. Use of clean fuels and good combustion practices is considered to be BACT for PM emissions from the stand-alone CC units and CTs.

3.4.3.3 Carbon Monoxide and Volatile Organic Compounds

Available technologies for reducing CO and VOC emissions from the IGCC facility (CT and ancillary combustion sources) include combustion process design and use of post-combustion oxidation catalyst controls. Combustion process controls involve combustion chamber designs and operation practices that improve the oxidation process and minimize incomplete combustion. Due to the high combustion efficiency of most proposed combustion processes, CO and VOC emissions are inherently low.

Noble metal (commonly platinum or palladium) oxidation catalysts can be used to promote oxidation of CO and VOCs to CO_2 and water at temperatures lower than would be necessary for oxidation without a catalyst. The operating temperature range for these oxidation catalysts is between 650 and 1,150°F. However, these oxidation catalysts are susceptible to deactivation due to impurities present in the exhaust gas stream. Arsenic, iron, sodium, phosphorous, and silica all act as catalyst poisons causing a reduction in catalyst activity and pollutant removal efficiencies. Thus, oxidation catalysts are nonselective and will oxidize other compounds in addition to CO and VOCs. The nonselectivity characteristics of oxidation catalysts are important in assessing applicability to exhaust streams containing sulfur compounds. Sulfur compounds that have been oxidized to SO_2 in the combustion process will be further oxidized by the catalyst to sulfur trioxide (SO_3). SO_3 will, in turn, combine with moisture in the gas stream to form H_2SO_4 mist which can lead to corrosion and fouling of boiler tubes in the HRSG, plugging of the catalyst reactor, decrease in CO conversion efficiency of the catalyst, and a visible exhaust plume.

Corrosion of the HRSG boiler tubes decreases heat transfer surface area and thus decreases steam generating capabilities. Sulfur compounds in the exhaust gas stream also decrease CO removal efficiency of the catalyst since the catalyst will selectively absorb sulfur compounds. This thin layer of sulfur residue inhibits the contact between CO and the catalyst decreasing catalyst performance. CO oxidation catalysts treating streams containing sulfur compounds must be washed or heated to high temperatures periodically to eliminate catalyst sulfur residue which increases the downtime of the control system. Increased downtime is unacceptable for the Polk Power Station IGCC facility since the facility will operate as a baseload power plant.

There are no significant energy or environmental impacts associated with the use of good combustor designs and operating practices to minimize CO and VOC emissions. The application of oxidation catalyst technology to a combustion device would result in an increase in backpressure on the device due to pressure drop across the catalyst bed thereby increasing energy consumption. Concerning environmental impacts, the use of oxidation catalysts would, as previously mentioned, result in excessive H_2SO_4 mist emissions if applied to combustion devices fired with fuels containing sulfur. Since the estimated CO and VOC emission rates from the IGCC combustion unit will be inherently low, further reductions through the use of oxidation catalysts will result in insignificant air quality improvements which are well below the defined PSD significant impact levels for CO and negligible reductions in ambient VOC levels. The Polk Power Station site (i.e., Polk County) is classified attainment for all criteria pollutants.

From an air quality perspective, the only benefit of CO oxidation catalysts would be to prevent localized CO *hot spots* since the catalyst does not remove CO but rather simply accelerates the natural atmospheric oxidation of CO to CO_2 . Dispersion modeling of CO emissions from the Polk Power Station sources indicate that maximum impacts will be insignificant.

Due to the oxidation of sulfur compounds and excessive formation of H_2SO_4 mist emissions, oxidation catalysts were not considered to be technically feasible for the IGCC combustion units since these units are fired with fuels (syngas and distillate fuel oil) containing appreciable amounts of sulfur. Use of combustion controls and good operating practices to minimize incomplete combustion are proposed as BACT for the IGCC unit and associated combustion sources. Proper combustion system design, efficient operation, and minimization of low load conditions will control CO and VOC emissions to low levels consistent with NO_x emission control requirements. *CO and VOC limits proposed for the IGCC advanced CT when fired with syngas are less than the lowest BACT/Lowest Available Emission Rate (LAER) Information System (BLIS) entries for coal-fired boilers.* Overall, the proposed BACT technologies and emission limits for the IGCC unit and associated facilities are consistent with previous BACT determinations both within Florida and elsewhere in the United States (FDER, 1991; EPA, 1992; San Bernardino County Air Pollution Control District, 1989).

The two available control technologies of combustion process modifications and use of oxidation catalysts would also apply to the stand-alone CC and CT units. The energy and environmental impacts associated with oxidation catalysts as previously described would also be relevant to these units (i.e., negligible improvements in ambient CO and VOC levels, increased H_2SO_4 emissions during distillate fuel oil firing, and an energy penalty due to increased turbine backpressure).

The CTs associated with the stand-alone CC and CT units will use natural gas as the primary fuel with low sulfur distillate fuel oil as a backup fuel source. Maximum distillate oil annual capacity factors for the stand-alone CC units and CTs are 25 and 10 percent, respectively. Maximum natural gas annual capacity factors for the stand-alone CC units and CTs are 100 and 50 percent, respectively. An economic evaluation of an oxidation catalyst system having an 80-percent CO removal efficiency was performed for the future Polk Power Station CTs using OAQPS and project-specific economic cost factors. Base case CO emissions are estimated to be 25 ppmvd

resulting in a controlled CO exhaust concentration of 5.0 ppmvd. Base case CO emission levels are representative of the performance of the dry low-NO_x burners planned for the future stand-alone CC units and CTs. The dry low-NO_x burners, which can attain a NO_x exhaust concentration of 9 ppmvd, produce slightly higher CO emissions in comparison to conventional CT burner technology. Cost effectiveness of oxidation catalyst for CO emissions was determined to be \$5,158 per ton of CO removed for the CC units. For the simple-cycle CTs, cost effectiveness of CO oxidation catalyst was found to be \$5,643 per ton. Based on the high control costs, use of oxidation catalyst technology to control CO and VOC emissions was not considered to be economically feasible. The slightly higher CO emissions which result from the proposed use of dry-low NO_x burners is an acceptable compromise with respect to overall NO_x and CO emission rates.

Use of combustion controls and good operating practices to minimize incomplete combustion are proposed as BACT for the future stand-alone CC and CT units. These control methods are consistent with prior FDER BACT determinations for CO and VOC emissions from CT units which have all been based on the use of good combustion techniques.

3.4.3.4 Sulfur Dioxide and Sulfuric Acid Mist

SO₂, SO₃, and H₂SO₄ mist emissions result from the combustion of fuels containing sulfur. H₂SO₄ emissions result from the reaction of SO₃ and water in the exhaust gas stream. The conversion rate of SO₂ to SO₃ depends on combustion parameters; e.g., temperature and excess oxygen levels, as well as fuel characteristics.

Removal and recovery of sulfur contained in the coal fuel are integral components of the CG process. The proposed IGCC unit and sulfur recovery processes are highly efficient and will result in a low rate of SO₂ emitted per megawatt of electricity produced in comparison to conventional coal-fired power plants. The syngas cleanup processes remove and recover sulfur compounds, primarily H₂S, from the high pressure syngas generated in the gasifier. Removal and recovery of sulfur compounds

from the syngas stream will be much more efficient than that achieved removing the same compounds from the post-combustion, highly dilute, low pressure exhaust streams generated by conventional coal combustion in a steam boiler. The proposed IGCC unit sulfur recovery processes result in saleable, concentrated by-product streams, liquid sulfur (CGCU) or H_2SO_4 (HGCU), in contrast to the large quantities of solid waste materials typically generated by conventional wet or dry FGD systems.

In the CGCU system, acid gases (CO_2 , H_2S , and COS) present in the syngas will be removed using a promoted amine process in the acid gas removal unit. The promoted amine will act as a weak base to selectively absorb the weak H_2S acid while allowing most of the CO_2 to remain in the syngas. The treated syngas stream, containing approximately 0.07 weight percent sulfur, will flow from the acid gas removal unit through several coolers and knockout drums for water removal and will then be burned in the advanced CT for power production. The rich amine solution containing dissolved acid gases will be routed to the amine stripper where the acid gases are steam stripped from the rich amine solution. The concentrated acid gas overhead stream from the amine stripper will be cooled and routed to the sulfur recovery unit for processing. Lean amine solution from the amine stripper will be cooled and pumped to the amine storage tank for subsequent re-use in the amine absorber. Amine treating is the most widely used and efficient process for removing acid gases from sour gas streams. For the Polk Power Station project, a three-stage catalytic sulfur recovery unit followed by a tail gas treating unit and thermal oxidation will recover over 99 percent of the sulfur entering the sulfur recovery unit/tail gas treating unit system.

The demonstration HGCU system will remove H_2S from the coal gasifier syngas stream at elevated temperatures by reacting the gas stream with zinc titanate sorbent in a moving bed absorber. The zinc titanate sorbent is regenerated by controlled temperature, multi-stage oxidation in a regenerator. The concentrated SO_2 stream from the regenerator will be routed to an H_2SO_4 plant for conversion to H_2SO_4 by-product. The high temperature zinc titanate absorption system has the potential to

achieve sulfur removals greater than conventional CGCU technology while improving the overall efficiency of the IGCC facility. At a minimum, sulfur removal efficiency for the HGCU technology will equal that of conventional CGCU.

The proposed sulfur removal and recovery processes (both CGCU and HGCU) which are integral to the IGCC facility will achieve an overall sulfur removal efficiency of 95.6 percent. *This removal efficiency is higher than the highest efficiency listed in BLIS for large, coal-fired power plants and exceeds that required for recently permitted CG and coal-fired boiler facilities in Florida.* Sulfur content of the treated syngas is projected to be less than 0.07 weight percent. Application of FGD systems is not feasible due to the low exhaust SO_2 concentrations. Use of the integral acid gas removal and sulfur recovery processes are proposed as BACT for the IGCC facility. BACT for the ancillary IGCC combustion sources is considered to be the use of low sulfur fuels.

The stand-alone CC and CT units will use natural gas and low sulfur (maximum 0.05 weight percent sulfur) distillate oil as fuels. Natural gas is the primary fuel with distillate oil serving as a backup fuel source. Maximum distillate oil annual capacity factors for the stand-alone CC units and CTs are 25 and 10 percent, respectively. Technologies available to control SO_2 and H_2SO_4 emissions from these units include fuel treatment and post-combustion add-on controls; i.e., FGD systems. While FGD technology would be technically feasible, there have been no applications to CT operations in the United States since low sulfur fuels have been used resulting in low exhaust gas SO_2 concentrations. The sulfur content of the backup distillate oil proposed for the CTs will be more than 40 times lower than the fuels employed in coal-fired boilers using FGD systems. In addition, CTs operate with a significant amount of excess air which generates high exhaust gas flow rates. Since FGD SO_2 removal efficiency decreases with decreasing inlet SO_2 concentrations, application of a FGD system to a CT exhaust stream would result in unreasonably low SO_2 removal efficiencies. Due to low SO_2 exhaust stream concentrations, FGD technology was not

considered to be feasible for CTs for the Polk Power Station since removal efficiencies would be unreasonably low and costs would be excessive.

Since post-combustion controls are not applicable, use of low sulfur fuels is considered to represent BACT for SO₂ and H₂SO₄ emissions from the stand-alone CC and CT units. These units will use natural gas (containing less than 10 gr/100 scf) and low sulfur distillate oil as fuels.

3.4.3.5 Nitrogen Oxides

NO_x emissions from combustion sources consist of two components; thermal and fuel NO_x. Thermal NO_x results from the oxidation of atmospheric nitrogen under high temperature combustion conditions. The amount of thermal NO_x formed is primarily a function of combustion temperature and residence time, air/fuel ratio and, to a lesser extent, combustion pressure. Fuel NO_x arises from the oxidation of non-elemental nitrogen contained in the fuel. In contrast to thermal NO_x, fuel NO_x formation does not vary appreciably with combustion variables such as temperature or residence time. Presently, there are no combustion process or fuel treatment technologies available to control fuel NO_x emissions.

Available control technologies evaluated for the IGCC combustion sources consist of combustion process modifications and post-combustion exhaust gas treatment systems. Available CT combustion process technologies are standard combustor design and water/steam/diluent injection, advanced combustor design and water/steam/diluent injection, and dry low-NO_x combustors. Combustion process modifications applicable to IGCC combustion sources other than the CT include flue gas recirculation, low excess air, and low-NO_x burners. Post-combustion technologies potentially applicable to all IGCC combustion sources are selective non-catalytic reduction (SNCR), non-selective catalytic reduction (NSCR), and selective catalytic reduction (SCR). Detailed descriptions of these control technologies are provided in the PSD application contained in Appendix 11.1.3 of this SCA.

In theory, technically feasible control technologies for the IGCC CT were determined to be water/steam/diluent injection with either standard or advanced combustor technology and SCR. For the IGCC oxygen-blown process, nitrogen will be provided to serve as a diluent to lower peak flame temperatures and reduce NO_x formation without the water consumption and treatment/disposal requirements associated with water or steam injection. Nitrogen used for injection will be provided by the air separation unit which also produces oxygen for the IGCC gasification process. Steam/water injection technology was not reviewed since it results in the same level of NO_x emissions in comparison to nitrogen injection.

SCR was evaluated although a number of concerns exist regarding the technical feasibility of SCR for CTs fueled with syngas. SCR catalyst deactivation can occur due to chemical poisoning. Principle poisons include arsenic, sulfur, potassium, sodium, and calcium. All of these are present in the flyash generated from coal and oil combustion. Decreased SCR catalyst activity after only a few hundred hours of operation was observed in European tests for certain coals and firing modes. The decrease in catalyst performance was subsequently attributed to arsenic poisoning of the catalyst. Gaseous arsenic trioxide, formed by the oxidation of elemental arsenic in coal, was found to condense on the SCR catalyst preventing the adsorption of NO_x and NH_3 .

SCR catalyst will promote the oxidation of flue gas SO_2 to SO_3 which will then combine with water vapor to form H_2SO_4 . Accordingly, corrosion of downstream piping and heat transfer equipment (which would operate at temperatures below the H_2SO_4 dew point) would be of concern when using SCR with sulfur-bearing fuels. Also, SO_3 will combine with unreacted NH_3 to form ammonium bisulfate and ammonium sulfate. Ammonium bisulfate is a hygroscopic solid at approximately 380°F and will deposit on equipment surfaces below this temperature as a white solid. Both ammonium bisulfate and ammonium sulfate would be expected to deposit on HRSG heat transfer equipment where temperatures below 380°F will occur. Since ammonium bisulfate is hygroscopic, the material will absorb water

forming a sticky substance which can cause fouling of heat transfer equipment. Ammonium bisulfate cannot be easily removed due to its sticky nature; a unit shutdown would be required to clean fouled equipment. Formation of ammonium salts will also result in a significant increase in PM emissions. The technical difficulties associated with SCR and sulfur bearing fuels have been documented for fuels having relatively low sulfur contents; e.g., as low as 50 to 100 parts per million (ppm) (0.005 to 0.01 percent) sulfur. Although the fuels planned for the IGCC advanced CT are low in sulfur content, the sulfur levels are more than sufficient to cause problems with operation of a SCR control system. Problems associated with ammonium salt deposition can be ameliorated to some extent by reducing the NH_3/NO_x molar ratio when firing sulfur-containing fuels. However, all known successful applications of SCR for CTs are on natural gas-fired units. There are presently no applications of SCR to CTs fired with syngas derived from coal.

There are no significant adverse energy or environmental effects due to the use of nitrogen injection and advanced combustor technology. In contrast, application of SCR technology will result in the following adverse impacts:

- Total energy penalty of 7.2 megawatt-hours per year (equivalent to an annual consumption of 23.5 million cubic feet of natural gas) due to increased backpressure on the CT and pumping and vaporization of aqueous NH_3 ;
- NH_3 emissions due to NH_3 slip; NH_3 emissions are estimated to total 98 tpy (at baseload and 59°F ambient temperature) for a typical SCR design NH_3 slippage rate of 10 ppmvd;
- Ammonium bisulfate and ammonium sulfate particulate emissions due to the reaction of NH_3 with SO_3 present in the exhaust gases; total particulate emissions would increase by approximately 50 percent;
- A public risk due to potential leaks from the storage of large quantities of NH_3 -- NH_3 has been designated an Extraordinarily Hazardous Substance under the Federal Superfund Amendment and Reauthorization Act (SARA) Title III regulations; and

- Disposal of spent catalyst which may be considered hazardous due to heavy metal contamination; vanadium pentoxide is an active component of a typical SCR catalyst and is listed as a hazardous chemical waste under Resource Conservation and Recovery Act (RCRA) Regulations 40 CFR 261.30.

An assessment of economic impacts was performed by comparing control costs between a baseline case of advanced combustion and nitrogen injection and baseline technology with the addition of SCR controls. Baseline technology is expected to achieve NO_x exhaust concentrations of 25 and 42 ppmvd at 15-percent oxygen for syngas and oil-firing, respectively. Due to the problems associated with the application of SCR to exhaust streams containing sulfur, NH_3 addition must be reduced to prevent formation of ammonium salts and subsequent fouling of downstream heat transfer equipment. Based on Japanese experience, SCR technology with reduced NH_3 addition was premised to achieve NO_x concentrations of 12.5 and 21.0 ppmvd at 15-percent oxygen for syngas and oil-firing, respectively, representing a 50-percent NO_x removal efficiency. The cost impact analysis was conducted using OAQPS and project-specific economic factors. Cost effectiveness for the application of SCR technology to the IGCC advanced CT was determined to be \$6,272 per ton of NO_x removed. This control cost is greater than those previously found to be reasonable for BACT NO_x determinations. Further, the economic evaluation did not include the increased costs that would also accrue due to downtime required for cleaning of fouled heat transfer equipment.

NO_x emissions during the 2-year HGCU demonstration period are expected to be higher than for CGCU technology. The primary reason for this increase is the presence of NH_3 in the HGCU syngas stream; the NH_3 will be subsequently oxidized to NO_x in the IGCC advanced CT. NH_3 will be removed from the gasifier syngas stream as part of the CGCU process and thus CGCU generates syngas with negligible NH_3 concentrations. One of the goals of the HGCU demonstration project is to determine the NO_x levels that are generated by the process.

Use of nitrogen diluent injection to achieve NO_x exhaust concentrations of 25 ppmvd at 15-percent oxygen for syngas-firing and water injection to achieve 42 ppmvd at 15 percent O₂ for oil-firing is proposed as BACT for the IGCC advanced CT. Nitrogen injection is considered to represent BACT for the following reasons:

- The 25 ppmvd NO_x concentration limit for syngas combustion together with NO_x emissions from the tail gas treating unit thermal oxidizer represents an overall IGCC NO_x emission rate of 0.099 pound per million British thermal unit (lb/MMBtu). *This rate is among the lowest contained in the BLIS database and is well below the most recent BACT determination of 0.17 lb/MMBtu made in Florida and New Jersey for coal-fired power plants.*
- Overall NO_x emissions from the IGCC facility in terms of pounds of NO_x per megawatt *is approximately 50 percent* of the rates recently approved by FDER for the Stanton and Indiantown coal-fired power plants and, with one exception, *is the lowest in the BLIS database.* Comparison of emissions on a pound-per-megawatt basis is felt to be more meaningful than other units such as pound-per-million-Btu since it reflects the emission reduction benefit of process efficiency.
- The 25 ppmvd NO_x concentration limit proposed for syngas combustion is well below the previous BACT concentration of 42 ppmvd assigned to CG projects in Virginia and Florida.
- Nitrogen injection will achieve the same level of NO_x control as water or steam injection without the water consumption and treatment/disposal requirements associated with wet injection.
- Power augmentation due to nitrogen addition results in lower emissions per unit of power produced since the nitrogen augmentation replaces power that would otherwise be generated by fossil fuel combustion. The concomitant emissions associated with fuel combustion are therefore avoided.

- Dry low-NO_x burner technology has not yet been developed for syngas fuels--initial research indicated comparable performance to the standard multi-nozzle combustor.
- Cost-effectiveness of SCR was found to be \$6,272 per ton of NO_x removed which exceeds values previously considered to be reasonable for NO_x BACT determinations.
- The application of SCR technology to the treatment of exhaust gases generated by the combustion of sulfur-bearing fuels poses a number of technical concerns. These concerns include catalyst poisoning from arsenic and sulfur compounds and formation of ammonium salts due to the combination of SO₃ and any unreacted NH₃ causing corrosion and reduced efficiency of downstream heat transfer equipment.
- Spent SCR catalyst may require handling and disposal as a hazardous waste due to vanadium pentoxide content. Also, facility workers could be exposed to high levels of vanadium pentoxide particulates during catalyst handling.
- Emissions of NH₃ will occur due to NH₃ slip. SCR vendors typically guarantee a maximum NH₃ slip rate of 10 ppmv. Both NO_x and NH₃ participate in the photochemical ozone cycle--the substitution of 10 ppmv NH₃ (due to slip) for 12.5 ppmv NO_x (the concentration controlled by SCR) during syngas firing, the fuel which will be employed 90 percent of the time in the IGCC CT, is felt to be problematical from an air quality perspective. In addition, NH₃ slip can increase significantly during start-ups, upsets/failures of the NH₃ injection system, or due to catalyst degradation. During such instances, NH₃ concentrations of 50 ppmv or greater have been measured which exceeds the odor threshold of approximately 20 ppmv.

Use of low-NO_x burner technology is proposed as BACT for the ancillary IGCC combustion sources. These sources have NO_x emission rates which are only a small fraction (approximately 5 percent) of the total IGCC facility NO_x emissions.

Control technologies to abate NO_x emissions previously described for the IGCC advanced CT are also applicable to the stand-alone CC and CT units with the exception of SCR technology for the simple-cycle units. SCR technology is not considered to be applicable to simple-cycle CTs due to temperature constraints; i.e., the CT exhaust temperature of approximately 1,100°F exceeds the maximum temperature required for successful SCR operation.

Use of dry low-NO_x burner technology will achieve lower NO_x emission rates in comparison to wet injection based on vendor data. The stand-alone CC and CT units are projected to attain NO_x exhaust concentrations of 9 and 42 ppmvd at 15-percent oxygen for gas and oil-firing, respectively. Dry low-NO_x burner technology has not yet been developed for oil-firing, and therefore conventional wet injection will be employed when backup distillate oil is used as the turbine fuel source.

The use of dry low-NO_x burner technology is considered to represent BACT for the future CC and simple-cycle CTs for the following reasons:

- Dry low-NO_x burner technology will achieve NO_x concentrations of 9 and 42 ppmvd for gas and oil-firing, respectively. A NO_x exhaust concentration of 9 ppmvd is generally considered to represent BACT for CTs *equipped with SCR control technology*. The proposed NO_x concentration is also below the current FDER BACT guideline of 15 ppmvd for natural gas-fired CTs using dry low-NO_x burners.
- Dry low-NO_x burner technology will achieve comparable emission rates as SCR for gas-firing without the adverse impacts associated with SCR technology; i.e., NH₃ emissions due to NH₃ slip, potential of ammonium salt particulate formation with subsequent downstream corrosion and reduced efficiency of heat transfer equipment, hazards associated with the storage of NH₃ and disposal of spent catalyst, and energy penalties due to increased turbine backpressure and additional system downtime for catalyst replacement.

- Use of backup distillate fuel oil will be limited to annual capacity factors of 25 and 10 percent, respectively for the combined and simple-cycle CTs.
- Application of SCR to the simple-cycle CTs is not considered to be feasible due to the substantial cost required to reduce CT exhaust temperatures to levels consistent with successful SCR operation, low backup fuel oil capacity factor, and relatively minor reduction in NO_x emissions that would result from applying SCR to CTs equipped with dry low-NO_x burners.

3.4.4 DESIGN DATA FOR CONTROL EQUIPMENT

Control of air emissions for the Polk Power Station project will be accomplished by the use of highly efficient process technologies and clean fuels. These process technologies and fuels will achieve low emission rates without the application of post-combustion control equipment. Process descriptions, emission rates and exhaust gas characteristics, and fuel specifications are provided in Sections 3.1 and 3.3 of this SCA. Tables 3.4.4-1 and 3.4.4-2 provide summaries of exhaust characteristics and pollutant emission rates for the IGCC facility and the stand-alone CT and CC units, respectively.

Table 3.4.4-1. Summary Exhaust Characteristics and Emission Rates for the IGCC Facility

Emission Source	Fuel Type	Pollutant	Emission Rate (lb/hr)	Exhaust Characteristics		
				Temperature (°F)	Velocity (ft/sec)	Flow Rate (acfm)
CT* (simple-cycle)	Distillate fuel oil	PM†	26.0	342	69	772,782
		CO	77.0			
		VOC	10.0			
		SO ₂	85.3			
		NO _x	288.0			
CT/HRSG*	Syngas (100% CGCU)	PM†	72.0	265	68	1,156,797
		CO	68.0			
		VOC	2.0			
		SO ₂	518.0			
		NO _x	213.0			
CT/HRSG*	Syngas (50% CGCU/50% HGPU)	PM†	72.0	260	69	1,173,809
		CO	87.0			
		VOC	2.0			
		SO ₂	518.0			
		NO _x	660.0			
Auxiliary boiler	Distillate fuel oil	PM†	3.0	500	43	18,237
		CO	4.3			
		VOC	2.4			
		SO ₂	2.6			
		NO _x	7.9			
TGTU thermal oxidizer	Distillate fuel oil	PM†	13.1	1,400	35	33,399
		CO	1.4			
		VOC	0.8			
		SO ₂	52.0			
		NO _x	2.6			

3.4.4-2

Table 3.4.4-1. Summary Exhaust Characteristics and Emission Rates for the IGCC Facility (Continued, Page 2 of 2)

Emission Source	Fuel Type	Pollutant	Emission Rate (lb/hr)	Exhaust Characteristics		
				Temperature (°F)	Velocity (ft/sec)	Flow Rate (acfm)
H ₂ SO ₄ thermal oxidizer	Distillate fuel oil	PM†	2.6	1,400	30	17,318
		CO	0.6			
		VOC	0.4			
		SO ₂	10.1			
		NO _x	1.1			

Note: For distillate fuel oil, emission estimates based on following properties: (1) maximum ash content of 0.01 weight percent, (2) maximum sulfur content of 0.05 weight percent, and (3) maximum fuel-bound nitrogen of 0.015 weight percent [for fuel-bound nitrogen levels greater than 0.015 weight percent, emission limits are adjusted in accordance with the fuel-bound nitrogen allowance contained in 40 CFR 60(GG)].

*Emission rates and exhaust characteristics at 100-percent load and 59°F ambient temperature.

†Includes H₂SO₄.

Sources: GE, 1992.
Texaco, 1992.

3.4.4-3

Table 3.4.4-2. Summary Exhaust Characteristics and Emission Rates for Stand-Alone CT and CC Units

Emission Source	Fuel Type	Pollutant	Emission Rate (lb/hr)	Exhaust Characteristics		
				Temperature (°F)	Velocity (ft/sec)	Flow Rate (acfm)
CC unit* (per unit)	Natural gas	PM†	20.0	253	72	713,361
		CO	108.0			
		VOC	18.0			
		SO ₂	66.0			
		NO _x	64.0			
	Distillate fuel oil	PM†	40.0	253	72	713,361
		CO	130.0			
		VOC	18.0			
		SO ₂	94.7			
		NO _x	326.0			
CT unit* (per unit)	Natural gas	PM†	10.0	985	94	1,421,280
		CO	54.0			
		VOC	9.0			
		SO ₂	33.0			
		NO _x	32.0			
	Distillate fuel oil	PM†	20.0	980	72	1,451,520
		CO	65.0			
		VOC	9.0			
		SO ₂	47.4			
		NO _x	163.0			

Note: For distillate fuel oil, emission estimates based on following properties: (1) maximum ash content of 0.01 weight percent, (2) maximum sulfur content of 0.05 weight percent, and (3) maximum fuel-bound nitrogen of 0.015 weight percent [for fuel-bound nitrogen levels greater than 0.015 weight percent, emission limits are adjusted in accordance with the fuel-bound nitrogen allowance contained in 40 CFR 60(GG)].

ft/sec = feet per second.

acfm = actual cubic feet per minute.

*Emission rates and exhaust characteristics at 100 percent load and 59°F ambient temperature.

†Includes H₂SO₄.

Source: GE, 1992.

3.4.5 DESIGN PHILOSOPHY

Air emission controls planned for the Polk Power Station project have been designed to fully comply with all applicable State and Federal regulations. Specific design concepts are summarized as follows:

IGCC Facility

- Use of the most efficient technology for converting coal to electrical power;
- Application of BACT for all affected pollutants and emission sources;
- Use of low sulfur and low ash fuels;
- Use of highly efficient, demonstrated integrated sulfur removal and recovery technology (CGCU);
- Demonstration of HGCU technology to potentially reduce SO₂ emissions to levels below those achieved by conventional CGCU;
- Use of water/nitrogen injection to control CT NO_x emissions;
- Use of efficient combustion to minimize emissions of pollutants associated with incomplete combustion; and
- Use of comprehensive controls to minimize fugitive dust emissions associated with coal handling.

Stand-Alone CT and CC Units

- Application of BACT for all affected pollutants and emission sources;
- Use of low sulfur and low ash fuels;
- Use of state-of-the-art dry low-NO_x burners to minimize NO_x emissions during natural gas-firing;
- Use of water injection to control NO_x emissions during oil-firing;
- Use of low distillate fuel oil capacity factors; and
- Use of efficient combustion to minimize emissions of pollutants associated with incomplete combustion.

The Polk Power Station project will use the most efficient technology available, IGCC, to convert coal to electrical power. On a total power production basis, IGCC air emissions are minimized by using a process technology which produces the most

power for each unit of coal consumed. IGCC emissions, on a pound-per-megawatt basis, are generally well below the rates generated by conventional coal-fired power plants.

Air emission control technologies planned for the Polk Power Station project reflect the application of BACT for each affected pollutant and emission source. The proposed BACT limitations are well below applicable State and Federal emission standards. Specific controls include highly efficient sulfur removal and recovery integral to the gasification process; nitrogen/water injection to control NO_x emissions from the IGCC CT during syngas and oil-firing, respectively; dry low-NO_x burners and water injection to minimize NO_x emissions during natural gas and oil-firing, respectively, for the future stand-alone CTs; efficient combustion to minimize emissions of pollutants associated with incomplete combustion; and comprehensive controls to minimize fugitive dust emissions associated with coal handling.

Both the IGCC facility and future stand-alone CTs will use clean fuels to reduce particulate and sulfur emissions. Maximum sulfur content for the syngas and distillate fuel oil will be 0.05 weight percent. Distillate fuel oil will contain no more than 0.01 weight percent ash. Primary fuel for the stand-alone CTs will be natural gas containing less than 10 gr/100 scf.

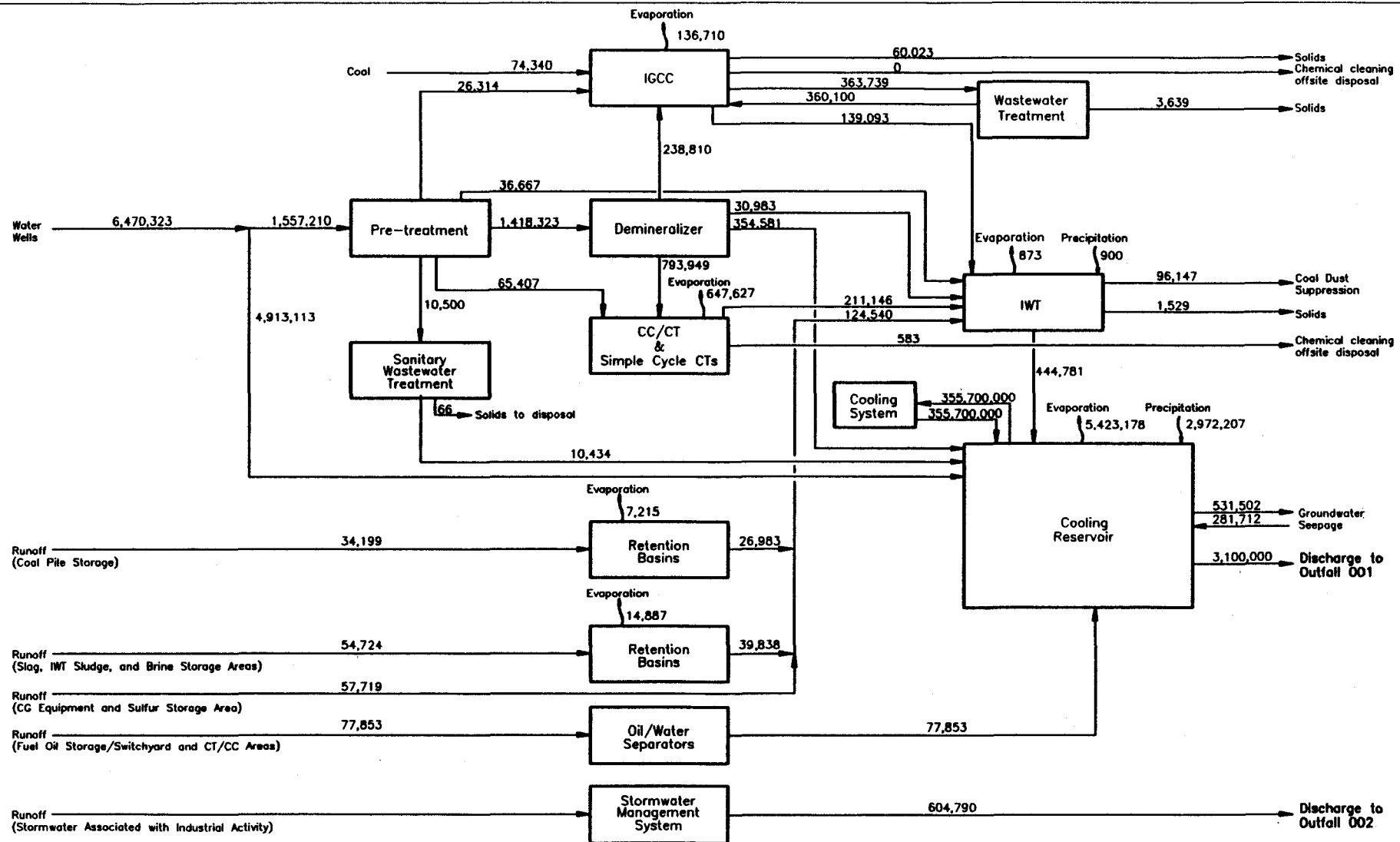
3.5 PLANT WATER USE

The primary water uses at the proposed Polk Power Station include potable water, plant service water, emergency fire protection water, NO_x injection water, chemical and non-chemical cleaning water, condenser cooling water, and cooling reservoir makeup water. The proposed project processes and systems will be designed to:

- Maximize water reuse and recycling,
- Minimize groundwater withdrawals,
- Minimize water consumption, and
- Optimize the water quality of the offsite surface water and groundwater discharges.

Figure 3.5.0-1 shows the water balance diagram for the plant operation under the annual average conditions based on average plant loads (i.e., expected annual average generating capacities) and average meteorological conditions (i.e., long-term normal rainfall and temperature conditions) after full build-out of the proposed project facilities. As shown in this figure, the largest water use by far will be for circulating condenser cooling purposes for the HRSG/ST generator modules of the IGCC and two CC units. Groundwater withdrawals for cooling reservoir makeup water represent the largest requirement for such withdrawals. The systems involving the largest water consumption and/or loss include evaporation losses from the cooling reservoir and the stand-alone CT and CC units when using water injection for NO_x control, blowdown discharges from the cooling reservoir, and water consumption within the IGCC unit process water handling and concentrating systems. As shown in Figure 3.5.0-1, the IGCC unit process waters will be processed and recycled within the system to the extent possible. Also, other process wastewaters from the overall project facilities will be appropriately treated in the IWT system and reused within the condenser cooling system (i.e., cooling reservoir).

Figure 3.5.0-2 shows the water balance diagram for the maximum daily makeup (i.e., maximum groundwater withdrawal) condition which is based on a worst case condition of 100 percent load factor for all generating units at the site during the



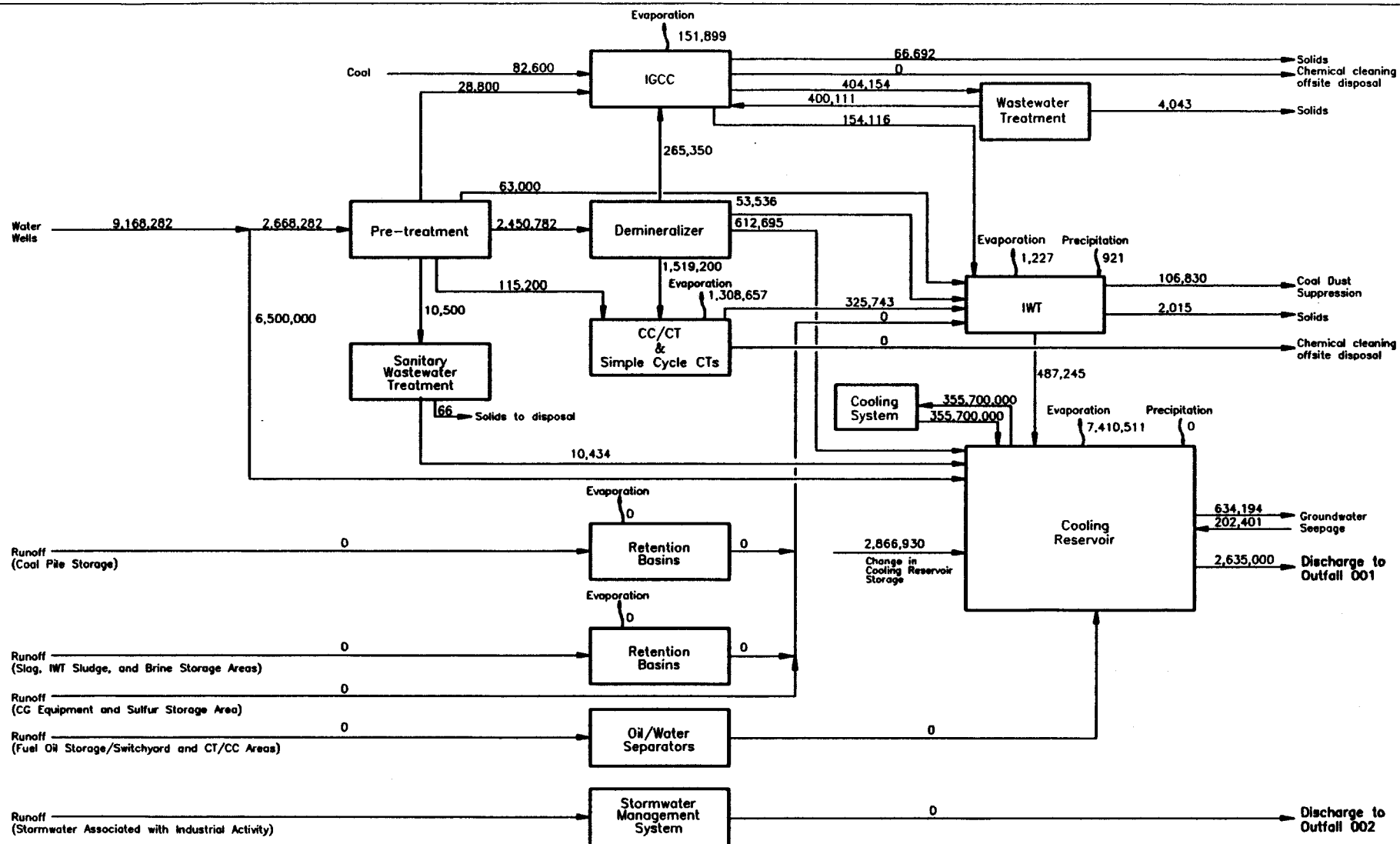
NOTE: ALL FLOW RATES IN GPD

FIGURE 3.5.0-1.

WATER MASS BALANCE, ANNUAL AVERAGE MAKEUP

Source: UE&C, 1992. ECT, 1992.


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NOTE: ALL FLOW RATES IN GPD

FIGURE 3.5.0-2.

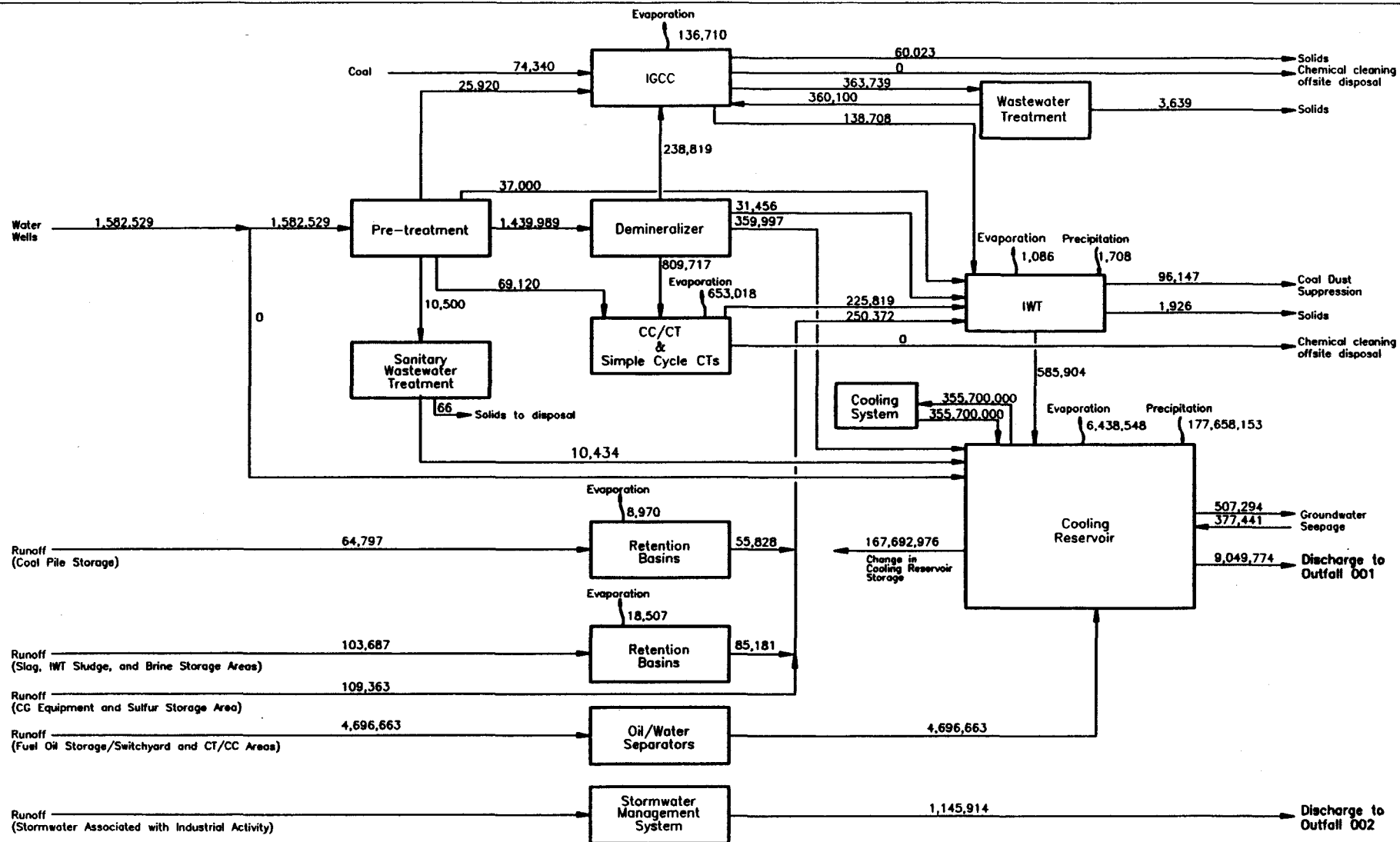
WATER MASS BALANCE, MAXIMUM DAILY MAKEUP

Source: UE&C, 1992. ECT, 1992.



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driest month of the year (i.e., normally May). Figure 3.5.0-3 presents the water balance for the maximum daily discharge condition (i.e., discharges from the cooling reservoir) which is defined to potentially occur during a 25-year, 24-hour storm event occurring in July, normally the wettest month of the year in the site area. For maximum daily discharge and maximum daily makeup scenarios, there are substantial short-term stresses on the cooling reservoir, causing the water level in the reservoir to rise or fall. The excess water supply and excess water demand are indicated in Figures 3.5.0-2 and 3.5.0-3 as changes in cooling reservoir storage.



NOTE: ALL FLOW RATES IN GPD

FIGURE 3.5.0-3.

WATER MASS BALANCE, MAXIMUM DAILY DISCHARGE

Sources: UE&C, 1992. ECT, 1992.



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3.5.1 HEAT DISSIPATION SYSTEM

3.5.1.1 System Design

A closed loop cooling system consisting of a cooling water reservoir will be used for heat dissipation/condenser cooling for the three proposed generating ST systems: two nominal net 220-MW CC units and one nominal net 260-MW IGCC unit. Cooling water from the reservoir will also be used for cooling in the air separation unit and other plant auxiliary equipment. The proposed cooling system was designed to meet the following objectives:

- The cooling system will have the capacity to reject 2.47×10^9 Btu per hour of thermal energy on a continuous basis;
- The cooling system will be able to supply cooling water to the condenser with water temperature less than 95.6°F under worst-case conditions (100 percent load factor);
- The turbine back pressure will not exceed 3.5 inches of mercury; and
- The cooling system, compared with alternatives, will have the least environmental impacts, considering surface water hydrology, surface water quality, groundwater hydrology, groundwater quality, water consumption, and ecological impacts.

Based on these design objectives, the proposed optimal configuration for the cooling system was determined to provide the following:

- Flow rate of the recirculating cooling water of approximately 247,000 gpm;
- Maximum temperature rise across the condenser of 20°F;
- Heat-rejection system consisting of a 727-acre (water surface area at 136 ft-NGVD) recirculating cooling reservoir;
- Maximum recycling/reuse of process wastewaters;
- Minimum makeup water from groundwater withdrawals provided to the reservoir to compensate for the net evaporation losses and manage water quality in the reservoir; and
- Minimum blowdown discharges provided for water quality management purposes and to manage stormwater runoff discharges from the site.

Other potential alternatives to this proposed recirculating cooling reservoir considered by Tampa Electric Company included:

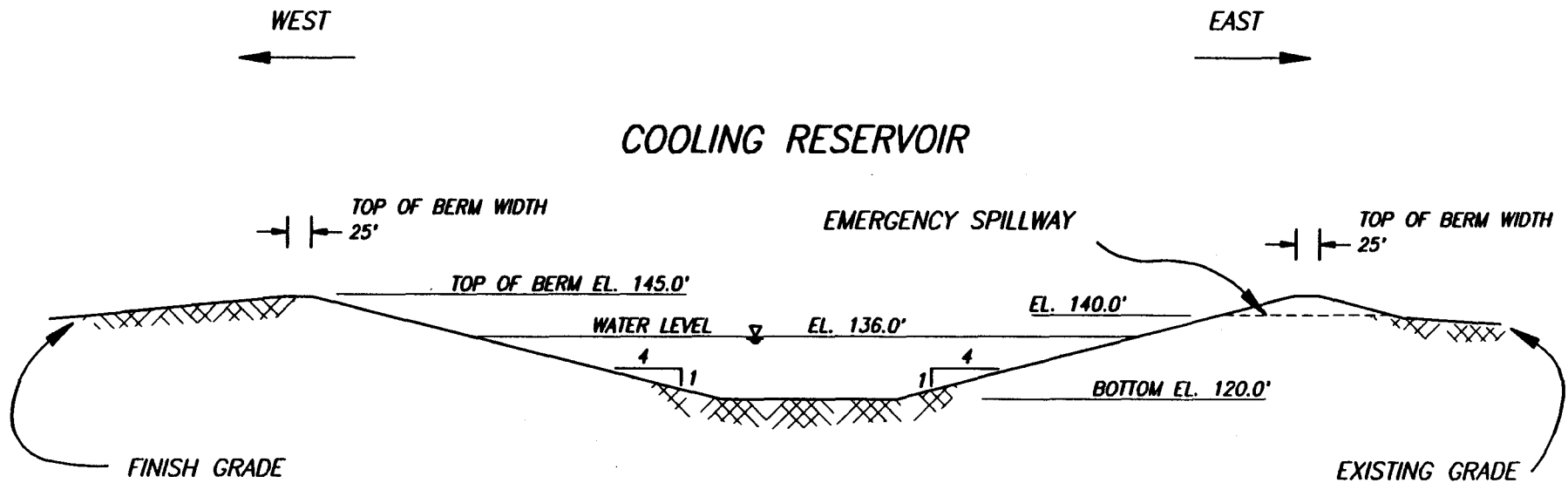
- Cooling towers with blowdown discharges, and
- Recirculating cooling reservoir system without blowdown.

The alternatives are discussed in Section 8.2.1.

The layout of the proposed cooling reservoir is shown in Figure 3.2.0-2. The reservoir will be a below-grade basin which will be constructed in areas which are currently water-filled phosphate mine cuts and overburden spoil piles. Materials from these mine cuts will be used to construct low-profile perimeter berms surrounding the reservoir. As shown in the figure, to maximize the heat dissipation efficiency of the cooling reservoir, interior berms or dividers will also be constructed to prevent short circuiting of the warmed water flow and maximize the travel time of water in the reservoir between the discharge and intake structures. The design bottom elevation of the reservoir will be approximately 120 ft-NGVD. The top of the berm will have a width of 25 ft and will be at approximately 145 ft-NGVD in elevation.

The slopes on both sides of the interior and exterior berms are 4:1 (4-ft horizontal to 1-ft vertical). The berms will be grassed to prevent erosion. The size of the reservoir will be approximately 727 acres of water surface when the water elevation is at 136.0 ft-NGVD. The total area of the reservoir system will be approximately 860 acres, including the area of the surrounding berm. A typical cross section of the reservoir is shown in Figure 3.5.1-1.

A cooling water intake structure, which will supply cooling water to the condenser cooling systems of the ST generating systems, will be located in the northern portion of the reservoir. The cooling water will be warmed to approximately 20°F above its intake temperature during the cooling process to condense the ST exhaust steam of the units. This warmed water will be discharged into the reservoir at a location to



Note: Vertical datum is ft-NGVD

NOT TO SCALE

FIGURE 3.5.1-1.

TYPICAL CROSS SECTION OF COOLING RESERVOIR

Source: ECT, 1992.



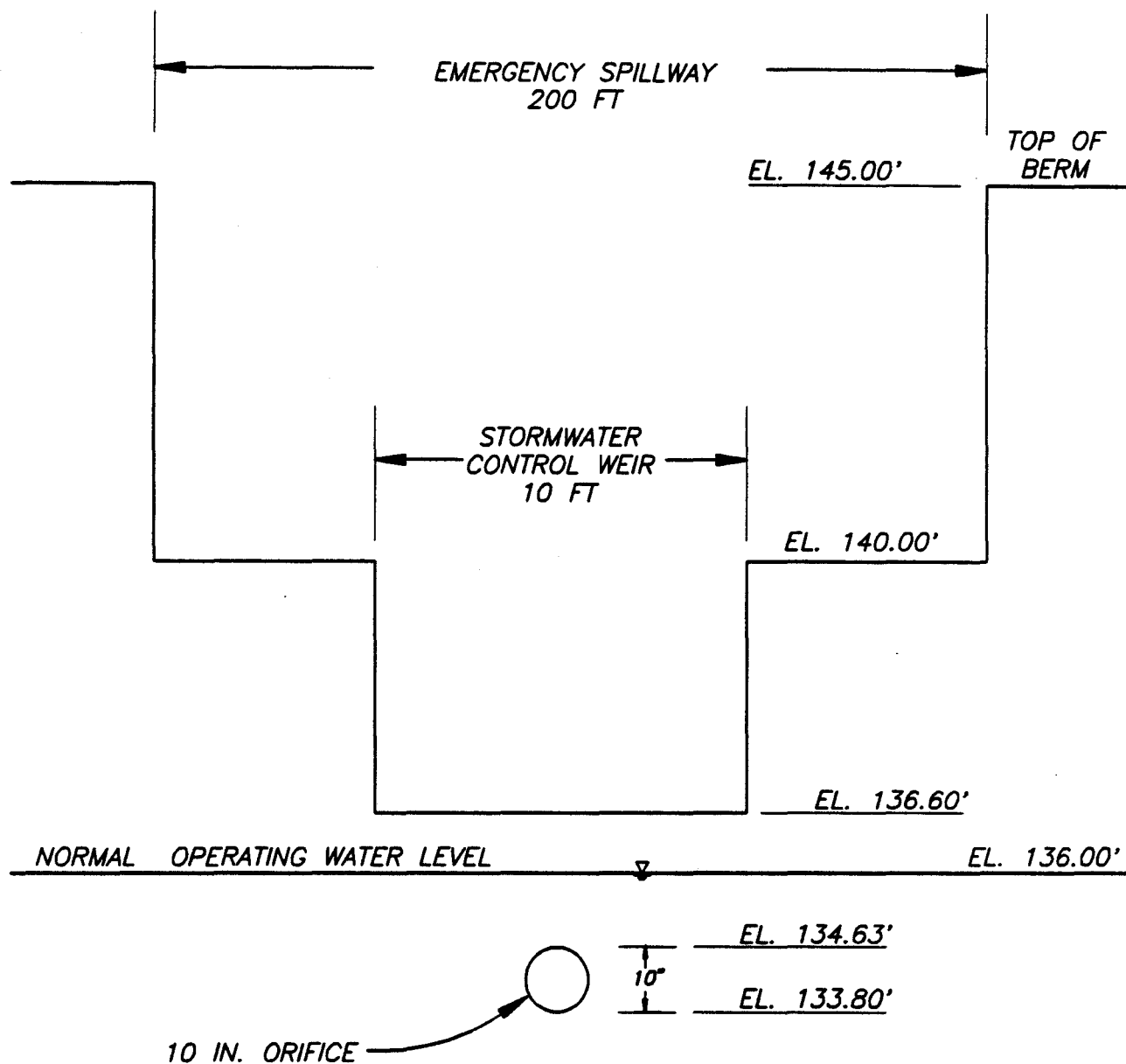
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the south of the intake. The discharge flow will meander through the reservoir which is channelized by the network of interior berms for optimal cooling efficiency. By the time the warmed discharge water reaches the intake structure, thermal energy will have been removed from the reservoir water through radiation, evaporation, and heat exchange from the water to the atmosphere. When the water is recirculated to the intake, the water temperature will be sufficiently lowered for reuse for additional condenser cooling purposes.

In order to maintain the water quality in the reservoir in compliance with Florida surface and groundwater standards, an outfall control structure for blowdown discharges from the reservoir to the Little Payne Creek drainage system will be provided. These discharges are needed to prevent trace metals, solids, and other potential constituents from accumulating in the reservoir. To comply with Florida Class III surface water quality standards, a continuous blowdown with an average annual flow of approximately 3.1 MGD from the reservoir will occur.

Hydrologic modeling, water quality protection, and thermal analyses were conducted to assess the potential water quality impacts of the cooling reservoir discharge on the offsite Little Payne Creek hydrological and ecological systems. The results of these analyses are discussed in the following sections and in Chapter 5.0 of this SCA.

In addition to the blowdown discharge control structure, a 10-ft wide rectangular weir will be installed to provide for drainage control during extreme storm events in compliance with applicable FDNR and SWFWMD requirements. A 200-ft wide emergency spillway will also be provided to ensure the berm safety in the event of extreme weather conditions. The operating water level in the reservoir will be controlled at approximately 136.0 ft-NGVD. The water level fluctuation will be about ± 0.5 ft. The overflow elevation of the 10-ft wide stormwater management weir will be 136.6 ft-NGVD, and the emergency spillway will be at an elevation of approximately 140.0 ft-NGVD. The conceptual design of the outfall control structure is shown in Figure 3.5.1-2. The design of this structure will allow stormwater



NOT TO SCALE

Note: Vertical datum is ft-NGVD

FIGURE 3.5.1-2.

COOLING RESERVOIR OUTFALL STRUCTURE

Source: ECT, 1992.



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overflow of rainfall directly on the reservoir and runoff from the internal berms inside areas of the surrounding berm when a storm event is greater than 7.2 inches. This proposed design to control stormwater runoff discharges will meet the applicable requirements of FDNR and SWFWMD to manage peak and mass flow runoff discharges compared to pre-mining conditions (see Section 3.8).

To ensure that the perimeter berm will not be over-topped under the most extreme weather conditions, wave forecast, wind setup, and wave run-up analyses were conducted for the proposed cooling reservoir. According to the historical weather data, the most severe storm in the region occurred in June 1964, with a highest windspeed of 67 mph recorded at the Tampa Airport. Using this extreme windspeed data and a shallow water wave forecast method developed by Bretschneider and Reid (1953), the greatest wave height will potentially occur at the eastern and western ends of the reservoir due to the large wind fetch along the east-west direction. The predicted significant wave height will be approximately 3.2 ft with a wave period of 2.8 seconds. The calculated wave run-up will be approximately 2.25 ft using the method presented in the Shore Protection Manual (USACE, 1984). The wind setup will be approximately 0.42 ft based on Ippen (1966). Therefore, the height limit of the wash-up will be approximately 5.9 ft above the mean operating water level in the reservoir, or approximately 141.9 ft-NGVD.

Assuming the extreme wind event will coincide with a 100-year, 24-hour rainfall event (slightly less than 11 inches), the wash-up elevation will be approximately 142.8 ft-NGVD, approximately 6.8 ft above normal operating water level in the reservoir. Given the top-of-berm elevation of 145 ft-NGVD, there will still be more than 2.2 ft freeboard on the berm even under the most extreme and highly unlikely event as described previously.

3.5.1.2 Cooling Reservoir Water Discharges

Water losses in the cooling water reservoir will occur due to evaporation, groundwater seepage, continuous blowdown, and stormwater discharges during severe rainfall

events. A blowdown outfall control structure (i.e., Outfall 001) will be located at the northeast corner of the cooling reservoir and discharged water will drain into the northern portion of the existing reclaimed lake to the east of the reservoir on the site (see Figure 3.2.0-2). Water in the lake drains through a swale along its southern edge and exits the site, flowing into a man-made ditch running along the western side of Fort Green Road. This water is ultimately routed to Little Payne Creek. As shown in Figure 3.5.1-2, the continuous blowdown structure will be a 10-inch orifice (i.e., pipe) with an invert elevation of approximately 133.8 ft-NGVD which will convey approximately 3.1 MGD of discharge water from the reservoir at the operational water level of 136.0 ft-NGVD.

The 10-ft wide overflow weir will not provide for water discharges from the reservoir under normal operating conditions unless a rainfall event of greater than 7.2 inches occurs on the site. An extreme 9-inch storm (25-year, 24-hour event) will create a discharge of approximately 8.2 cfs (5.3 MGD) from the cooling reservoir according to the hydrologic drainage modeling results under the extreme storm event conditions. The hydrologic analysis and modeling results are presented in Section 3.8.4.

In addition to the direct surface discharge through the outfall structure, a net groundwater flow discharge from the reservoir into the surficial aquifer will occur which will assist in managing the water quality within the reservoir. This net outward seepage will occur because the normal operating water level in the reservoir will be generally higher than the surficial aquifer water level.

3.5.1.3 Sources of Cooling Reservoir Water Makeup

As discussed previously, water losses will occur in the cooling water reservoir. Therefore, makeup water will be needed to continuously replenish the reservoir water in order to maintain an operating water level that is required for cooling efficiency and water quality management purposes. As shown in Figures 3.5.0-1 through 3.5.0-3, the other sources of water supplies to the reservoir will include direct

rainfall, runoff from the berm areas, surficial groundwater inflow, treated process water and stormwater runoff from the IWT facilities, and treated sanitary wastewater.

The most significant component of the cooling reservoir makeup water will be groundwater pumped from the Floridan aquifer through the onsite well field. According to the water budget analysis, an annual average makeup of 4.9 MGD (or approximately 5.0 MGD) will be required to maintain required water level and water quality conditions in the reservoir under average plant loads. The average makeup requirement will be approximately 5.3 MGD during plant full load conditions, and the expected maximum makeup requirement under plant full load and dry season conditions will be approximately 6.5 MGD. This maximum makeup rate may occur for up to a 2-month period under assumed worst-case plant operating conditions (i.e., full load and abnormally dry weather conditions). The water level fluctuation in the reservoir will be about 0.2 ft during such dry periods.

The estimated water quality for each component of the cooling reservoir makeup water is shown in Table 3.5.1-1. Based on the flow rates and water quality of these makeup streams and the net groundwater seepage predicted, the long-term water quality (i.e., long-term equilibrium condition) in the reservoir is presented in Table 3.5.1-2. As shown in this table, the water quality in the reservoir and, in turn, the quality of discharges from the reservoir are predicted to meet all applicable Class III surface water quality standards. Further, the reservoir water quality is predicted to meet all applicable groundwater quality standards, except for iron and manganese which are secondary drinking water parameters.

The water from the reservoir will be discharged to the northern portion of the reclaimed lake located to the east of the reservoir. The discharged water will mix with other water flowing through the lake and drain off the site through a swale located along the southern portion of the lake and flow to the Little Payne Creek system. The predicted water quality of the water overflowing offsite from the reclaimed lake is also presented in Table 3.5.1-2. Again, the water quality of

Table 3.5.1-1. Water Quality of Supply Water to Cooling Reservoir (mg/L)

Parameter	IWT	Sanitary Waste Treatment Plant	Membrane Processor	Floridan Aquifer	Surficial Aquifer
Alkalinity	75	225	266		
Aluminum	3	0.02			
Antimony	0.069				
Arsenic	0.006			0	0
Barium	0.0099			0	0
Benzene				0	0
Beryllium	0.00098				
Cadmium	0.0002			0.000333	0.0018
Calcium	59	100	215.1	33.05	
Chlorine	0.2	0.2	0.2		0
Chromium III	0.0003			0	0
Copper	0.021			0	0
Cyanide	0.00003				
Fluoride	0.2		2.5	0.5445	0.6533
Iron	1	0.3		0	10.6
Lead	0.002			0	0.011
Magnesium	9.2	55.2	77.1	15.5	
Manganese	0.25	0.05		0.037	
Chloride	7.7	45	187.4	11.667	11
Mercury	0.00006			0	0
Nickel	0.097				
Nitrate	1.1	25	0.5	0.002	0
Phosphate	2	30	0.35	0.153	
Potassium	1.6	17	14.2	1.730	
Selenium	0.0004			0	
Silver				0	0
Sodium	88.5	64.3	43.5	11.63	8.33
Sulfate	279	140	456	25.6	9
TDS	493	485	1,005	229	118.7
Zinc	0.1			0.02	
Annual average flow rate (gpd)	444,781	10,434	354,581	4,913,113	281,712

Sources: ECT, 1992.
UE&C, 1992.

Table 3.5.1-2. Cooling Reservoir Water Quality Projections (mg/L)

Parameter	Reservoir Blowdown Quality	Offsite Discharge Quality	Surface Water Standard	Ground- water Standard
Alkalinity	35.9	49.9	>20	
Aluminum	0.373	0.238	<1.5	
Antimony	0.009	0.005	<4.3	
Arsenic	0.001	0	<0.05	<0.05
Barium	0.001	0.001		
Benzene	0	0	<0.071	<0.001
Beryllium	0.000122	0.000078	<0.00013	
Cadmium	0.000621	0.000396	<0.001283	<0.01
Calcium	73.96	55.37		
Chlorine	0.000426	0.000272	<0.01	
Chromium III	0	0	<0.235	<0.05
Copper	0.003	0.002	<0.014	<1
Cyanide	0.000004	0.000002	<0.0052	
Fluoride	1.07	1.33	<10	<2
Iron	0.959	0.613	<1	<0.3
Lead	0.001114	0.000712	<0.003885	<0.05
Magnesium	30.16	23.91		
Manganese	0.081	0.052		<0.05
Chloride	36.255	28.58		<250
Mercury	0.000007	0.000005	<0.000012	<0.002000
Nickel	0.012	0.008	<0.18	
Nitrate	0.259	0.166		<10
Phosphate	0.573	0.366		
Potassium	4.01	2.56		
Selenium	0	0	<0.005	<0.01
Silver	0	0.000004	<0.00007	<0.05
Sodium	31.79	28.44		
Sulfate	114.55	90.55		<250
TDS	487.0	388.4	<826	<500
Thallium	0	0	<0.048	
Zinc	0.04	0.025	<0.121	<5

Note: Blowdown = 3.10 MGD.
 Average makeup = 4.91 MGD.
 Maximum makeup = 6.5 MGD.
 Water level = 136 ft-NGVD.
 Hardness = 117 mg/L.

Sources: ECT, 1992
 UE&C, 1992.

discharges off the Polk Power Station site to the Little Payne Creek system is predicted to meet all applicable surface water quality standards.

3.5.2 DOMESTIC/SANITARY WASTEWATER

Sanitary facilities using potable water will be provided for a projected staffing of 210 administrative, maintenance, and operating personnel after full build-out of the Polk Power Station. Discharges from showers, wash basins, bathrooms, drinking fountains, and other facilities are expected to result in an estimated 10,500 gpd (50 gallons per capita per day) of combined sanitary wastewater flow. The BOD of the sanitary wastewater influent is anticipated to be 160 mg/L, or 14 pounds per day BOD loading to the system. The sludge per pound of BOD ratio is 0.6, or 8.4 pounds per day of sludge.

The proposed sanitary waste treatment system will be an extended aeration type package unit capable of handling at least a daily load of 10,500 gallons. The sanitary wastewater treatment system will include a covered, vented lift station and an activated sludge package unit. The components of the package unit include equalization, biological treatment, clarification, sludge digestion, filtration, and disinfection units. Effluent from the sanitary wastewater treatment system will be discharged to the cooling reservoir for reuse in the heat dissipation system. Periodically, sludge will be removed from the sludge digester by vacuum truck for offsite disposal in an appropriately licensed sanitary landfill. Approximately 1,400 gallons of sewage sludge is expected to be produced each month, based on a maximum of 210 persons at full build-out, and assuming a sludge concentration of 1.5 percent.

The treatment system will be designed to ensure compliance with the following effluent limitations: BOD, 20 mg/L; TSS, 20 mg/L; and pH, between 6 and 8.5. Disinfection will be designed to result in not more than 200 fecal coliform values per 100 mL of effluent sample [Chapter 17-600.440(4), F.A.C.].

Figure 3.5.2-1 presents a flow diagram of the sanitary wastewater treatment system. Wastewater from the sanitary lift station(s) will flow to an activated sludge package treatment unit. Aeration air will be supplied by blowers to provide oxygen and

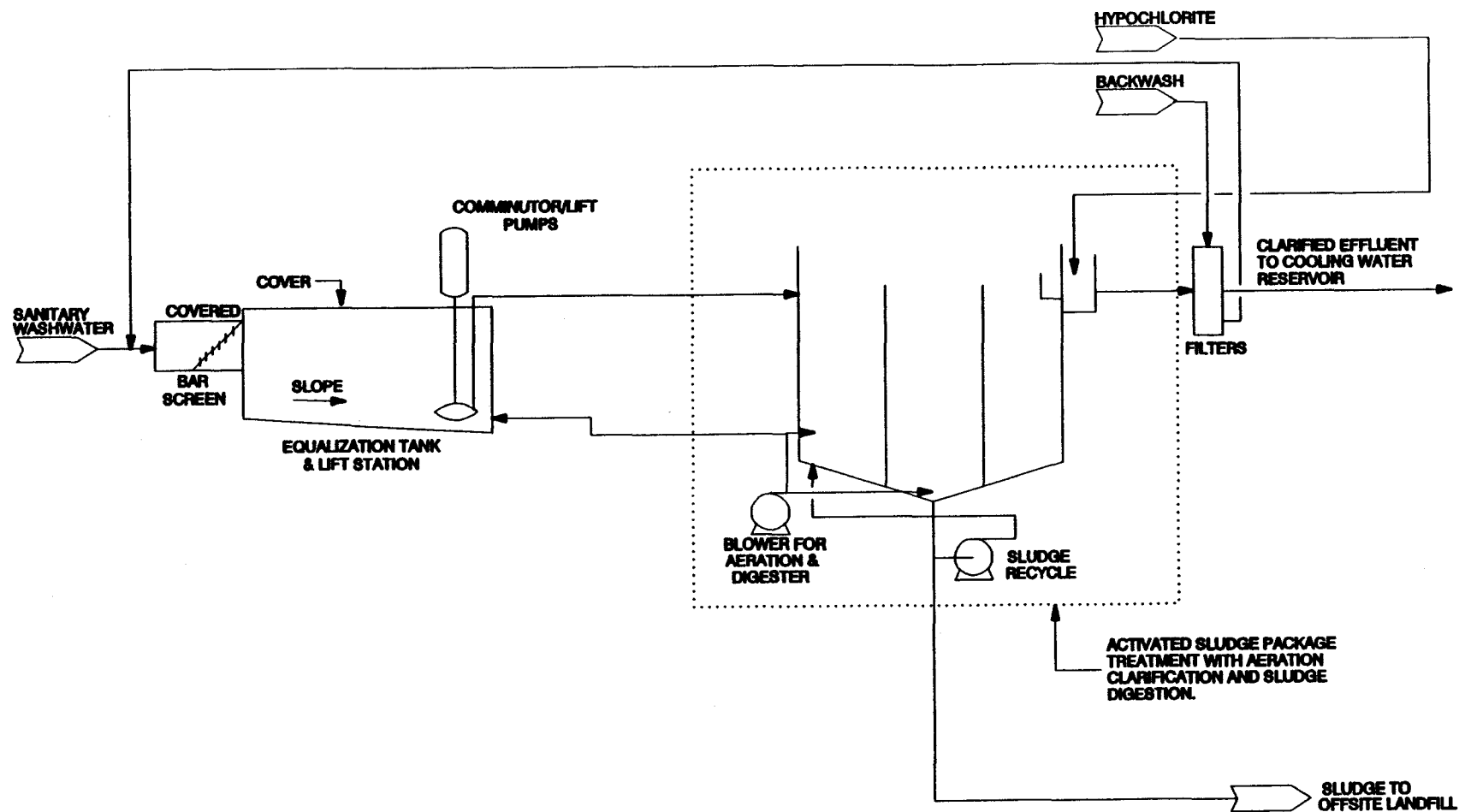


FIGURE 3.5.2-1.

SANITARY WASTEWATER TREATMENT SYSTEM

Sources: Texaco, 1992. UE&C, 1992.

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mixing to the activated sludge for biological metabolism of organic material. Activated sludge will flow by gravity from the aeration basin to the clarifier for solids separation. A portion of the settled solids will be recycled to the aeration basin to sustain the microorganism population. Excess activated sludge will be drawn off and sent to the sludge digester, providing the correct waste-to-recycle ratio.

Effluent from the clarifier will flow by gravity to the chlorine contact chamber for disinfection. Effluent will be given at least 15 minutes contact time in the disinfectant chamber. A residual concentration of 0.5 mg/L total chlorine will be maintained in the effluent prior to discharge to the cooling reservoir.

3.5.3 POTABLE WATER SYSTEMS

Floridan aquifer water will provide the Polk Power Station's process water and potable water needs. The potable water system will provide water for drinking, sanitary facilities, safety showers, and eyewash stations. Potable water needs are estimated to be 10,500 gpd for the 210 administrative, maintenance, and operating personnel at full build-out.

Water will be provided from Floridan aquifer wells, which will also provide service water, fire protection water, and process water needs which will total up to 2.8 MGD (monthly maximum) at full build-out and 100-percent load for all units. Chlorine will be added to the well water to prevent biological growth on the filters. Figure 3.5.3-1 depicts the integrated potable water and process water treatment system. Raw water from the wells will be chlorinated and pumped to the filter skid. Pressure filter units will be used for removal of suspended solids from the total water supply stream. The filters will be backwashed each day with an average of 36,700 gallons of unfiltered well water at full build-out. The filter backwash will be routed to the wastewater equalization basin for treatment in the IWT system.

Following filtration, the water will be routed to a water storage tank. The tank will supply water for the service water, potable water, demineralized water treatment systems, and fire protection water. The tank will be sized to provide 2 hours of reserve storage capacity for fire protection purposes and 8 hours storage for service water and demineralized water treatment system uses. A residual chlorine concentration of 0.1 ppm will be maintained in the storage tank.

Potable water will be pumped to a potable water accumulator to provide potable water distribution to the facility. The accumulator will provide water for safety showers and eyewash stations during power interruptions and to handle system surge requirements. Additional chlorination using sodium hypochlorite will take place in the potable water tank to maintain 0.1 ppm of residual chlorine. From the

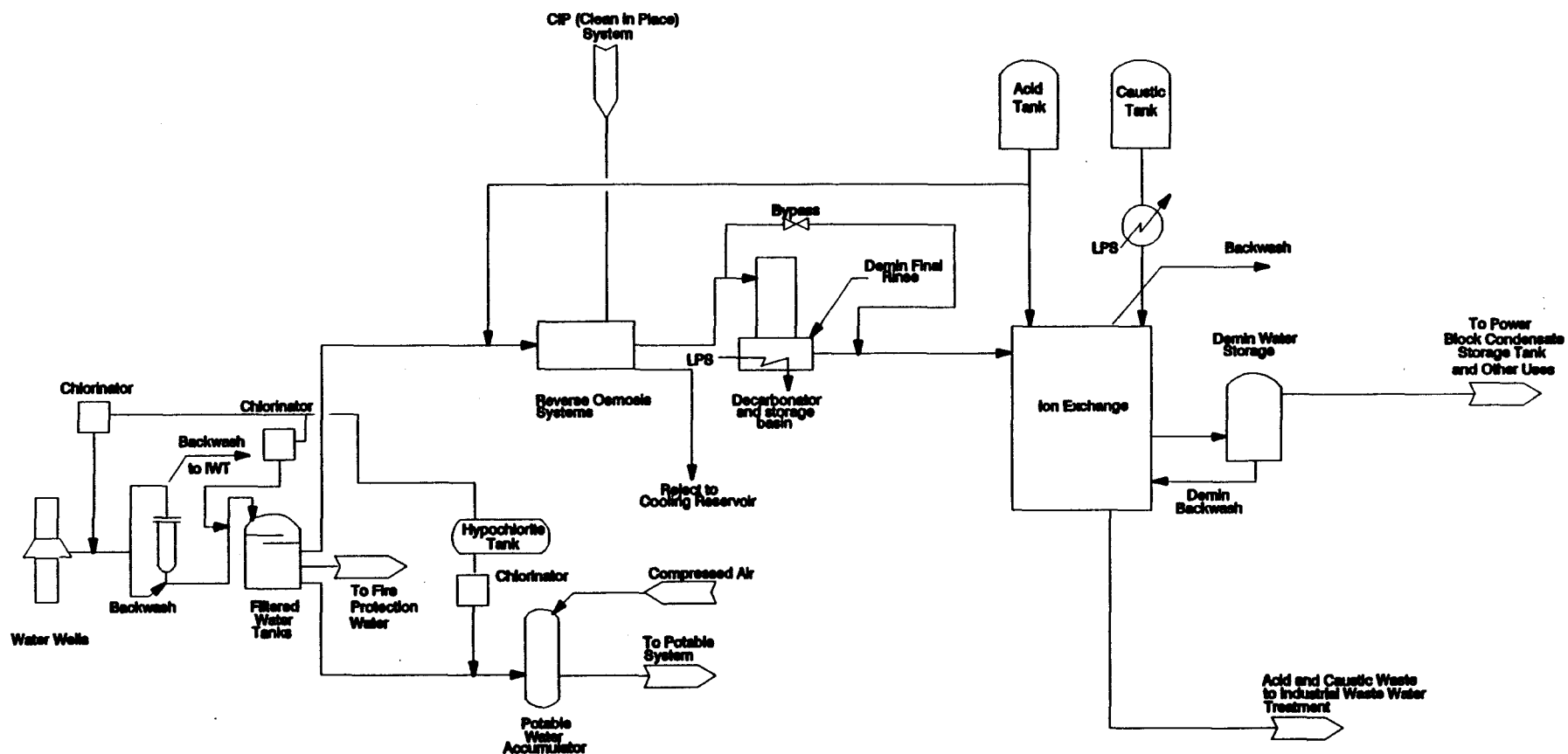


FIGURE 3.5.3-1.

POTABLE WATER AND PROCESS WATER TREATMENT SYSTEM

Sources: Texaco, 1992. UE&C, 1992.



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accumulator, the potable water will be directed to the individual process units and buildings.

The system will be classified as a non-transient, non-community water system and will be operated in accordance with Chapters 17-550 and 17-560, F.A.C., and other relevant standards.

3.5.4 PROCESS WATER SYSTEMS

Process water uses generally fall under one of two categories: service water and demineralized water. Service water will be primarily drawn from the filtered water storage tank or secondarily from the cooling reservoir for additional fire protection needs. Demineralized water will be drawn from the filtered water storage tank and before use, undergo treatment by activated carbon filtration, reverse osmosis (R.O.), decarbonation, and demineralization using mixed bed ion exchangers. Cooling reservoir makeup water will also be drawn from the filtered water storage tank.

Table 3.5.4-1 summarizes the major monthly average water demands for service and demineralized process water and cooling reservoir makeup water. The following sections describe the various process water uses and water treatment system components.

3.5.4.1 Process Water Use

Service Water Uses

The major service water demands will be for non-chemical cleaning of the CT and low volume uses. Fire protection water will represent a major potential use of service water. The daily average service water demand is projected to be approximately 26,000 gpd with the IGCC operation only, and approximately 93,000 gpd at full build-out, excluding fire protection water, under average operating plant loads.

Combustion Turbine Water Washing

CTs can experience a loss of performance during operation as a result of deposits on internal components. The deposit of atmospheric contaminants on compressor parts occurs with the ingestion of air containing contaminants which pass through the inlet air filter. A CT compressor wash will be performed up to 6 times per year to remove these accumulated deposits. The wash water system will consist of a 5,500-gallon water and a 60-gallon detergent tank. These will be the volumes needed for each wash operation. The detergent will be used if hydrocarbons in the inlet air have resulted in oily deposits on the compressor parts. The detergent used for this

Table 3.5.4-1. Process Water Demands

Water Use	Monthly Average Water Demand (gpd)*		Monthly Maximum Water Demand at Full Buildout (gpd)†
	IGCC Only	Full Buildout	
<u>Service Water</u>			
Non-chemical cleaning	400	1,200	7,200
Low volume uses	25,900	90,500	144,000
<u>Demineralized Water</u>			
Advanced CT/CC components of IGCC unit	156,100	156,100	173,500
Gasification makeup	82,700	82,700	91,900
CC units	--	513,300	778,300
Simple cycle CTs	--	280,700	843,200
<u>Water Treatment Units</u>			
Water supply filter backwash	9,000	36,700	66,000
Mixed bed regeneration	7,200	31,000	56,600
R.O. unit	82,000	354,600	647,800
<u>Potable Water Use</u>	6,500	10,500	10,500
Total Process/Potable Water Uses	369,800	1,557,300	2,819,000
<u>Cooling Reservoir Makeup</u>	5,000,000	5,000,000	6,500,000
Total Water Withdrawn	5,369,800	6,557,300	9,319,000

*Assuming average load operating conditions for all units.

†Assuming 100-percent load operating conditions for all units.

Source: UE&C, 1992.

wash will not contain RCRA-listed chemicals, and will be suitable for flushing with rinsewater to the IWT system. Wastewater from CT washings is expected to contain small amounts of dirt, oil, organic debris, and detergent.

Miscellaneous Low Volume Uses

Service water will be provided throughout the facilities for washdown purposes, pump and equipment gland seals, and flushes, as needed. Designated hose stations will be located to conveniently allow equipment and facility washdowns to occur. Drainage from these uses will enter an oil/water separator before entering the IWT system.

Fire Protection Water

The system will be designed for 3,000 gpm flow. Main piping loops will be utilized around the gasification area, fuel oil storage area, fuel unloading areas, and coal storage, at a minimum. The fire protection water loops will extend in phases as the additional CC and CT units are added so that an adequate level of coverage and protection will be provided at all times.

Fire protection water will be drawn from the filtered water tank and also from the cooling reservoir, as needed. From the storage tank, the electric drive fire water pump will deliver water at 1,000 gpm. Figure 3.5.4-1 depicts the overall service and fire water delivery system.

The service water pump will take suction from the same filtered water tank and keep the fire protection water system pressurized. The fire protection water pump will automatically deliver additional flow through the service piping when the service water flow exceeds 100 gpm, or when the service water pressure drops below 95 pounds per square inch gauge (psig). Shutdown of this pump will require action by an operator. The cooling reservoir will provide supplemental fire protection water via two 1,500-gpm diesel driven pumps located at the intake structure. These pumps will have remote start capability and will have separate fuel sources. A pump test

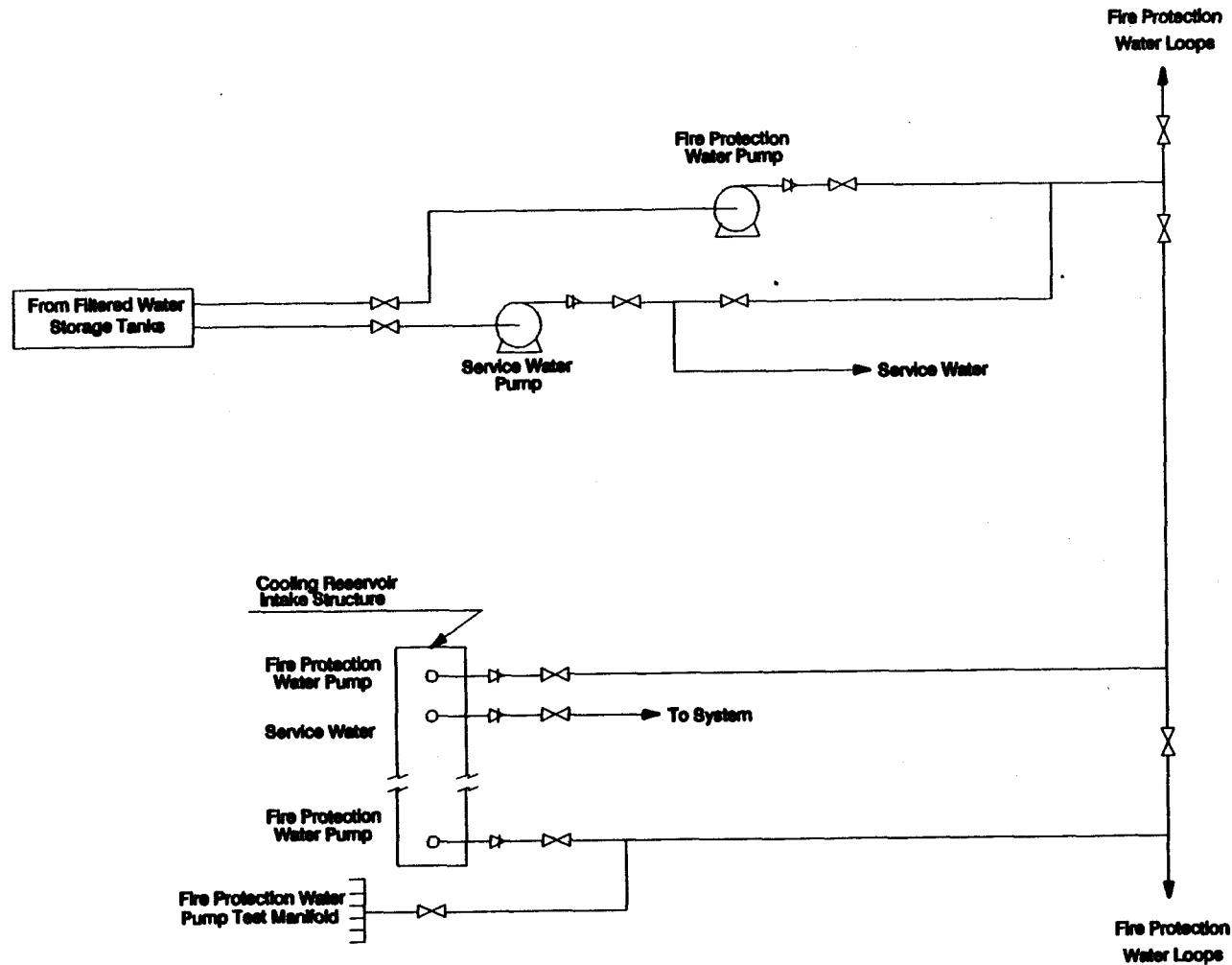


FIGURE 3.5.4-1.

SERVICE AND FIRE PROTECTION WATER DELIVERY SYSTEM

Sources: Texaco, 1992.



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manifold will be located near the intake structure to allow annual testing of the fire protection water pumps.

Demineralized Water Uses

Demineralized water will be used primarily for the following purposes:

- CT NO_x control,
- HRSG boiler makeup,
- Demineralizer regeneration,
- HRSG chemical cleaning, and
- Gasification process water makeup.

The monthly average demineralized water demand is projected to be approximately 0.24 MGD with the IGCC only operation, and 1.03 MGD at full build-out.

Combustion Turbine Nitrogen Oxides Control

During the first year of operation (i.e., prior to being combined with the HRSG, ST, and CG facilities to form the IGCC unit), the advanced GE 7F CT unit will be fired on No. 2 fuel oil. The stand-alone CC and CT units will also use No. 2 fuel oil as a backup fuel. When these units are fired on fuel oil, the primary measure to control NO_x air emissions from these units will be water injection. For this control measure, water will be injected into the primary combustion zone of the CTs to reduce the formation of thermal NO_x by controlling the peak combustion temperature. High purity water will be required to prevent turbine corrosion and deposition of solids on the turbine blades. No wastewater will result from the use of demineralized water for NO_x control since all injected water is evaporated in the process.

Heat Recovery Steam Generator Boiler Makeup

The steam cycle water will be treated to prevent corrosion or scaling in the HRSG components of the IGCC and CC units. The steam cycle water will be treated with an oxygen scavenger for dissolved oxygen control, and with amines or ammonia for pH control. Tri- and di-sodium phosphates will also be fed to the cycle to react with

calcium hardness in the HRSGs, to form a nonadherent precipitate. The steam drums on the HRSGs will have intermittent (mud drum) and continuous blowdowns of up to 1 percent of the HRSGs feedwater to control the HRSG water chemistry. Demineralized water will be required to makeup the HRSG water lost to blowdown.

Demineralizer Regeneration

A stream will be taken from the demineralized water tanks twice per day to be used as regenerant dilutant and rinse water. H_2SO_4 , sodium hydroxide, rinse water, and backwash streams will be preneutralized in batch fashion prior to treatment in the IWT system in a 60,000-gallon capacity sump for neutralization, and then routed to the IWT system. A portion of the final rinse water may be routed to the decarbonator tanks and used as recycle water.

Heat Recovery Steam Generator Chemical Cleaning

The HRSG components of the IGCC and CC units will be chemically cleaned once at commissioning and then at a probable frequency of once every 5 years, if necessary. The provision of high quality boiler feed water will preclude the need for acid cleaning after startup. The likely chemical cleaning procedure will be an alkaline cleaning followed by passivation and rinse. Each of the cleaning steps will involve 1.5 times the HRSG water volume (filled to top of steam drum). The solutions will be dumped to a chemical cleaning water holding tank for subsequent transport to an offsite permitted disposal facility.

Gasification Process Water Makeup

Gasification process makeup water will be required to replace water lost from various gasification process streams within the CG facilities, such as the water lost to grey water blowdown. Process condensate generated by gas scrubbing, quenching, and cooling will be continuously cleaned and reused. There will be a process contribution to water makeup because the gasifier consumes water-producing hydrogen and CO, and the sulfur recovery unit and thermal oxidizer produce water.

The gasification unit will also send water to the advanced CT unit (in the clean syngas stream).

3.5.4.2 Demineralized Water Treatment System

The proposed demineralizer water treatment system will consist of activated carbon filtration, R.O. for primary demineralization, common atmospheric decarbonation, and ion exchangers to meet the required high water quality requirements. The following paragraphs summarize the major components of the demineralized water treatment system.

Activated Carbon Filtration

Activated carbon filters will be used to dechlorinate the makeup water from the storage tank to the R.O. demineralizers. The backwash water from the carbon filters will be routed to the wastewater equalization basin for treatment in the IWT system.

Reverse Osmosis

The function of R.O. is primary demineralization of the filtered raw water. The R.O. system design parameters will include 75-percent recovery of permeate flow, with 95-percent rejection of solids to the concentrate stream.

Feed pumps will draw water from the filtered water storage tank. The R.O. system will require acid injection and filtering with activated carbon to prevent scaling and to remove residual chlorine. In addition, a clean in-place chemical feed system will be required.

Atmospheric Decarbonation

The function of the atmospheric decarbonator is to remove carbonate from the primary demineralizer effluent. The decarbonator will be sized for a hydraulic loading of 25 gallons per minute per square foot (gpm/ft²), plus a minimum retention time in the clearwell of 5 minutes. From the decarbonator, the flow will be split to the two mixed bed demineralizers for further demineralization.

Ion Exchange Demineralization

The ion exchange demineralizer will remove dissolved solids to achieve the required demineralized water specific conductivity of 0.1 micromhos per centimeter ($\mu\text{mhos/cm}$). Ancillaries for the demineralization system will include a common acid storage tank with dedicated injection pumps for R.O. injection and for mixed bed demineralizer regeneration, and caustic storage and injection pumps for mixed bed demineralizer regeneration.

3.5.4.3 Combined Cycle/Combustion Turbine Process Wastewater

Figure 3.5.4-2 shows the overall treatment schematic for wastewater from water treatment, CC, simple cycle CT facilities, and potentially contaminated stormwater from industrial areas. A separate zero wastewater discharge system will be used to handle and recycle process waters from the CG unit. Table 3.5.4-2 provides a summary of the major process wastewater streams. Wastewater from potable and process water treatment, facility operation, and runoff from the coal pile will fall within one of five categories included in the EPA NSPS for steam electric power generating point sources (40 CFR 423.15): low volume wastes, chemical metal cleaning wastes, once-through cooling water, cool tower blowdown, and coal pile runoff. Table 3.5.4-3 lists the effluent guidelines which apply to the five categorized wastewaters. The IWT system is expected to achieve the TSS, oil and grease, metals, and pH effluent guidelines for the respective waste streams. These and other facility wastewaters are described in the following paragraphs.

Low Volume Wastes

The Polk Power Station low volume wastes will mainly consist of equipment and floor drains, laboratory wastes, boiler blowdown, and makeup water treatment system waste (filter backwash, R.O. concentrate, and demineralizer regeneration wastes). These wastewaters may typically contain high concentrations of TSS and TDS. Floor and equipment drainage and laboratory wastewater may contain *de minimis* amounts of various plant chemicals from small leaks or spills [40 CFR 261.3(iv)]. Spill containment provisions (e.g., berms, absorbent materials) will be used to prevent the

INDUSTRIAL WASTEWATER TREATMENT PROCESS FLOW SCHEMATIC



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Table 3.5.4-2. Process Wastewater Stream Flows

Wastewater Stream	Monthly Average Waste- water Flow (gpd)		Discharged To
	IGCC Only	Full Buildout	
Advanced CT/CC unit	112,800	112,800	IWT
CC units	0	145,700	IWT
Simple cycle CT units	0	100	IWT
CG wastewater	363,700	363,700	CG process water handling
Non-chemical cleaning wastewater	400	1,200	IWT
Miscellaneous low volume wastewater	25,900	90,500	IWT
Demineralizer wastewater	7,200	31,000	IWT
R.O. concentrate	82,000	354,600	Cooling reservoir
Potable/process filter backwash	9,000	36,700	IWT
Slag pile runoff	20,300	20,300	Retention basin, IWT
Sludge pile runoff	3,000	3,000	Retention basin, IWT
Coal pile runoff	34,200	34,200	Retention pond, IWT
CG equipment area runoff	48,700	48,700	IWT
Brine storage area runoff	31,400	31,400	IWT
Sulfur storage area runoff	9,000	9,000	IWT
Fuel oil storage/switchyard runoff	54,200	54,200	Oil/water separator, cooling reservoir
CT/CC area runoff	0	23,600	Oil/water separator, cooling reservoir

Source: UE&C, 1992.

Table 3.5.4-3. Effluent Guidelines, NSPS Steam Electric Power Generation

Waste Type	Maximum (mg/L)	30-Day Average (mg/L)
<u>Low Volume Waste</u>		
TSS	100.0	30
Oil and grease	20.0	15
<u>Chemical Metal Cleaning Waste</u>		
TSS	100.0	30
Oil	20.0	15
Copper, total	1.0	1
Iron, total	1.0	1
<u>Once-Through Cooling Water</u>		
Total residual chlorine (discharge to maximum 2 hours per day)	0.2	
<u>Cooling Tower Blowdown</u>		
Free available total residual chlorine	0.5	0.2
Chromium, total	0.2	0.2
Zinc, total	1.0	1.0
Priority pollutants	No detectable amounts	
<u>Coal Pile Runoff</u>		
TSS	<50	
pH	6.0 to 9.0	

Source: EPA NSPS, 40 CFR 423.15.

inappropriate release of chemicals to the wastewater system. HRSG blowdown may include boiler treatment chemicals in extremely small quantities, and will also contain some trace metals such as copper and iron which are picked up from heat exchanger surfaces.

Low volume wastewaters will be routed to the wastewater equalization basin for treatment in the IWT system. One exception is the concentrate from the R.O. unit, of relatively higher quality, which will be discharged directly to the cooling reservoir. An R.O. concentrate monitoring station will provide a final effluent monitoring point and lift station prior to discharging the wastewater. The effluent piping will include a recycle line to the wastewater equalization basin in the event that the treated wastewater is out of compliance. Some low volume wastewaters will require the following types of pretreatment prior to entering the equalization basin:

- Neutralized Waste Streams--High TDS wastewater from demineralization regeneration and rinse water from the anion and cation beds of the demineralization trains will have high or low pH, depending on whether it results from the regeneration of the anion or cation beds. These waste streams will collectively enter a neutralization tank for instantaneous pH adjustment in a neutralization unit by acid or caustic solution. The pH will be adjusted to between 6 to 9 before leaving the neutralization unit, to reduce the loading to the IWT system. An automatic feed system will regulate the addition of acid or caustic until the 6 to 9 pH is reached, then the wastewater will enter the equalization basin.
- Oil/Water Separator--Any oily waste streams generated from minor leaks or spills in the CC/CT, fuel oil storage, and switchyard areas will be processed in area oil/water separators before entering the cooling reservoir. An oil/water separator will also be used to remove oil and grease and suspended solids from equipment and floor drains prior to discharging to the wastewater equalization basin. The oil/water separators will be designed to reduce the oil and grease content of the wastewater to a level not exceeding 15 mg/L. The oil will be separated off and collected in

drums or waste oil tanks for offsite disposal. Sludge from the bottom of the separators will be periodically disposed offsite by a licensed contractor at either a hazardous waste or industrial waste facility, depending on the results of toxicity characteristic leaching procedure (TCLP) analyses.

Metal Cleaning Wastes

Non-chemical and chemical metal cleaning wastes will be generated at the Polk Power Station. As discussed in Section 3.5.4.1., non-chemical cleaning wastes associated with CT and compressor washing contains dirt, organic matter, oil, and non-hazardous detergent. This wastewater will be generated up to six times per year and will be routed to the equalization basin for subsequent treatment. Chemical metal cleaning wastes, also discussed in Section 3.5.4.1, will be conducted at plant startup and infrequently thereafter. Pollutants in the metal cleaning wastes may include variable pH, high TSS, and trace metals such as copper and iron, depending on the boiler tube composition. Spent chemicals and metal cleaning wastes will be taken offsite by a licensed contractor for disposal at approved licensed disposal facility.

Condenser Cooling Water

Cooling of the facilities main condensers and miscellaneous components will be achieved by recirculating, non-contact cooling loops. Recirculating water for this application will be withdrawn and subsequently discharged to the onsite cooling reservoir. Gaseous chlorine will be used as a biocide for cooling system protection.

Coal Pile/Slag Storage Area Runoff

Precipitation results in the generation of surface runoff and leachate from open, lined coal storage areas. Coal pile runoff will not exceed 50 mg/L TSS, 1 mg/L iron and 0.5 mg/L copper. These wastewaters from the coal pile will be initially collected in a retention basin to allow settling of solids. After settlement, the basin overflow will be pumped to the wastewater equalization basin within the IWTP. Compaction and grading of the coal will be performed to minimize air and water contact with coal,

which in turn, is expected to minimize oxidation and solubilization of the coal constituents.

In addition to the coal pile drainage, the IWT system will receive drainage from the lined, CG slag stackout area, and the industrial wastewater treatment sludge storage area. Runoff from these two areas will enter basins designed to collect stormwater in excess of the 25-year, 24-hour storm event.

3.5.4.4 Process Wastewater and Stormwater Runoff Treatment System

The proposed IWT system includes a waste collection system consisting of four wastewater retention basins and an equalization basin followed by a dynamic physical/chemical treatment system and a wastewater holding tank for chemical cleaning waste.

Wastewater Equalization Basins

The four wastewater holding basins/tanks are as follows:

- **Coal Pile Runoff Retention Basin**--The function of this basin will be to contain runoff from the coal pile for transfer to the IWT system wastewater equalization basin. This basin will be lined with a synthetic material or other materials with similar low-permeability characteristics and provide containment in excess of the 25-year, 24-hour storm volume.
- **Slag Pile Runoff Retention Basin**--The function of this basin will be to contain runoff from the slag pile for transfer to the wastewater equalization basin. This basin will be lined with a synthetic material or other low-permeability materials and provide containment in excess of the 25-year, 24-hour storm volume.
- **IWT Sludge Pile Runoff Retention Basin**--The function of this basin will be to contain runoff from the sludge pile for transfer to the wastewater equalization basin for treatment in the IWT system. This basin will incorporate a synthetic liner and provide containment in excess of the 25-year, 24-hour storm volume.

- Brine Runoff Retention Basin--The function of this basin will be to contain runoff from the active brine pile for transfer to the IWT system. Any leachate collected from within the active brine storage area will be routed to the inlet of the brine concentrator unit. The design of this basin will incorporate a synthetic liner. Containment in excess of the 25-year, 24-hour storm volume will be provided by this basin design.
- Wastewater Equalization Basin--The function of this basin will be to provide containment and equalization of all industrial wastewater requiring treatment. The design of this basin will incorporate a synthetic liner and provide containment of 24 hours of wastewater at the design service rate of the IWT system.
- Chemical Cleaning Wastewater Holding Tank--The function of the chemical cleaning wastewater holding tank will be to provide collection and temporary storage of chemical cleaning wastewater generated by the periodic cleaning of the HRSG boilers. The tank will include drain overflow and local and remote level indication. The chemical cleaning waste will be stored onsite in a dedicated cleaning waste tank prior to being hauled offsite by a boiler cleaning contractor for appropriate treatment and disposal.

Industrial Wastewater Treatment System

The IWT system will consist of five principal unit operations as described below. The system will be designed to treat wastewater on a continuous basis.

Wastewater Neutralization/Oxidation Tank

Wastewater from the waste equalization basin will be directed to the neutralization tank to achieve oxidation of ferrous iron in conjunction with waste neutralization. The pH will be adjusted to the range of 8.5 to 9.0 through the addition of hydrated lime slurry. At this neutralized pH, the ferric iron will precipitate as a hydroxide which ensures compliance with iron limits while providing nucleation sites for the co-precipitation of other trace metals. The lime slurry feed rate will be based on pH

feedback control from the neutralization tank effluent. Lime slurry will be recirculated continuously from the lime slurry storage tank and withdrawn from the recirculation loop for injection into the neutralization tank. The injection rate will be controlled by an in-line pinch valve modulated by pH feedback control. A blower will deliver aeration air through a sparger located at the bottom of the tank.

Clarifier

Overflow from the neutralization tank will cascade by gravity to a clarifier for solids removal. The clarifier will include a flash mix and flocculator tank for chemical conditioning prior to clarification. The clarifier will have a design rise rate of 0.35 to 0.5 gpm/ft², at the maximum service rate depending on the type of clarifier selected. Effluent from the clarifier will flow by gravity to the chemical restabilization tank for final pH adjustment. Solids collected in the clarifier will be continuously pumped out and treated in the sludge handling system. Ferric chloride will be used as coagulant in conjunction with a polyelectrolyte additive for flocculation in the clarifier package.

Chemical Restabilization Tank

The function of the chemical restabilization tank will be to readjust the pH of the IWT system wastewater effluent prior to polishing filtration and discharge. The pH will be adjusted to the range of 6.0 to 9.0 to meet effluent standards for discharge to the cooling reservoir. Treated wastewater will flow by gravity from the IWT system clarifier to the pH restabilization tank. The neutralizing chemical will be gaseous CO₂ regulated by a pH feedback signal control loop.

Polishing Filters

The function of the polishing filters will be to further reduce the TSS levels in the IWT system effluent into the 5- to 10-mg/L range to ensure compliance with total iron and TSS discharge limits. The polishing filters will be continuous backwash gravity filters. The filters will receive stabilized effluent at a pH of 6.0 to 9.0 from the pH restabilization tank, and discharge from the filter to the clearwell sump for

monitoring prior to discharge to the cooling reservoir. The effluent piping design will include a recycle line to the wastewater equalization basin in the event that the treated wastewater is out of compliance. Backwash will flow to the wastewater equalization basin for subsequent treatment in the IWT system.

Sludge Handling System

Sludge handling will consist of sludge storage and dewatering. A sludge holding tank will receive sludge from the clarifier on a continuous basis. The sludge tank will have an active design capacity to store sludge from the IWT system for an average 3-day period. Sludge will be pumped from the sludge holding tank to the filter press for dewatering. The press capacity will be selected to allow dewatering of sludge on a one-shift-per-day, 5-days-per-week basis. The filter cake will be temporarily stored onsite prior to offsite disposal by a licensed contractor. Filtrate from the filter press will be routed to a filtrate sump for transfer to the wastewater equalization basin and subsequent treatment in the IWT system.

3.5.4.5 Coal Gasification Process Water

The slag flushed from the gasifier to the slag sump tank will be dewatered and conveyed to the slag storage area. The water removed from the slag will contain fine particles of slag and is referred to as black water. The syngas scrubber will also generate black water, which contains all the entrained solids which were not removed by the radiant syngas cooler sump in the gasifier.

Hot gas and slag in the gasifier will flow downward into the radiant syngas cooler. Slag will solidify in a water sump at the bottom of the pressurized radiant cooler. The solids which have accumulated in the water sump will be water flushed to the slag sump tank.

Black water from both of these sources will be directed to a vacuum flash drum and gravity settler, which together remove nearly all of the suspended solids in the black water feed. The overflow from the gravity settler is referred to as grey water and will

be directed to the grey water tank. The water in the grey water tank will contain approximately 200 ppm of fine slag solids. Most of the grey water will be reused in the gasification plant for syngas scrubbing or slag flushing; however, some of the grey water will be discharged and processed to maintain the correct solids balance within the recycling system. The solids stream (approximately 20-percent solids) leaving the settler will be routed to a plate/frame fines filter, where the slag filter cake will be removed and sent to the temporary slag storage area and sold for offsite uses with the coarser slag by-products. The filtrate from the gravity settler, also considered grey water, will be routed to the grey water treatment system.

3.5.4.6 Coal Gasification Grey Water Processing and Brine Concentration

Grey water from the filtrate tank and grey water tank will be preheated and subsequently fed to the grey water evaporator. Caustic soda will be added to the grey water system to control pH. The grey water will flow in series through the first and second evaporator stages where low pressure steam will be used to evaporate most of the water. Plant steam will be used as the heating medium in the first evaporator stage, and the overhead vapor from the first evaporator will be used as the heating medium in the second evaporator stage.

Concentrated grey water from the second stage of the grey water evaporator will be pumped to the brine storage tank. Figure 3.5.4-3 shows a schematic of the grey water evaporation system. Brine from the tank will be heated in a crystallizer slurry heater, and then pumped to the grey water solids crystallizer. Figure 3.5.4-4 presents a schematic of the solids crystallization system. Some gypsum may be used as an additive in the crystallization procedure. Vapor from the crystallizer will be condensed and recycled as coal slurry water. The liquid and crystal mixture will be separated in a centrifuge or other means of solids separation. The crystals will be sent to the onsite brine solids storage area. The liquid will be recycled back to the crystallizer for further processing.

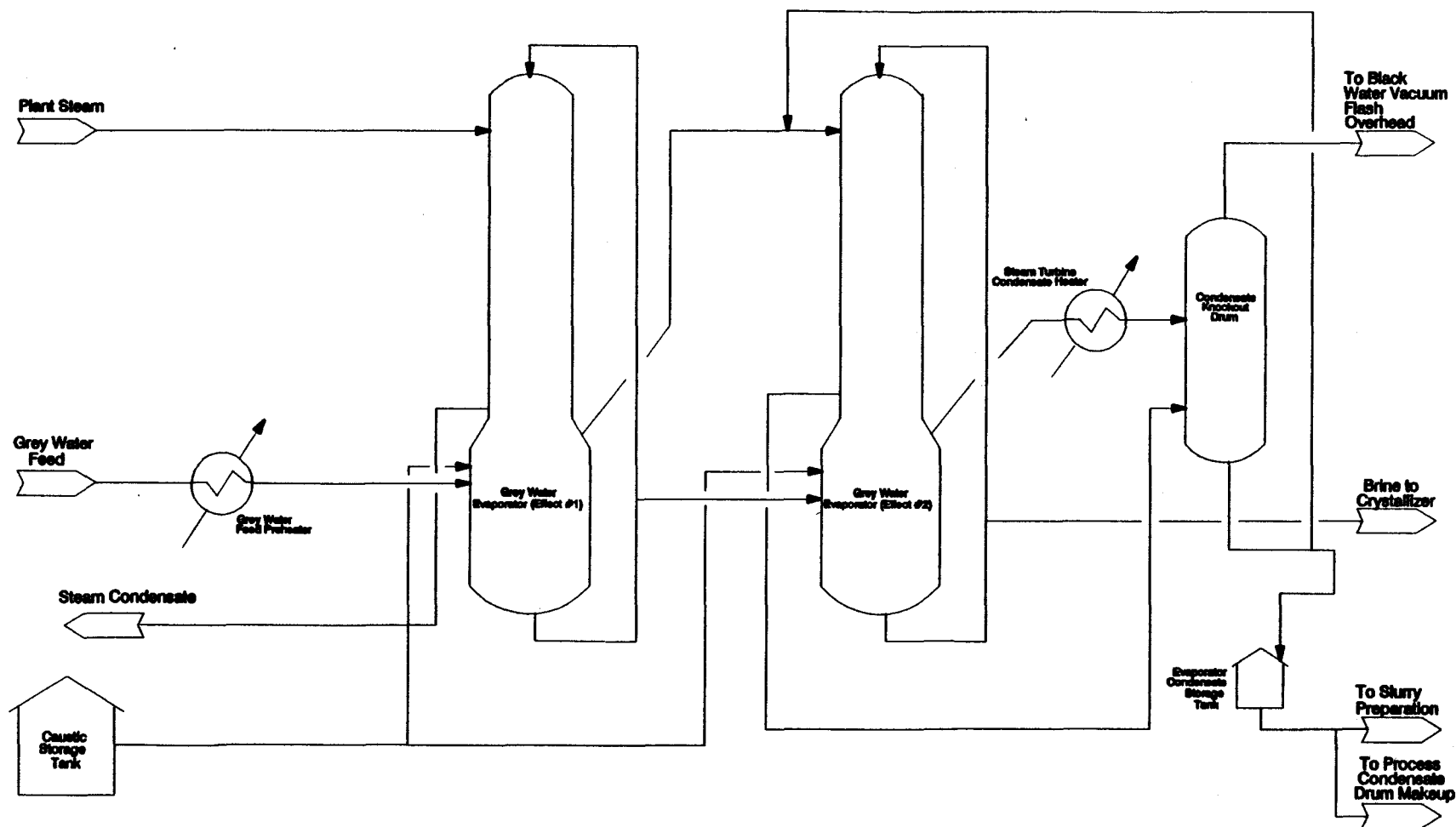


FIGURE 3.5.4-3.

GREY WATER EVAPORATION SYSTEM SCHEMATIC

Source: Texaco, 1992.



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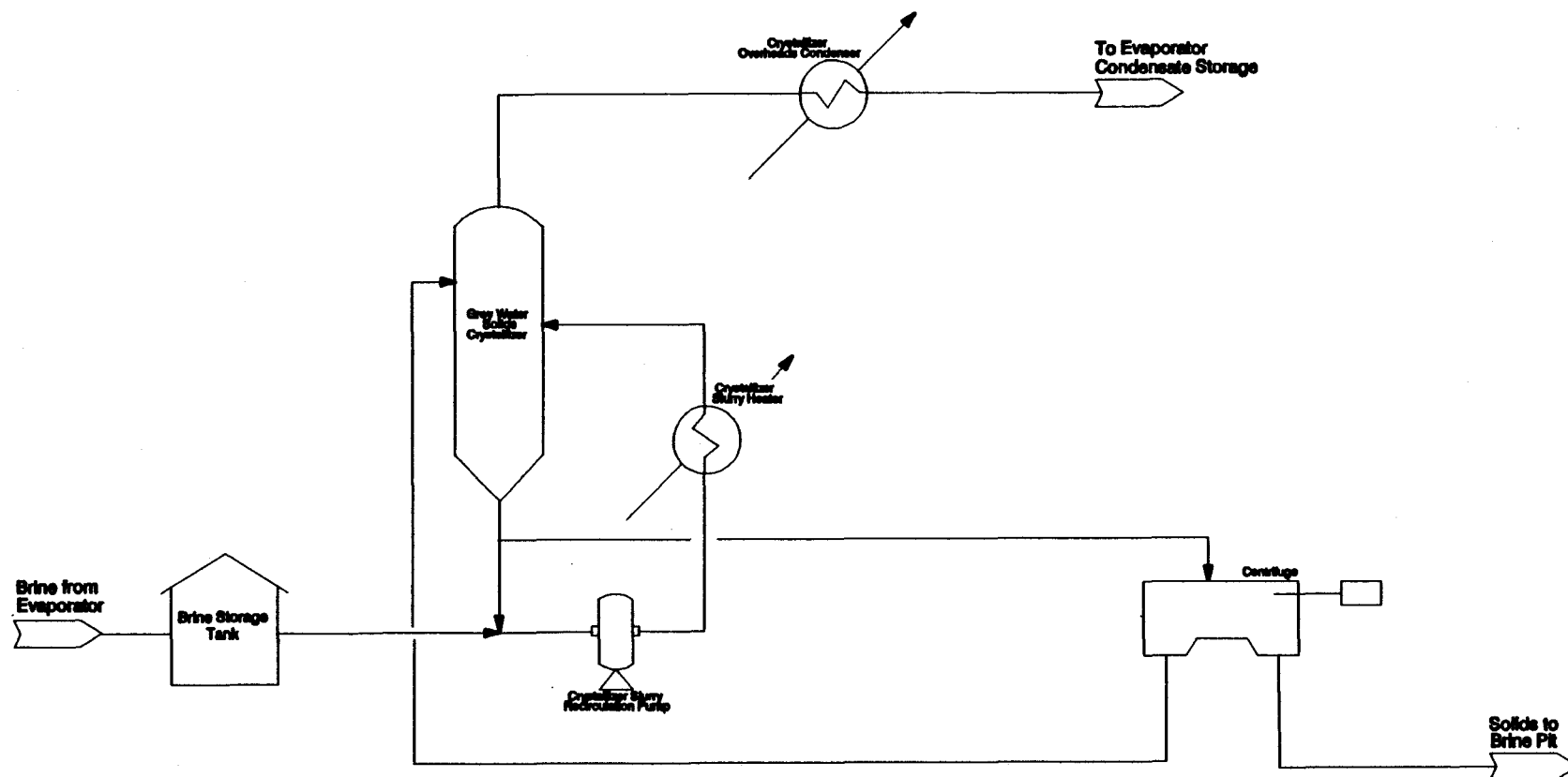


FIGURE 3.5.4-4.

SOLIDS CRYSTALLIZATION SYSTEM SCHEMATIC

Source: Texaco, 1992.

The resulting brine will primarily consist of salt, with some small amounts of gypsum and formate. Together, these compounds are expected to constitute 99 percent of the brine. The remaining 1 percent of the brine will be trace elements contained in the coal feed ash as described in Section 3.7.1.

The brine will be stored in a secure, onsite solids storage area with a leachate and runoff collection system, synthetic liner, and other provisions to prevent the release of brine constituents to the environment.

3.6 CHEMICAL AND BIOCIDES WASTES

3.6.1 CHEMICAL STORAGE AND HANDLING

Several chemicals will be used as process additives and typically will not result in the generation of solid or hazardous wastes, unless an accidental spill occurs.

Spill prevention measures will be implemented to prevent the unauthorized release of hazardous chemicals to the environment for the Polk Power Station operations. For example, storage tank systems will meet all applicable aboveground and underground storage tank rules specified in Chapters 17-762 and 17-761, F.A.C., as well as applicable EPA and other regulations and design standards for tanks. H_2SO_4 storage facilities will comply with rules governing mineral acids specified in Chapter 17-767, F.A.C.; fuel oil storage will comply with oil spill contingency requirements outlined in 40 CFR 112. The use and management of containers (e.g., drums, pails) storing chemicals or hazardous wastes will be in accordance with relevant FDOT, RCRA, and state requirements. Spill absorbent, neutralizing agents, and personal protective equipment will be provided for responding to spills occurring in the workplace. Tampa Electric Company will also conduct appropriate hazardous material handling and health and safety training programs for appropriate employees at the Polk Power Station.

3.6.2 CHEMICAL USAGE

The following paragraphs describe the chemicals which may be used on the Polk Power Station site. During the operational life of the facilities, certain substitutes for these chemicals which provide similar characteristics and functions may be used.

3.6.2.1 Ammonia

Coal will be withdrawn from the coal storage bin and fed to the grinding mill. Ammonia may be added to the mill for pH adjustment, if necessary. Slurry pH will be maintained between 6 and 8 to minimize corrosion in the carbon steel equipment.

3.6.2.2 Ammonium Hydroxide

Ammonium hydroxide (aqueous ammonia) will be used for boiler feedwater pH control and coal slurry preparation. A bulk storage tank, of approximately 6,000-gallon capacity, will be used for onsite aqueous ammonia storage.

3.6.2.3 Sodium Hypochlorite

Sodium hypochlorite is an oxidizing biocide which will be used for potable water sterilization and treated sanitary wastewater disinfection. It is anticipated that approximately 150 gallons of 15-percent commercial solution will be stored onsite. The sodium hypochlorite will be received in drums.

3.6.2.4 Hydrazine

Hydrazine will be used as a boiler feedwater oxygen scavenger for dissolved oxygen control. It is anticipated that 200 gallons of 35-percent commercial solution will be stored onsite in drums. Hydrazine used in the boiler is expected to be decomposed prior to discharge to the IWT system.

3.6.2.5 Sodium Hydroxide

Sodium hydroxide will be used as a regenerant for the makeup demineralizer and for the neutralization of regenerated water backwash. Caustic will also be used in the brine concentration area for pH control. A 50-percent solution bulk storage tank,

approximately 8,000-gallon capacity, will supply the two solution tanks. Each solution tank will be sized for two regenerations with concentrated chemical.

3.6.2.6 Sulfuric Acid

H₂SO₄ will be used as a regenerant for the makeup demineralizer, neutralization of the regenerated wastewater, and pH adjustment of the R.O. feedwater. A bulk storage tank, approximately 8,000-gallon capacity, will supply three solution tanks. The regenerant solution tanks will be sized for two regenerations, and the R.O. feed tank will hold enough acid for 24 hours of maximum continuous usage. Operation of the H₂SO₄ plant for treatment of off-gas from the HGCU system may produce as much as 45,000 tons of H₂SO₄ annually. An aboveground storage tank of approximately 150,000-gallon capacity will be used for onsite storage prior to sale.

3.6.2.7 Ferric Chloride

Ferric chloride will be used as coagulant for wastewater treatment prior to discharge or reuse. A bulk storage tank, approximately 4,000-gallon capacity, will be provided for storage of 25- to 45-percent ferric chloride solution.

3.6.2.8 Sodium Phosphates

Di- and trisodium phosphate will be fed to the boiler stream cycle water to react with calcium hardness to prevent scaling. These chemicals will be stored in drums.

3.6.2.9 Combustion Turbine Water Washing Detergent

Contaminants that pass through the air inlet filters, such as condensed hydrocarbon fumes, will be removed from the compressor by washing with a water-detergent solution (less than 5 percent detergent), followed by a water rinse. The detergent will be stored in drums or pails.

3.6.2.10 Polyelectrolytes (Polymers)

Polyelectrolytes may be used for wastewater treatment. The application could involve commercially available liquid solution of about 35-percent concentration.

The exact concentration to be used will depend on treatability testing results. It is estimated that approximately 10 gallons of polymer will be used per day.

3.6.2.11 Lime

Hydrated lime will be used for wastewater neutralization. The lime storage system will include a 1,500-cubic-foot (ft³) (26-ton) silo with approximately 50 days of storage capacity. A 750-gallon slurry feed tank will be used to hold a 10-percent lime slurry solution.

3.6.2.12 Chlorine

Liquid or gaseous chlorine will be used for makeup water and condenser cooling water treatment. The chlorine will be received and stored in 1-ton cylinders. Sodium hypochlorite may be alternatively used for chlorination of process makeup water.

3.6.2.13 No. 2 Fuel Oil

No. 2 fuel oil will be stored onsite in three aboveground steel tanks, each with a capacity of approximately 3 million gallons. The tanks will be surrounded by an earthen berm covered with sealed asphalt or comparable sealing material to contain any unanticipated spills or tank failures, in accordance with federal and state spill contingency requirements and the requirements of Chapter 17-762, F.A.C. Fuel oil will be delivered to the site by truck, railcar, or pipeline.

3.6.2.14 Heat Recovery Steam Generator Chemical Metal Cleaning Solutions

The HRSG and condensate/feedwater piping will be chemically cleaned during plant construction and startup and may be cleaned periodically during the life of the plant, but on an infrequent basis. The solutions to be used for acid and alkaline cleaning of the HRSG and piping will be dependent on the HRSG manufacturer selected. The most likely method of cleaning condensate/feedwater piping includes alkaline cleaning, acid cleaning, and passivation. Typical chemicals associated with each step will be as follows:

- Alkaline cleaning--Disodium phosphate, trisodium phosphate, and anti-foaming and wetting agents;
- Acid cleaning--Hydroxyacetic acid, formic acid, and anti-foaming and wetting agents; and
- Passivation--Hydrazine, ammonia, and anti-foaming and wetting agents.

The probable HRSG cleaning methods include alkaline cleaning, acid cleaning and passivation, or ammoniated citric acid cleaning. The most probable chemicals associated with each alkaline/acid/passivation step are as follows:

- Alkaline cleaning--Disodium phosphate, trisodium phosphate, and anti-foaming and wetting agents;
- Acid cleaning--Inhibited hydrochloric acid, anti-foaming agent, and citric acid rinse; and
- Passivation--Sodium carbonate and sodium nitrate.

Chemicals associated with ammoniated citric acid cleaning include 50-percent liquid citric acid, ammonia, sodium nitrate, ammonium bicarbonate, ammonium bifluoride, hydrochloric acid, and sodium sulfite.

These chemical solutions will be brought onsite, and spent chemicals and post-rinse waters will be collected and transported offsite for appropriate treatment and disposal.

3.6.2.15 Sulfur Recovery and Tail Gas Treating Materials

Several materials will be used to convert H_2S and SO_2 in the acid gases from the syngas cleanup systems to liquid molten sulfur, or to H_2SO_4 . These materials have the potential to be considered hazardous wastes, although most of these spent materials will be reclaimed. These materials are discussed in Section 3.7.2.

Some raw materials will become part of a wastewater stream requiring treatment in the IWT system. The wastewater streams and methods of treatment are discussed

in Sections 3.5.4.3 through 3.5.4.6. Other raw materials resulting in a solid or potential hazardous waste will be disposed of or reclaimed offsite. The handling of these wastes or by-products is discussed in Section 3.7.

3.7 SOLID AND HAZARDOUS WASTES AND BY-PRODUCTS

3.7.1 SOLID WASTES AND BY-PRODUCTS

Non-hazardous solid wastes and by-products generated by the Polk Power Station project include the following:

- Sanitary wastewater treatment sludge,
- Industrial wastewater treatment sludge,
- CG wastewater treatment brine,
- Sulfur,
- Slag,
- Waste oils,
- Water treatment media,
- HGCU system wastes, and
- General solid wastes.

3.7.1.1 Sanitary Wastewater Treatment Sludge

Sludge from the sewage treatment package plant will be periodically transported offsite for disposal. Approximately 1,400 gallons of sludge per month will be generated based on an estimated 210 operating personnel at full build-out. The sludge will be transported offsite to a permitted facility for disposal.

3.7.1.2 Industrial Wastewater Treatment Sludge

Metal hydroxide sludge and total suspended solids from the IWT system will be generated at the rate of approximately 100 cubic feet per day (ft³/day) at 30-percent solids. The filter cake is expected to be non-hazardous, containing primarily calcium carbonates, metal hydroxides, and inert solids.

The sludge handling system will consist of a sludge holding tank and a filter press. The sludge tank will be sized for 3 days active storage of solids from the clarifier. Sludge will be pumped from the sludge holding tank to the filter press for dewatering. Filter cake will be stored in the sludge disposal area. Stormwater from the sludge disposal area will be collected in an adjacent drainage basin and routed

to the IWT system for treatment. The disposal area will be designed with a synthetic liner/leachate collection system in accordance with Chapter 17-701, F.A.C.

3.7.1.3 Coal Gasification Wastewater Treatment Brine

Concentrated brine solids will be discharged from the brine concentrator at an approximate rate of 26.5 ft³/hr. The brine will be predominantly water and sodium chloride. Some gypsum may be used as an additive in the crystallization procedure. There may also be some formate content. These three compounds are expected to represent 99 percent of the total brine makeup. The remaining 1 percent consists of trace elements present in the feed coal ash, such as aluminum, barium, cobalt, copper, vanadium, and zinc.

The brine will be stored in a secure, onsite disposal area. The disposal area will consist of six 540-ft square cells with leachate and runoff collection systems and impermeable liner in accordance with Chapter 17-701, F.A.C. The brine will be mixed with up to an equal amount of sand or other stabilizing medium. The mix will then be stacked approximately 4 to 6 ft high and covered with a temporary cover. The disposal area will be designed to operate with one cell accepting waste at any one time. The majority of rainfall will be isolated from the brine by the temporary cover and runoff from the active brine area will be sent to the IWT system. Any leachate collected from within the active brine storage area will be routed back to the inlet of the brine concentrator unit. As the cell reaches storage capacity, it will be covered with a clay cap and the impermeable cover will be moved to the next cell. Runoff from the capped brine storage cells will be routed to the stormwater retention basin.

3.7.1.4 Sulfur By-Product

Elemental sulfur by-product from the CGCU system is expected to be of marketable-grade quality, with low ash levels and trace elements content. Approximately 90 tpd of sulfur is expected to be generated from the sulfur recovery units if 100 percent of the syngas for the IGCC unit is being treated in the CGCU system. Operation of the

H₂SO₄ plant for treatment of approximately 50 percent of the syngas for the IGCC unit in the HGCU system would result in significantly lower rates of sulfur produced. The sulfur will be stored in a molten state in a sulfur day tank, located within a concrete pit. The sulfur day tank will be provided with a sulfur pump to transfer the sulfur to either the truck loading rack or to the railcar loading rack for transport for offsite uses.

3.7.1.5 Slag By-Product

Slag formed in the gasifier will consist of coal ash, unconverted carbon, and trace elements contained in the coal. This material will be generated at a maximum rate of 210 stpd, dry weight. The slag will contain approximately 25-percent moisture and have a density of 90 pounds per cubic foot (lb/ft³). The silt content of less than 200 mesh slag material is 1 to 8 percent.

Fine slag will consist of filter cake material produced by the syngas scrubbing system. This slag will be generated at the maximum rate of 60 stpd dry and will be approximately 50-percent moisture with a bulk density of approximately 70 lb/ft³. The fine slag will have 80- to 90-percent silt content for the less than 200 mesh material.

Slag will be composed of glassy particles which are the remnants of completely burned coal particles or slurry droplets. Slag particles that have contacted the wall of the gasifier chamber will be typically of non-spherical, irregular shape, representing the drippings from the gasifier chamber exit throat. Slag particles that have traversed the gasifier chamber without wall contact will generally be spherical in shape. The glassy slag particles will be collected in the bottom of the radiant syngas cooler (see Figure 3.1.1-4).

Slag is a solid waste which is not considered hazardous under federal regulations 40 CFR 261.4(6)4 or 261.4(6)7vi. Local requirements such as the California leachability testing have been always passed by slag generated in the Texaco gasification system. Tables 3.7.1-1 and 3.7.1-2 summarize the State of California and

Table 3.7.1-1. State of California Waste Leaching Testing Results for Gasifier Slag (mg/L)

Parameter	Leachate Concentration	California Limit
Antimony	ND	15
Arsenic	ND	5.0
Barium	25	100
Beryllium	ND	0.75
Cadmium	ND	100
Chromium	1.6	560
Chromium (+6)	ND	5.0
Cobalt	0.14	80
Copper	0.25	25
Fluoride	3.8	180
Lead	0.36	5.0
Mercury	ND	0.2
Molybdenum	ND	350
Nickel (total)	ND	20
Selenium	ND	1.0
Silver	ND	5.0
Thallium	ND	7.0
Vanadium	1	24
Zinc	ND	250
LC-50 (96-hour)	> 500	--

Note: ND = not detected.

Source: Cool Water Coal Gasification Program, 1984.

Table 3.7.1-2. RCRA Waste Testing Results for Gasifier Slag (mg/L)

RCRA Parameter	Leachate Concentration	RCRA Limit
Arsenic	ND	5.0
Barium	0.32	100.0
Cadmium	ND	1.0
Chromium (total)	ND	5.0
Lead	ND	5.0
Mercury	ND	0.2
Selenium	ND	1.0
Silver	ND	5.0

Note: Ignitability is negative.
Corrosivity is negative.
Reactivity is negative.
ND = not detected.

Source: Cool Water Coal Gasification Program, 1984.

EPA extraction procedure toxicity leaching test results for gasifier slag produced from the Texaco Cool Water Coal Gasification Program. The slag contains the trace elements found in the feed coal in non-leachable form. Table 3.7.1-3 provides a summary of the trace element balance in the slag, fine slag, sulfur, and brine, using the modified Illinois No. 6 coal. These trace element estimates are based on actual Texaco gasifier operating data and account for contribution of some trace elements by the wear of gasifier refractory materials.

The slag by-product is salable as an abrasive, roofing material, industrial filler, aggregate for concrete, or road base material. Onsite storage will be provided for temporary storage in the event the slag cannot be immediately sold. Tampa Electric Company will actively market this by-product and has been successful in securing markets for this type of product at its other power plants. The temporary storage area will be designed with a liner and stormwater collection system in accordance with Chapter 17-701, F.A.C. The area will be sloped to allow water to drain into an adjacent stormwater collection basin, for subsequent treatment in the IWT system. The basin will be sized to retain the runoff in excess of the 25-year, 24-hour storm event.

3.7.1.6 Waste Oils

Waste oils will be periodically generated from lubricating oil leakage and replacement from turbines, pumps, fans, bearings, compressors and other plant-related operating machinery and vehicles. Less than 50 pounds per day (lb/day) of waste oil is expected to result from small leaks or other *de minimis* plant sources. These oils will be captured in the plant oil/water separators, and later skimmed out and placed in drums for pickup by an oil recycling contractor. Waste oils generated from oil changes and equipment maintenance will vary according to the level of plant maintenance. The waste oil will be placed in designated 55-gallon drums to prevent the mixing of oil with listed hazardous solvents. Waste oil collected in the drums will be periodically picked up by an oil recycler or disposed of as appropriate in an approved

Table 3.7.1-3. Trace Element Analysis in Slag, Fine Slag, Sulfur, and Brine

Element	Feed Coal (percent)	Slag (lb/hr)	Fine Slag (lb/hr)	Sulfur (lb/hr)	Brine (lb/hr)
Aluminum	1.13	2,116	65.4	0	0.001
Antimony	0.00040	0.54	0.23	0	0.005
Arsenic	0.0013	1.73	0.59	0	0.093
Barium	0.0084	14.9	1.14	0.002	0.228
Beryllium	0.00047	0.80	0.11	0	0
Boron	0.014	9.1	10.9	0.05	7.195
Cadmium	0.00019	0.16	0.21	0.001	0.005
Calcium	0.36	686	6.48	0	6.851
Chromium	0.0028	11.7	0.5	0	0.016
Cobalt	0.00093	1.71	0.07	0	0.004
Copper	0.0026	3.76	1.25	0.008	0.01
Iron	1.03	1,672	310	0	1.395
Lead	0.00047	0.24	0.66	0	0.004
Magnesium	0.075	140	4.11	0.06	0.71
Manganese	0.0045	8.31	0.22	0.002	0.076
Mercury	0.000028	0.005	0.048	0	0
Molybdenum	0.0010	0.36	1.57	0	0.029
Nickel	0.0014	2.11	0.43	0.003	0.015
Potassium	0.16	303	6.92	0	2.03
Selenium	0.00080	1.31	0.23	0	0.009
Silicon	2.85	5,276	243	0.245	5.641
Silver	0.000004	0	0.01	0.004	0
Sodium	0.076	107	35.5	0.55	5.252
Strontium	0.028	43.9	9.42	0.002	0.403
Thallium	0.00025	0	0.48	0	0
Tin	0.00080	0.96	0.57	0	0.017
Titanium	0.13	233	12.9	0	0.32
Vanadium	0.0052	9.03	1.02	0.007	0.012
Zinc	0.0054	5.63	4.78	0.007	0.043

Note: Coal feed rate at 193,489 lb/hr.

Source: Texaco, 1992.

disposal facility. Waste oil which meets the specifications listed in 40 CFR 266.40 may be burned as fuel in the boiler.

3.7.1.7 Water Treatment Media

Water treatment media such as ion exchange resin, filter media (e.g., sand, anthracite) and R.O. cartridge filters will periodically require replacement. Such replacements are not expected to occur more than once every 3 to 5 years. These wastes will be disposed of at an offsite permitted landfill.

3.7.1.8 Hot Gas Cleanup System Wastes

The HGCU system is expected to generate sorbent fines from the regenerator, salt from the barrier filter, and solids from the cyclone unit. An approximate amount of these materials is as follows:

- Salt, 125 pounds per hour (lb/hr);
- Sorbent fines (zinc oxide and titanium dioxide), 25 lb/hr; and
- Cyclone solids (zinc sulfide, titanium dioxide, carbon), 25 lb/hr.

It is anticipated that the salt from the barrier filter will be disposed in the brine storage area. The sorbent fines are expected to be reclaimed offsite. The non-hazardous cyclone solids will be disposed of offsite in a permitted landfill.

3.7.1.9 General Wastes

General wastes will include miscellaneous plant trash and organic material collected from the cooling water reservoir intake screens. The non-hazardous plant trash will be disposed of at an offsite sanitary landfill. Small quantities of predominately organic matter collected at the intake will be returned to the reservoir, and inorganic matter will be disposed of as trash.

3.7.2 POTENTIALLY HAZARDOUS WASTES AND BY-PRODUCTS

Material and by-products with *potentially* hazardous properties to be generated by the Polk Power Station project include the following:

- Worn gasifier refractory,
- Refractory backup brick,
- Spent sulfur recovery unit catalysts,
- Spent tail gas treatment catalysts,
- Rich acid gas removal solvent,
- Acid gas removal solvent filters,
- De-activated carbon filter media,
- H₂SO₄ by-product, and
- Miscellaneous wastes.

3.7.2.1 Worn Gasifier Refractory

Gasifier refractory hot face is the innermost layer of brick in the gasifier. Following extensive use, the brick face will become impregnated with slag and must be replaced. The typical composition of the worn refractory material will contain various trace metals which are a potential concern; however, previous extraction procedure toxicity testing of this material has indicated that the refractory is non-hazardous. A typical analysis of worn refractory is provided in Appendix 11.13.3.

Total weight of the refractory hot face is approximately 48 tons. The hot face will generally be replaced over a 2-year cycle. Startup conditions may force one early refractory repair or replacement after the first year of IGCC unit operation. It is expected that hot face refractory will be sold back to the manufacturer for reclamation. Because of its intrinsic value, waste refractory is not expected to be disposed in offsite landfill facilities.

3.7.2.2 Refractory Backup Brick

Backup brick, the brick layers located behind the gasifier hot face, consist primarily of aluminum, silica, and iron oxide minerals. The sulfur recovery unit facilities will

also have refractory lined vessels of the same composition as that of the gasifier backup brick. Under normal operating conditions, an estimated 27 tons of this material will be returned to the vendor for reclamation or disposed of offsite every 5 years.

3.7.2.3 Spent Sulfur Recovery Unit Catalysts

The sulfur recovery unit will convert the H_2S gas in the CGCU system to liquid molten sulfur. Three catalytic reactors will be used in conjunction with a thermal reactor to achieve sulfur recovery. A typical analysis of the sulfur recovery unit catalyst is provided in Appendix 11.13.3.

Total catalyst in the three reactors will amount to approximately 45 tons. The catalyst will require replacement every 3 to 5 years. It is unlikely that all three beds will require a simultaneous replacement. It is expected that the spent catalyst will be returned to the vendor for reclamation.

3.7.2.4 Spent Tail Gas Treating Catalysts

The tail gas treating unit will be designed to recover the H_2S and SO_2 from the tail gas in the CGCU system for recycle back to the sulfur recovery unit. The tail gas treating unit catalysts will primarily consist of nickel or cobalt-molybdenum. A typical analysis of these catalysts is provided in Appendix 11.13.3. Total reactor charge of catalysts will be approximately 25 tons.

Typically these catalysts will be replaced every 3 to 5 years. Plant upsets could result in a more frequent changes. The catalysts will typically be sold to metals reclaimers or taken back by the catalyst vendor. If these options are not available, the material will be disposed of in a permitted offsite landfill.

3.7.2.5 Rich Acid Gas Removal Solvent

Amines from the acid gas removal or tail gas treating units, with an inventory of as much as 80,000 gallons, will be returned to the manufacturer for reclamation when

replacement is required. Therefore, no waste amine solvent requiring offsite or onsite disposal will be produced.

3.7.2.6 Acid Gas Removal Solvent Filters

The acid gas removal solvent filters will be periodically changed based on differential pressure build-up. The filtrate will consist primarily of corrosion products and a small amount of degraded amine solvent.

This material will collect immediately after any event that allows air into the acid gas removal system (e.g., major plant outages). During routine operations, approximately 70 pounds per week of wastes will be generated as a result of filter replacement. The waste filters will be characterized for hazardous constituents, and accordingly disposed of at an offsite RCRA hazardous or sanitary waste disposal facility.

3.7.2.7 De-Activated Carbon Filter Media

De-activated carbon filter media will need to be periodically replaced. The waste filter media will either be disposed offsite in an approved facility or sent back to vendor for reactivation.

3.7.2.8 Sulfuric Acid By-Product

Treatment of the off-gas from the HGCU system will involve the production of liquid H_2SO_4 in an onsite skid-mounted plant. The H_2SO_4 is a by-product which will be sold for offsite commercial uses. Operation of the acid plant may produce up to 45,000 tons of H_2SO_4 annually. The H_2SO_4 will be temporarily stored onsite in an aboveground tank or in specially designed rail cars prior to offsite shipment. The storage facilities will comply with applicable rules for mineral acids (Chapter 17-767, F.A.C.).

3.7.2.9 Miscellaneous Wastes

The operation and maintenance of the Polk Power Station facilities will require the use of solvents, degreasers, paints, and other materials which result in hazardous

wastes. The amount of hazardous wastes will be minimized through the use of appropriate product substitution and waste segregation techniques. The routine hazardous waste generation rate is expected to be a small quantity [i.e., between 100 to 1,000 kilograms (kg) per calendar month]. However, during periods of shutdown or high maintenance the facility may generate large quantities (i.e., greater than 1,000 kg per month) of hazardous wastes.

These wastes will be managed onsite and shipped offsite to a permitted waste disposal or recycle facility in accordance with local, state, and federal hazardous waste requirements. Some locations where hazardous wastes will be stored are expected to be fixed (e.g., maintenance shop, paint shop), while other locations may vary according to the need (e.g., pump requiring degreasing and repair). Satellite storage areas will be selected near the most common hazardous waste generation points which will be used to store up to 55 gallons of hazardous wastes in a designated drum. When the drum is full, the waste will be transferred to the hazardous waste storage facility and shipped to a permitted RCRA facility within 90 days. The hazardous waste storage facility will be located near a site roadway to provide easy access to both offsite waste transporters and emergency response personnel. The facility will be equipped with fire extinguisher, spill absorbent material, and spill containment features to ensure that the environment is adequately protected from a chemical release. A preliminary RCRA contingency plan for the facility is included in Appendix 11.13.2.

3.8 ONSITE DRAINAGE SYSTEM

Similar to the pre-mining drainage conditions, the surface runoff from the project site will be drained into three watersheds: South Prong Alafia River, Payne Creek, and Little Payne Creek. As discussed in Section 2.3.4, currently the proposed project site has been significantly altered by the phosphate mining activities. To alleviate the existing mining impacts and to minimize the potential hydrologic impact due to the proposed project, the Polk Power Station onsite drainage plan is designed to achieve the following objectives:

1. Comply with FDNR's reclamation regulations (Chapter 16C-16, F.A.C.);
2. Comply with SWFWMD's surface water regulations (Chapter 40D-4, F.A.C.);
3. Comply with FDER's stormwater management regulations (Chapter 17-25, F.A.C.);
4. Comply with EPA regulations for stormwater discharges associated with industrial activities (40 CFR 122.26); and
5. Comply with state and Federal regulations for surface water and ground-water standards.

The onsite master drainage plan is designed to detain at least the first inch of stormwater runoff resulting from the 25-year, 24-hour storm event from areas on the plant site associated with industrial activity for appropriate water quality treatment. The drainage system will also provide sufficient storage and detention capacity for water quantity control so that the post-reclamation peak runoff rate will not exceed the pre-mining peak discharge for a design storm event (25-year, 24-hour event) in each of the three watersheds. The detention/storage capacity will be provided by the proposed stormwater detention basins and reclaimed wetland areas.

Although the onsite drainage patterns and watersheds have been significantly altered by mining activities, the proposed project development will restore the drainage basin boundaries and onsite basin acreages to approximately (i.e., within 2 percent) pre-mining conditions. The proposed post-reclamation/development drainage basin

boundaries are shown in Figure 3.8.0-1 and Figure 3.8.0-2 for the portions of the site to the west and east of SR 37, respectively. The pre-mining and post-reclamation watershed areas are compared in Table 3.8.0-1. The onsite drainage patterns for the onsite watersheds (i.e., South Prong Alafia River, Payne Creek, and Little Payne Creek) are described in the following sections.

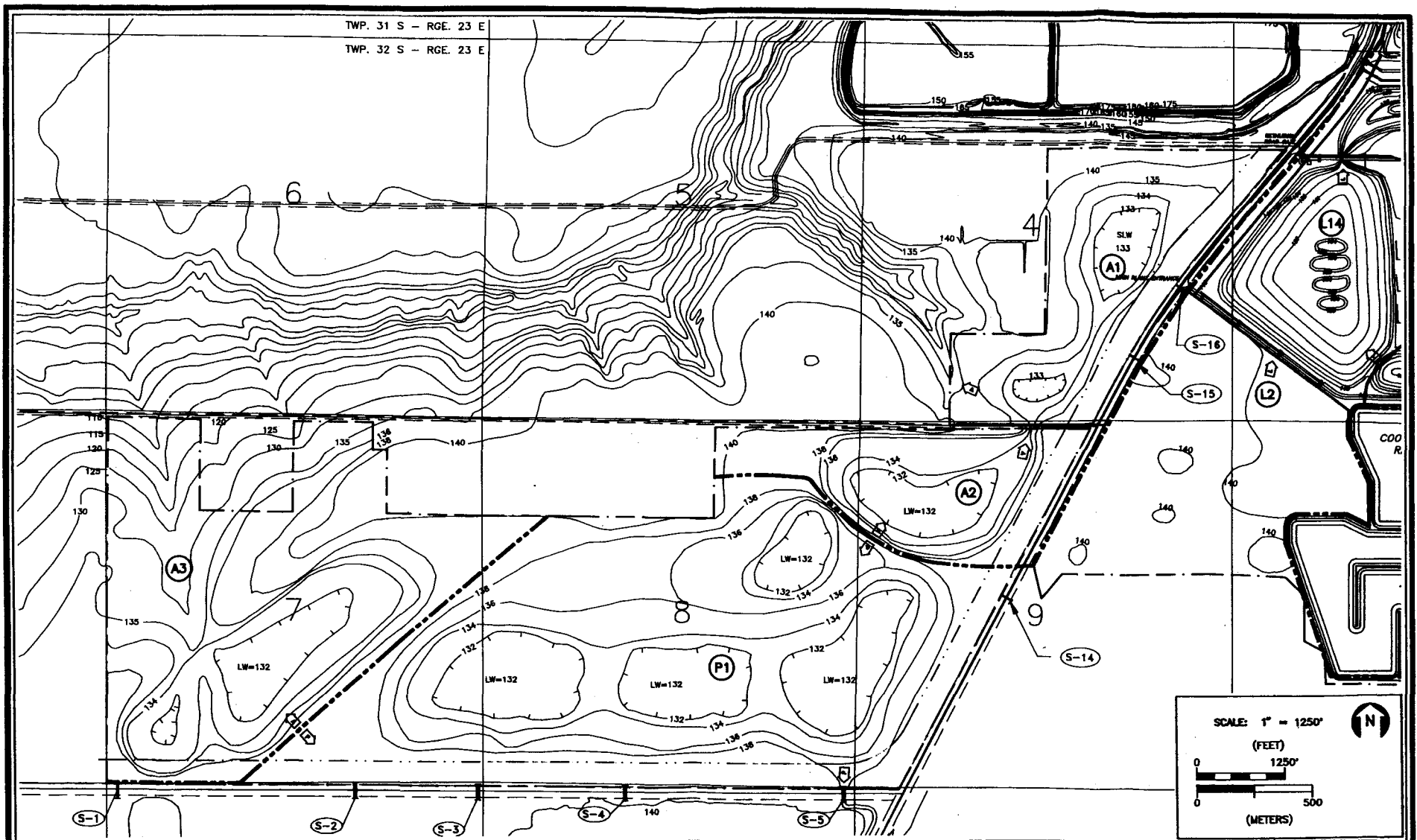


FIGURE 3.8.0-1.

POST-RECLAMATION/DEVELOPMENT DRAINAGE BASINS AND TOPOGRAPHY: WESTERN SITE TRACT

Source: ECT, 1992.

TAMPA ELECTRIC
A TECO ENERGY COMPANY

POLK POWER STATION

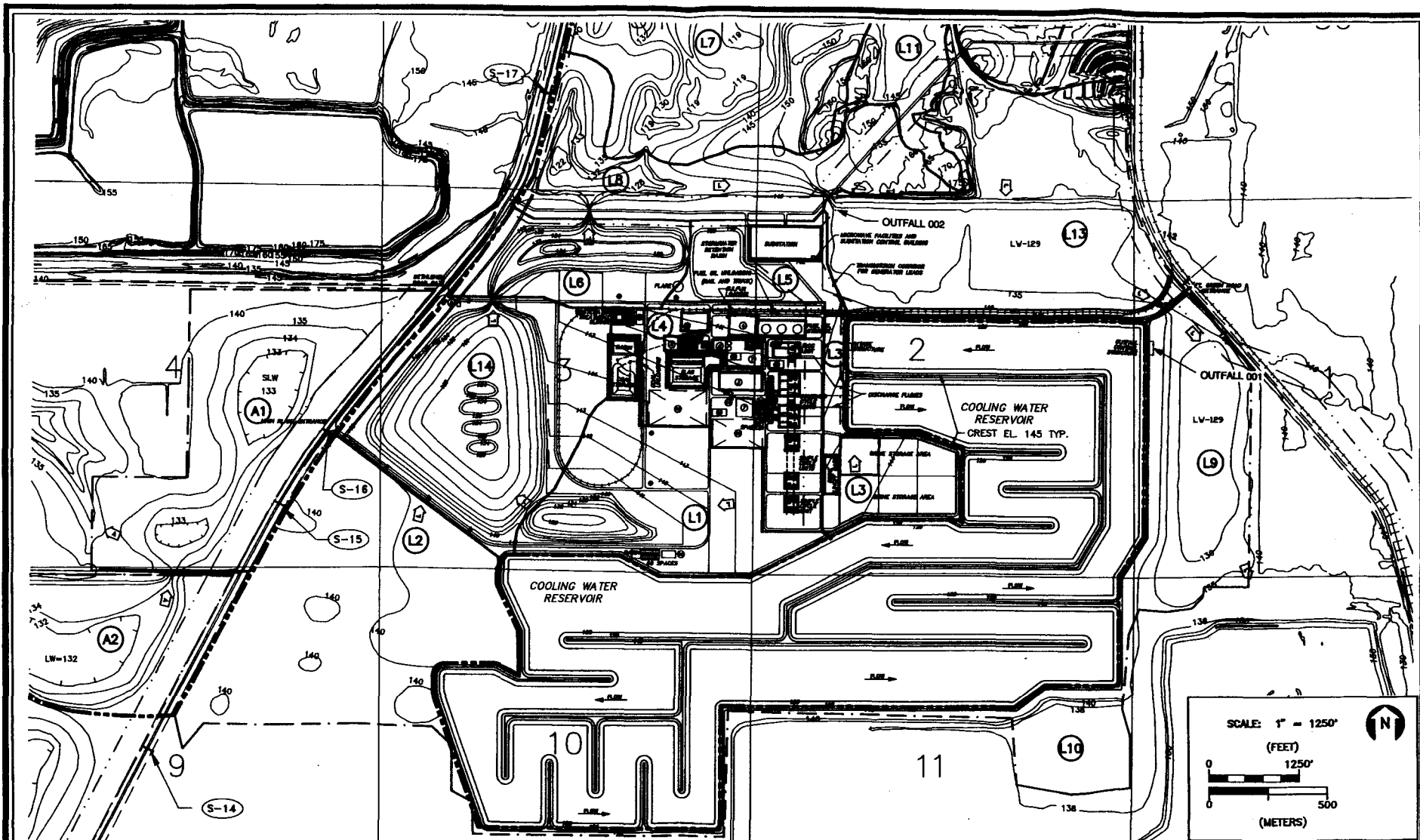


FIGURE 3.8.0-2.

POST-RECLAMATION/DEVELOPMENT DRAINAGE BASINS AND TOPOGRAPHY: EASTERN SITE TRACT

Source: ECT, 1992.



POLK
POWER
STATION

Table 3.8.0-1. Pre-Mining and Post-Reclamation Drainage Areas

Watershed	<u>Drainage Basin Size (acres)</u>		Percent Change
	Pre-Mining	Post-Reclamation	
South Prong Alafia River	816	801	-1.8
Payne Creek	716	710	-0.8
Little Payne Creek	2,816	2,837	0.7
TOTAL	4,348	4,348	

Source: ECT, 1992.

3.8.1 SOUTH PRONG ALAFIA RIVER BASIN

As shown in Table 3.8.0-1 and Figure 3.8.0-1, the drainage basin boundary of South Prong Alafia River watershed within the project site will be restored to approximately its pre-mining location. The total drainage area after reclamation will be 801 acres compared to the pre-mining drainage area of 816 acres. According to FDNR's mined land reclamation requirements, this mined area west of SR 37 will be regraded and planted with vegetation to enhance wildlife habitats. Also, to comply with these requirements, the onsite reclamation plan for this tract will create approximately 216 acres of forested and non-forested wetland areas. The western site tract will not include any power plant facilities. The runoff from the reclaimed upland forest and pasture will not be associated with industrial activity and will sheet flow into two separate wetland areas (east and west) prior to offsite discharge as depicted in Figure 3.8.0-1. The wetlands will have a large surface area to significantly suppress the peak discharge and allow for the settling and filtering of suspended material and removal of nutrients by plant uptake prior to offsite discharge.

The stormwater runoff from the wetlands in the eastern area in the South Prong Alafia River watershed will be routed to a tributary of the river via a vegetated swale. The stormwater runoff from the western wetland areas will also be discharged into a small tributary of the South Prong Alafia River in the extreme northwestern corner of the site through a fixed hydraulic structure to maintain the proper hydroperiod for the wetland.

3.8.2 PAYNE CREEK BASIN

The drainage basin boundary of the Payne Creek watershed within the project site will also be restored to approximately its pre-mining position (see Table 3.8.0-1 and Figure 3.8.0-1). The total drainage area after reclamation will be 710 acres compared to the pre-mining drainage area of 716 acres. Similar to the South Prong Alafia River, the presently mined areas will be reclaimed to 242 acres of wetlands and upland forests. The runoff from the reclaimed upland forest will sheet flow into the wetlands prior to offsite discharge. The substantial wetland areas will have flood control functions and provide for water quality treatment. Any runoff discharges from the wetlands will drain southward across SR 674 through culverts similar to pre-mining conditions. This discharge of stormwater not associated with industrial activity will be routed to Payne Creek which runs along the western side of SR 37. The post-reclamation topography and drainage plan for the Payne Creek basin is shown in Figure 3.8.0-1.

3.8.3 LITTLE PAYNE CREEK BASIN

The drainage basin boundary of the Little Payne Creek watershed within the project site will be restored to approximately its pre-mining position. As shown in Table 3.8.0-1, the total drainage area after reclamation will be 2,837 acres, compared to a pre-mining drainage area of 2,816 acres. The power blocks and associated facilities, including the cooling reservoir, for the Polk Power Station will be located within the Little Payne Creek basin. Other mined-out areas in this basin will also be reclaimed to upland and wetland areas. Figure 3.8.0-2 presents the post-reclamation topography and drainage plan for the Little Payne Creek basin.

The cooling water reservoir will receive direct rainfall and runoff from its 835-acre area, including 727 acres of water surface area and 108 acres of interior berms and the inside slope of the exterior berm. The configuration and operation of the cooling reservoir are described in detail in Section 3.5.1.

Stormwater runoff associated with industrial activities from the CG process area and sulfur storage area will be collected and routed to the IWT system. Runoff associated with industrial activity from CT/CC units, fuel oil storage area, and substation will be treated in an oil/water separator and then discharged into the cooling reservoir.

The runoff from coal pile, slag storage, active brine storage, and IWT sludge storage areas will be collected in retention basins to allow settling of the suspended solids and then routed to the IWT system for further treatment. A small portion of the treated water from the IWT system will be used for dust suppression in the coal handling system, and the remainder will be discharged into the cooling water reservoir for reuse in the cooling system.

The total drainage area associated with industrial activities which ultimately discharges to the cooling reservoir is approximately 65 acres. In addition to recirculating cooling water and the IWT effluent, the cooling water reservoir receives

other process waters described in Section 3.5. Blowdown from the cooling reservoir will be discharged to a reclaimed lake along the eastern edge of the cooling reservoir via a control structure (Outfall 001).

Two detention basins will be constructed to collect stormwater runoff from other plant site areas not described previously. The detention basins will provide water quantity and water quality treatment as required by SWFWMD. A 0.2-acre detention basin located south of the power block and adjacent to the northern berm of the cooling reservoir will receive runoff from the administration building, parking lot, and a small area in the immediate vicinity of the building. The total subbasin area is about 3 acres, and the detention basin will detain in excess of 1 inch of runoff from the area. The discharge from this detention basin will be drained via a control structure into a reclaimed wetland located east of SR 37 and west of the cooling reservoir (see Figure 3.8.0-2).

A 26-acre detention basin will be constructed to the north of the power block. This basin will receive stormwater runoff from a 172-acre upland facility area. This detention basin will detain in excess of 1 inch of runoff prior to discharging into a second wetland area lying to the west of the basin and northwest of the main plant facilities (see Figure 3.8.0-2).

The runoff from the detention basins and other site areas to the west of the power block plant site and east of SR 37 will also be drained into a wetland area to the west of the large detention basin. The discharge from this wetland will be routed north and then eastward via swales and Outfall 002 into the old mine-cut lake which also receives runoff from the northern portion of the project site. The total drainage area which discharges to the old mine-cut lake is approximately 1,994 acres.

The discharge from the old mine-cut lake will be drained southward into an existing reclaimed lake located along the eastern edge of the proposed cooling water reservoir. The blowdown from the reservoir will also be routed into this existing

reclaimed lake. The blowdown and stormwater runoff discharges from the reclaimed lake will be routed offsite through a swale and drain into Little Payne Creek system which currently consists of a man-made ditch running along the west side of Fort Green Road near the project site.

3.8.4 HYDROLOGIC ANALYSIS

The onsite drainage plan has been designed to minimize the potential hydrologic impacts of the Polk Power Station project by restoring drainage basin boundaries to pre-mining conditions. However, the proposed project will alter certain land use patterns on the project site by the inclusion of the proposed reclaimed wetlands, plant facilities, and the cooling reservoir. Therefore, a hydrologic analysis of drainage patterns and stormwater flows within each of the onsite watersheds (Payne Creek, Little Payne Creek, and South Prong Alafia River) was conducted. The results of this analysis were used in establishing the proposed hydrologically balanced drainage plan.

In accordance with the drainage and stormwater management requirements of FDNR and SWFWMD, the potential hydrologic impacts of the proposed project can be assessed according to two evaluation criteria:

1. The project will not increase the peak runoff from the design storm (i.e., 25-year, 24-hour) compared with the pre-mining peak runoff to ensure that the proposed project will not worsen the potential for downstream flooding; and
2. The project will not increase the total mass flow and will not reduce the mass flow by more than 15 percent. These criteria will ensure that the project will cause no excessive diversion, addition, or consumption of the surface runoff.

A hydrologic model, HEC-1, developed by Hydraulic Engineering Center (USACE, 1990) was used to conduct the hydrologic analysis. The SCS runoff hydrograph method was selected to perform the surface runoff calculations. A storm event of a 25-year return period and 24-hour duration with SCS Type II distribution was used for the design storm for the hydrologic analysis. According to SWFWMD's surface water permit manual, the 25-year, 24-hour storm depth near the project area is approximately 9 inches.

For the analysis, each watershed was divided into a number of sub-basins according to the topography, land use, and other watershed characteristics. A weighted curve number for each sub-basin was computed based on its soil type and land use cover. The Payne Creek watershed, due to its small size on the site and uniform hydrologic characteristics, had only one basin for both pre-mining and post-reclamation conditions. South Prong Alafia River was divided into three sub-basins for pre-mining and four sub-basins for post-reclamation conditions. Alternately, Little Payne Creek watershed, which will consist of reclaimed upland and wetland systems, the plant facilities, and areas not disturbed by the project after site development, was divided into ten sub-basins for pre-mining and 16 sub-basins for post-reclamation conditions. The watershed post-reclamation/development and sub-basin boundaries for Little Payne Creek are shown on Figure 3.8.0-2.

The computed total mass flows for the design storm in the three watersheds are provided in Table 3.8.4-1 for pre-mining and post-reclamation conditions. The results indicate that the proposed project will decrease the mass flow in South Prong Alafia River by 5.6 percent. Mass flows in Payne Creek and Little Payne Creek will be reduced by 13.2 and 11.9 percent, respectively.

To assess potential flooding impacts, the hydrographs for each watershed under post-reclamation condition were compared with pre-mining hydrographs. Figure 3.8.4-1 shows the hydrograph comparison for the South Prong Alafia River watershed. Figures 3.8.4-2 and 3.8.4-3 illustrate the hydrographs for Payne Creek and Little Payne Creek, respectively. The results indicate that the proposed project will significantly reduce the peak runoff largely because of the extensive onsite wetland areas and water management facilities. The drainage plan for the proposed project will also allow runoff to be slowly released out of the detention areas, therefore reducing the probability of extreme dry conditions in the receiving streams. Table 3.8.4-2 summarizes the peak discharges for each watershed. The HEC-1 model inputs and outputs are presented in Appendix 11.8.9.

Table 3.8.4-1. Mass Flow Analysis

Sub- Watershed	Drainage Area (acres)		Mass Flow (ac-ft)		Ratio (%)
	Pre- Mining	Post- Reclamation	Pre- Mining	Post- Reclamation	
South Prong Alafia River	816	801	411	388	94.4
Little Payne Creek	2,816	2,837	1,441	1,269	88.1
Payne Creek	716	710	380	330	86.8
TOTAL	4,348	4,348	2,232	1,987	

Note: Storm event = 25-year, 24-hour.
Rainfall depth = 9 inches.

Source: ECT, 1992.

Total Stormwater Discharge South Prong Alafia River

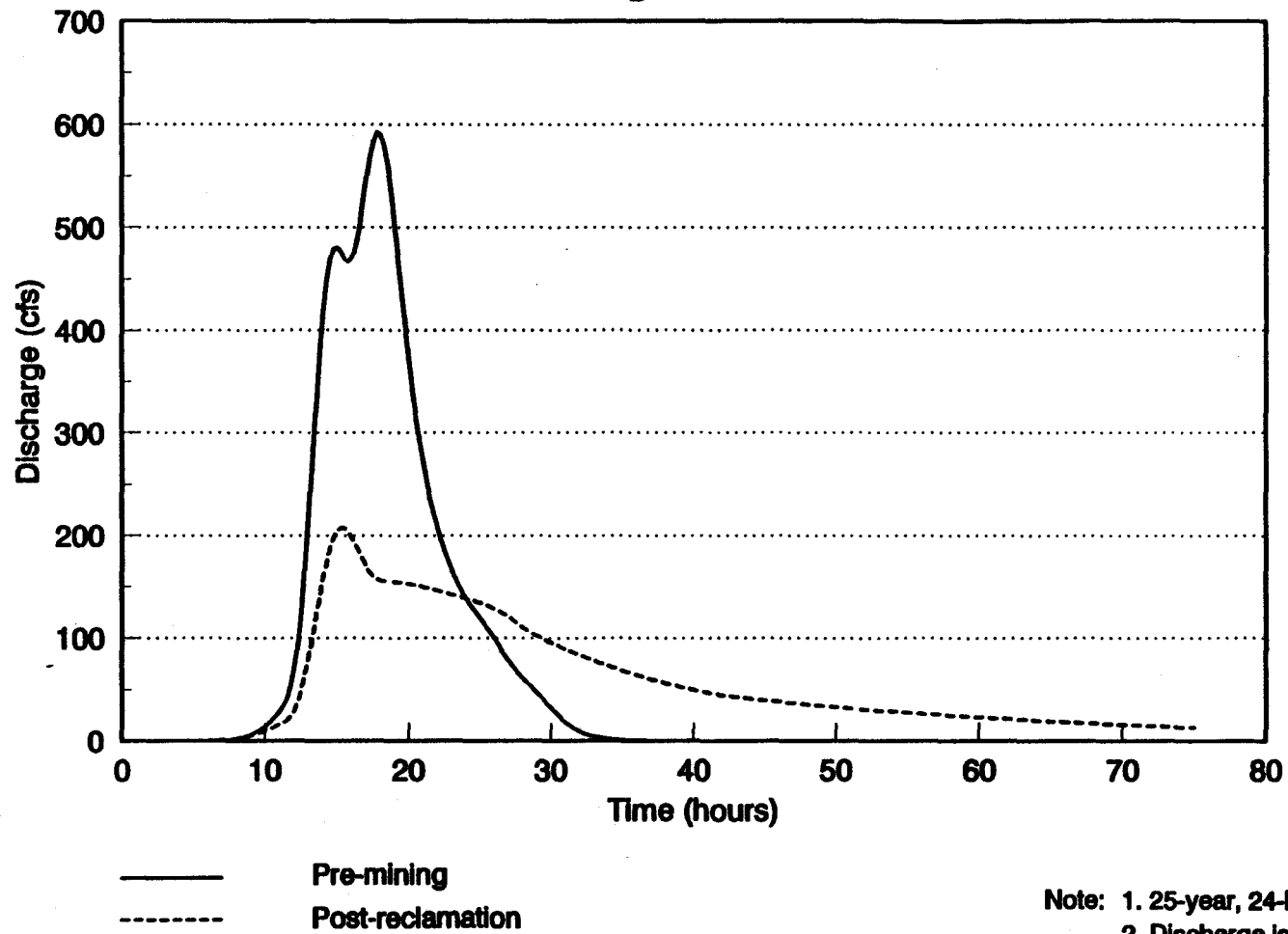


FIGURE 3.8.4-1.
PRE-MINING AND POST-RECLAMATION RUNOFF
HYDROGRAPH FOR SOUTH PRONG ALAFIA RIVER
BASIN (25 YEAR, 24 HOUR STORM)

Source: ECT, 1992.

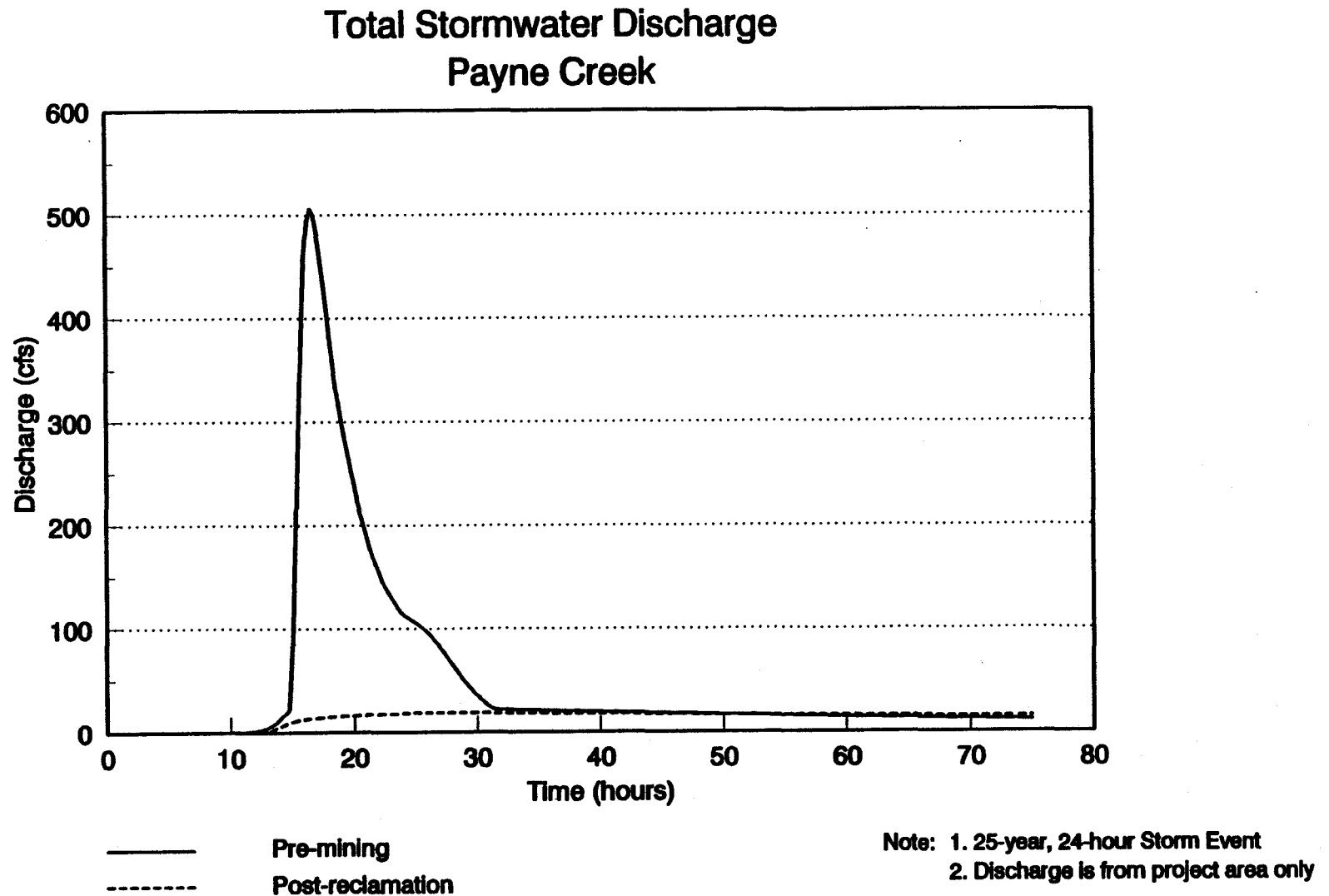


FIGURE 3.8.4-2.
PRE-MINING AND POST-RECLAMATION RUNOFF
HYDROGRAPH FOR PAYNE CREEK BASIN
(25 YEAR, 24 HOUR STORM)

Source: ECT, 1992.



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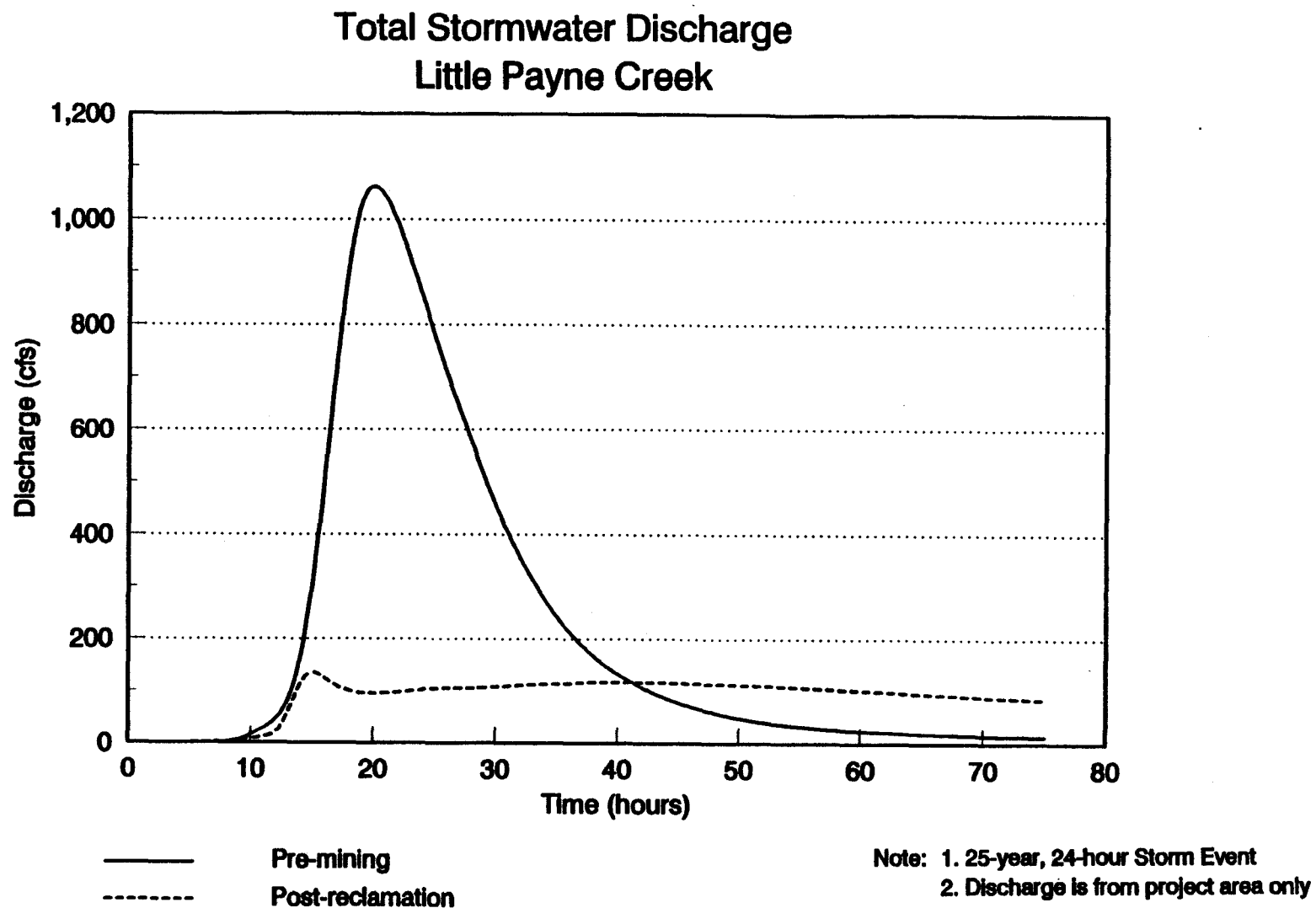


FIGURE 3.8.4-3.
PRE-MINING AND POST RECLAMATION RUNOFF
HYDROGRAPH FOR LITTLE PAYNE CREEK BASIN
(25 YEAR, 24 HOUR STORM)

Source: ECT, 1992.



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Table 3.8.4-2. Summary of Pre-Mining and Post-Reclamation Peak Runoff

Watershed	Drainage (acres)		Peak Runoff (cfs)	
	Pre-Mining	Post-Reclamation	Pre-Mining	Post-Reclamation
South Prong Alafia River	816	801	541	208
Little Payne Creek	2,816	2,837	1,063	135
Payne Creek	716	710	506	19

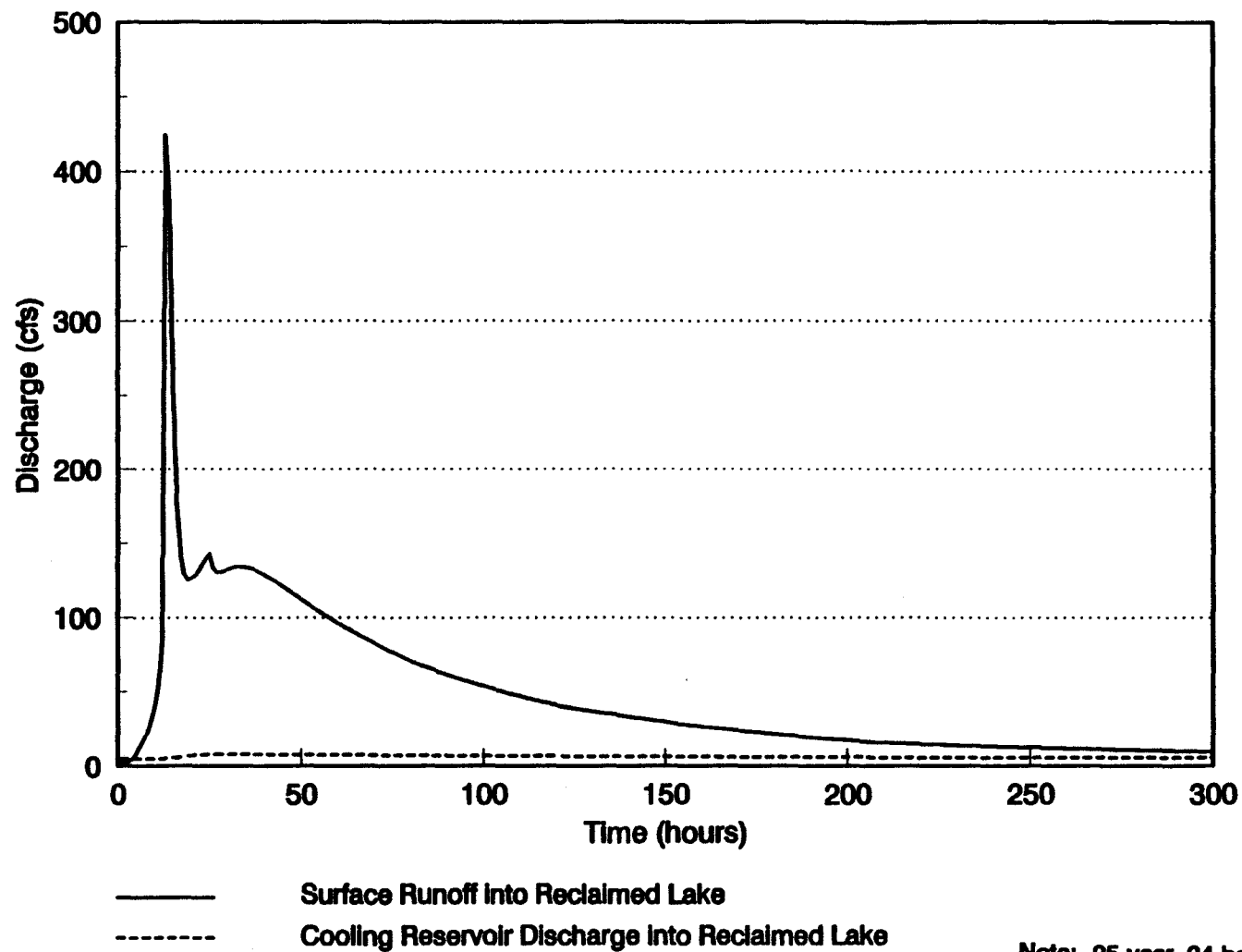
Source: ECT, 1992.

As discussed in Section 3.5.1.2, the cooling reservoir will have an approximately 3.1-MGD discharge into the reclaimed lake under normal conditions. With a 9-inch rainfall (i.e., 25-year, 24-hour storm event), however, additional stormwater will be released from the reservoir through a 10-ft overflow weir. To assess the potential water quality and quantity impacts due to the increased blowdown from the overflow weir, the hydrograph of the reservoir discharge is compared with the surface runoff into the reclaimed lake, as shown in Figure 3.8.4-4. The solid line represents the surface runoff into the reclaimed lake, including runoff from a 277-acre offsite drainage area. Figure 3.8.4-4 indicated that the maximum surface runoff is about 465 cfs while the maximum cooling reservoir discharge under 25-year, 24-hour storm is about 8.2 cfs; therefore, the surface runoff into the reclaimed lake will provide significant mixing to the reservoir discharge even though the blowdown will increase with a 9-inch storm.

The mixing ratio between the surface runoff and the cooling reservoir discharge is shown in Figure 3.8.4-5. The analysis shows that the maximum mix ratio of the surface runoff is approximately 82:1 during the design storm, and the mix ratio will decrease when the surface runoff into the reclaimed lake has receded. The mixing ratio at 300 hours (12.5 days) after the storm is approximately 8.1:1. On an annual average basis, the base flow into the reclaimed lake is approximately 2.7 cfs and will have a mix ratio of 0.6:1 to be mixed with 3.1 MGD blowdown.

To assess the possibility of flooding at the proposed facilities, a 100-year, 24-hour storm (approximately 11 inches) was used to simulate the hydrograph and to predict the water levels of the water bodies in the project area. The results indicate that the highest water level will occur at the 0.2-acre and 26-acre retention basins. Both basins will have a water level of 138.8 ft-NGVD at the peak stage, and the maximum stage in the wetland areas to the east of SR 37 is approximately 137.9 ft-NGVD. The maximum stages in the old mine-cut is approximately 137.9 ft-NGVD.

Reclaimed Lake Inflows



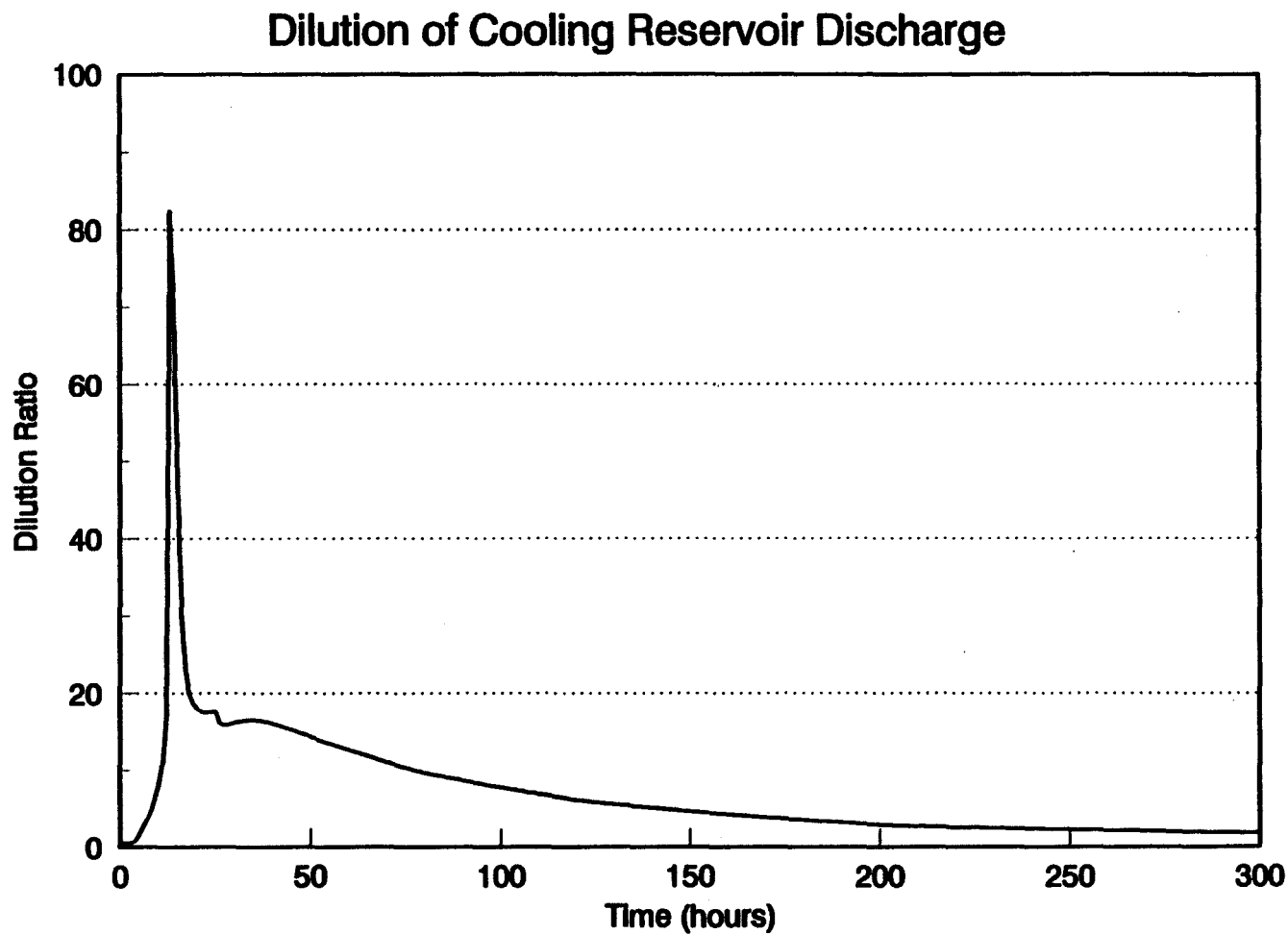
Note: 25-year, 24-hour Storm Event

FIGURE 3.8.4-4.
COMPARISON BETWEEN COOLING RESERVOIR
DISCHARGE AND SURFACE RUNOFF INTO
THE RECLAIMED LAKE

Source: ECT, 1992.



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Dilution Ratio = Surface Runoff Into Reclaimed Lake / Cooling Reservoir Discharge

Note: 25-year, 24-hour Storm Event

**FIGURE 3.8.4-5.
DILUTION RATIO BETWEEN SURFACE
RUNOFF AND COOLING RESERVOIR
DISCHARGE**

Source: ECT, 1992.



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The plant facility areas will be graded to be above 140 ft-NGVD; therefore, the facilities will not be flooded with a 100-year storm.

The HEC-model inputs and outputs are presented in Appendix 11.8.9 and in the Conceptual Reclamation Plan submitted separately to FDNR.

The results of the hydrologic analysis indicate that the post-reclamation peak discharge will be significantly lower than the pre-mining peak discharges; therefore, the proposed project will not cause additional downstream flooding under the 25-year, 24-hour storm event. However, the continuous 3.1 MGD blowdown will increase baseflow in the Little Payne Creek system during dry periods.

According to Table 2.3.4-1, the pre-mining drainage areas of the Little Payne Creek at Fort Green Road and at Route 665 near Bowling Green are 6,567 acres and 24,693 acres, respectively. Based on an annual average flow of 0.8 CSM for Little Payne Creek basin, the average pre-mining discharge at Fort Green Road and 8.2 cfs and 30.9 cfs, respectively.

Similarly, the post-reclamation drainage areas of the Little Payne Creek at Fort Green Road and at Route 665, excluding the cooling reservoir, are 5,646 acres and 23,793 acres, respectively, and the annual average flows at these two locations including the 3.1-MGD cooling reservoir blowdown are 11.9 cfs and 34.5 cfs, respectively. The results indicate that the proposed project will increase the average flow of Little Payne Creek by 3.7 cfs. This increased flow will raise the water level of Little Payne Creek at Fort Green Road approximately 0.2 ft. The water level increase will be diminished further downstream. The increase of water depth at the USGS gauging station near Bowling Green will be approximately 1.4 percent, or less than 1 inch.

3.8.5 STORMWATER MANAGEMENT DURING CONSTRUCTION

As described in Section 4.2., stormwater runoff from the site during construction activities will normally be retained in the onsite mine cuts and cooling water reservoir area under normal rainfall conditions. However, offsite stormwater discharges may occur during construction under higher rainfall conditions or storm events. Best management practices will be implemented to prevent soil erosion and to remove any sediments from any potential offsite runoff discharges. The sediment control and stormwater management practices to be used during construction are discussed in detail in Section 4.2.

3.9 MATERIALS HANDLING

3.9.1 CONSTRUCTION MATERIALS AND EQUIPMENT

Construction materials and equipment will be delivered to the site by existing roads and railroads. As shown in Figure 3.2.0-1, existing roads to the site include Fort Green Road to the east of the power block area, SR 37 to the west of the power block, and CR 630 located along the north site boundary. An existing CSX railroad is located along Fort Green Road to the east.

During initial construction activities, Tampa Electric Company will construct appropriate geometric improvements at the intersections of the two entrance roads from SR 37 and the Fort Green Road entrance road to accommodate the projected construction and operational workforces, while not adversely affecting the operations (i.e., LOS) of the existing roadways. These improvements are shown in Figures 4.1.2-1 and 4.1.2-2 for the main plant and Bethlehem Road entrances, respectively. The detailed transportation analysis for the Polk Power Station demonstrated that the projected construction-related traffic will not lower other existing roadway links and intersections in the project area to unacceptable LOS levels (see Appendix 11.6).

The planned roads will be constructed in accordance with applicable FDOT and Polk County requirements. A rail spur will also be constructed on the site from the CSX Railroad to allow the movement of materials onto the site by rail. Materials will be unloaded and moved around the site using cranes, trucks, and forklifts. Some of the heavier items, such as the CTs, generators, and transformers, will require rail delivery and special rigging for onsite handling. Pollution control measures for the laydown areas will include runoff collection in temporary drainage basins and ditches and water spraying for dust control. Water collected in ditches and basins will be routed to onsite water storage subareas.

Storage of materials will be conducted in a manner which will not create an environmental or safety hazard. Bags, containers, bundles, etc., stored in tiers will

be stacked, interlocked, and limited in height so that they are stable and secure against sliding or collapse. Storage areas will be kept free from an accumulation of materials that constitute hazards from fire, explosion, or spills. Suitable fire extinguishing equipment will be kept near flammables in a state of readiness for instant use.

3.9.2 OPERATIONAL MATERIALS

The handling and storage of fuels and other operational chemicals are discussed in Sections 3.3 and 3.6, respectively. Handling and storage of solid and hazardous wastes and gasification by-products (i.e., slag, sulfur, and H_2SO_4) are discussed in Section 3.7. These operational materials, wastes, and by-products will be handled and stored in a manner which complies with applicable environmental regulations and prevents the release of untreated chemical constituents to the site soil, surface water, and groundwater resources.

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4.0 EFFECTS OF SITE PREPARATION AND PLANT AND ASSOCIATED FACILITIES CONSTRUCTION

4.1 LAND IMPACT

As discussed in Section 2.3.5, more than 94 percent of the 4,348-acre Polk Power Station site has been or will be disturbed by phosphate mining activities prior to Tampa Electric Company's use of the site for the proposed project. Also, more than 3,330 acres (i.e., more than 76 percent) of the site which have been recently or will be mined or disturbed would be subject to further disturbance by reclamation activities required under FDNR regulations even without the proposed Polk Power Station project. These required reclamation activities would essentially involve earthmoving and dewatering activities similar to those needed for the proposed project. Therefore, the general site preparation and construction activities for the Polk Power Station will have minimal impacts on land resources on and in the vicinity of the site.

4.1.1 GENERAL CONSTRUCTION IMPACTS

The general site preparation and construction activities associated with the overall development of the project site include the following:

- Clearing, grubbing, corridor preparation, and construction of the three access roads and rail spur to the main power plant facilities area;
- Construction of temporary berms within the cooling reservoir area to provide separate subareas for onsite storage of water from dewatering and stormwater runoff from other subareas under construction;
- Sequential dewatering of reservoir and reclaimed wetland subareas by pumping to other subareas and excavation and surrounding and internal berm construction activities in dewatered subareas of the reservoir;
- Construction of temporary stormwater runoff storage basins and drainage ditches to collect and route runoff to onsite water storage subareas within the cooling reservoir area or, as needed, to offsite drainage basins during grading, excavation, and construction activities;

- Clearing, grubbing, and cutting of main plant site area and filling the area with materials excavated from cooling reservoir area;
- Stabilizing, grading, and contouring main plant facilities area for construction of facilities foundations, interior roadways, and parking lots;
- Construction of areas for coal unloading, permanent stormwater retention basins, by-product, fuel storage, water and wastewater treatment, and brine and wastewater treatment sludge storage;
- Performing groundwork, as necessary, for construction of facility footings and foundations and underground electrical, water, and other utility piping systems;
- Development of substation and onsite and offsite transmission line rights-of-way; and
- Earthmoving, grading, and contouring for reclaimed wetland and upland areas and re-establishing drainage systems to pre-mining conditions.

These site preparation and construction activities are not expected to require the use of explosives. Materials for filling and preparing areas for development will be provided from other onsite areas except for some finishing foundation and bed support materials such as limerock, crushed rock ballast, and other materials which will be provided from regional, contracted sources.

4.1.1.1 Main Power Plant Facilities and Cooling Reservoir Areas

The main power plant facilities, excluding the cooling reservoir, will be primarily constructed on lands which have not been mined for phosphate, but have, for the most part, been disturbed by associated mining activities such as dragline walk corridors, vehicle access roads, and material storage areas. As shown in Figure 3.2.0-2, the area developed for the main power plant facilities will be approximately 150 acres or 3 percent of entire Polk Power Station site. The proposed facilities within this area include the power block areas; the coal and fuel oil delivery and storage areas; the CG facilities and associated coal preparation and process water handling and brine storage areas; the by-product temporary storage and

handling areas; the water supply and wastewater treatment and temporary sludge storage areas; parking lot areas, administration, and general services and maintenance buildings; and construction laydown and temporary parking areas. These areas include all facilities for the full build-out (i.e., approximately 1,150 MW) of the Polk Power Station site in the 1994 through 2010 timeframe (see Table 3.1.0-1).

The cooling reservoir will be constructed on lands which have been primarily mined for phosphate. The entire reservoir facility will include approximately 860 acres of land, including the surrounding earthen berms. The proposed reclaimed wetland and upland areas to the west and north of the main plant facilities site will also be developed in mined-out areas. Development activities for the cooling reservoir and reclaimed wetlands and uplands in these mined out areas will require dewatering of the specific subareas under construction. Also, soil materials will be excavated from the dewatered subareas of the reservoir and used to fill the main plant site area and reclaimed wetland areas.

All dewatering water from these general site preparation activities will be collected, managed, and contained within the site boundaries by sequentially pumping or routing water to and from subareas within the site as the construction activities proceed. Therefore, no offsite land or surface water body impacts are expected from the proposed construction activities except for potential discharges of stormwater runoff. These stormwater runoff discharges will be detained within the storage subareas allowing for sediment settling in accordance with the applicable requirements of Chapter 40D-4, F.A.C. No adverse impacts are expected from these stormwater discharges.

The initial site preparation activities for the main plant site and cooling reservoir areas will involve establishing preliminary site access and clearing, grubbing, and initial earthwork activities in the plant site, access road, and rail spur areas. Temporary berms will be constructed within the mined-out reservoir area to establish three subareas for the sequential dewatering, water storage, and construction of the

cooling reservoir. Temporary stormwater runoff basins and drainage ditches will be developed, as needed, to route runoff to the onsite water storage subareas. The initial site preparation efforts also include grading and contouring activities to re-establish drainage patterns on the portion of the site to the east of SR 37 to the Little Payne Creek system which is similar to pre-mining conditions. Any potential stormwater runoff discharges from the site during the construction activities will be routed through these re-established drainage systems.

During normal rainfall conditions, stormwater runoff from areas under construction will generally be contained within the dewatering storage subareas on the site. Some runoff may need to be discharged from these storage subareas to the Little Payne Creek system. The stormwater runoff will be initially detained within the storage subareas or constructed detention basins to allow for sediment settling and will be discharged through overflow swale(s) with appropriate controls and measures (e.g., straw bales and silt fences) to minimize transport of sediments offsite. Therefore, any stormwater runoff discharges are not expected to adversely impact offsite water bodies.

As construction activities proceed in the dewatered subareas of the cooling reservoir, soil materials will be excavated and used to fill the main plant site area and adjacent reclaimed wetland areas. Existing elevations on the plant site area range between 135 and 140 ft-NGVD. This area will be cut, filled, stabilized, and graded to final elevations ranging from 140 to 145 ft-NGVD. Figures 3.8.0-1 and 3.8.0-2 present the finish grade contours and post-reclamation drainage basins on the plant site and cooling reservoir areas to the east of SR 37 and on the remainder of the site to the west of SR 37. After these initial site preparation activities are completed, construction activities will proceed for the coal unloading facility (i.e., dump pit hopper), the rail spur and loop, the entrance roads, rough grades for interior roads, and the permanent stormwater management basins and structures. The remaining construction activities on the plant site area will involve specific groundwork needed for the foundations of the power block, CG, and associated facilities and structures;

the coal, fuel, and by-product storage areas; the brine and wastewater treatment sludge storage areas; the permanent parking lots; the administration and maintenance buildings; and the substation. These activities will also include the construction and installation of underground electrical, water, and other utility piping systems, including the recirculating water pipelines to and from the reservoir. After final grading, areas of the plant site which do not involve additional construction activities will be grassed to prevent erosion.

The cooling reservoir and reclaimed wetland systems adjacent to the plant site will be constructed on mined-out lands. Currently, these lands consist primarily of spoil pile rows with elevations generally ranging from approximately 155 to 160 ft-NGVD and up to 170 to 180 ft-NGVD and water-filled mine cuts with bottom elevations ranging from approximately 100 to 120 ft-NGVD and water surfaces ranging from approximately 125 to 135 ft-NGVD. In addition to the excavation of materials for filling the plant site, site preparation activities for the cooling reservoir will include the construction of a surrounding earthen berm and a series of internal earthen berms. The internal berms will be used to maximize the residence time of the recirculating water within the reservoir by specifically directing the discharged water throughout the reservoir area prior to its intake and reuse. After final contouring, both the surrounding and internal berms will have top elevations of approximately 145 ft-NGVD, while the bottom of the reservoir will have a maximum elevation of approximately 120 ft-NGVD. The berms will have gentle interior and exterior slopes (i.e., 4:1 horizontal to vertical) and therefore will be structurally stable. During plant operations, the average elevation of water within the reservoir will be maintained at approximately 136 ft-NGVD.

4.1.1.2 Wildlife Habitat/Corridor Area

More than 89 percent (1,345 acres) of the 1,511-acre portion of the Polk Power Station site to the west of SR 37 has been mined or will be mined and disturbed prior to Tampa Electric Company's use of this property tract for the proposed project. Currently, Agrico has ongoing mining operations on this tract which are

expected to be completed in 1994. For the Polk Power Station, this portion of the site will be reclaimed to an integrated system of forested and non-forested wetlands and uplands which will develop as a wildlife habitat/corridor area. The proposed reclamation activities will occur on those portions of the tract which have been disturbed by mining. Therefore, the proposed activities will have no adverse land impacts and will have positive impacts by reclaiming mined-out lands to a significant environmental resource area in southwest Polk County.

Since no power plant facilities or structures will be located on this site tract, the proposed site preparation activities will be similar to those used for reclamation of mined phosphate lands in central Florida. These activities generally involve the sequential dewatering of mined-out subareas by pumping water to other mined-out subareas and cutting, filling, and grading earthwork activities in the dewatered subareas. Similar to the main plant site and cooling reservoir area, the dewatering water and stormwater runoff from the subareas under preparation will generally be collected and maintained within the site boundaries. Some runoff may be discharged offsite after initial detention and through appropriate control measures to prevent sediment transport. This runoff would be routed to either the Payne Creek or South Prong Alafia River systems similar to pre-mining conditions on this tract. The site preparation/reclamation activities will not adversely impact offsite lands or surface water bodies. Also, after final contouring, the subareas will be seeded and planted to control potential erosion. The proposed post-reclamation vegetation plans for this tract were presented in Figure 3.2.0-1 and discussed in Section 3.2.

4.1.1.3 Other General Activities

Construction waste materials will be appropriately collected, managed, and disposed in accordance with applicable rules and regulations. Combustible construction wastes (e.g., wood, paper, etc.) will be burned onsite in accordance with applicable state and local requirements. General waste materials (i.e., garbage) will be collected in appropriate waste collection containers and periodically transported offsite for disposal at an approved facility. Other construction wastes (e.g., metal, wire, piping,

etc.) will be stockpiled for salvage, to the extent possible, and then also removed from the site for disposal at an approved facility.

Waste oil from construction vehicles and equipment will be collected in appropriate containers and transported offsite for recycling or disposal at an approved, permitted facility.

During site preparation and construction, the construction labor force will use portable chemical toilets. These facilities will be provided and serviced by a licensed contractor and all sanitary sewage from these facilities will be transported offsite by the contractor for appropriate disposal.

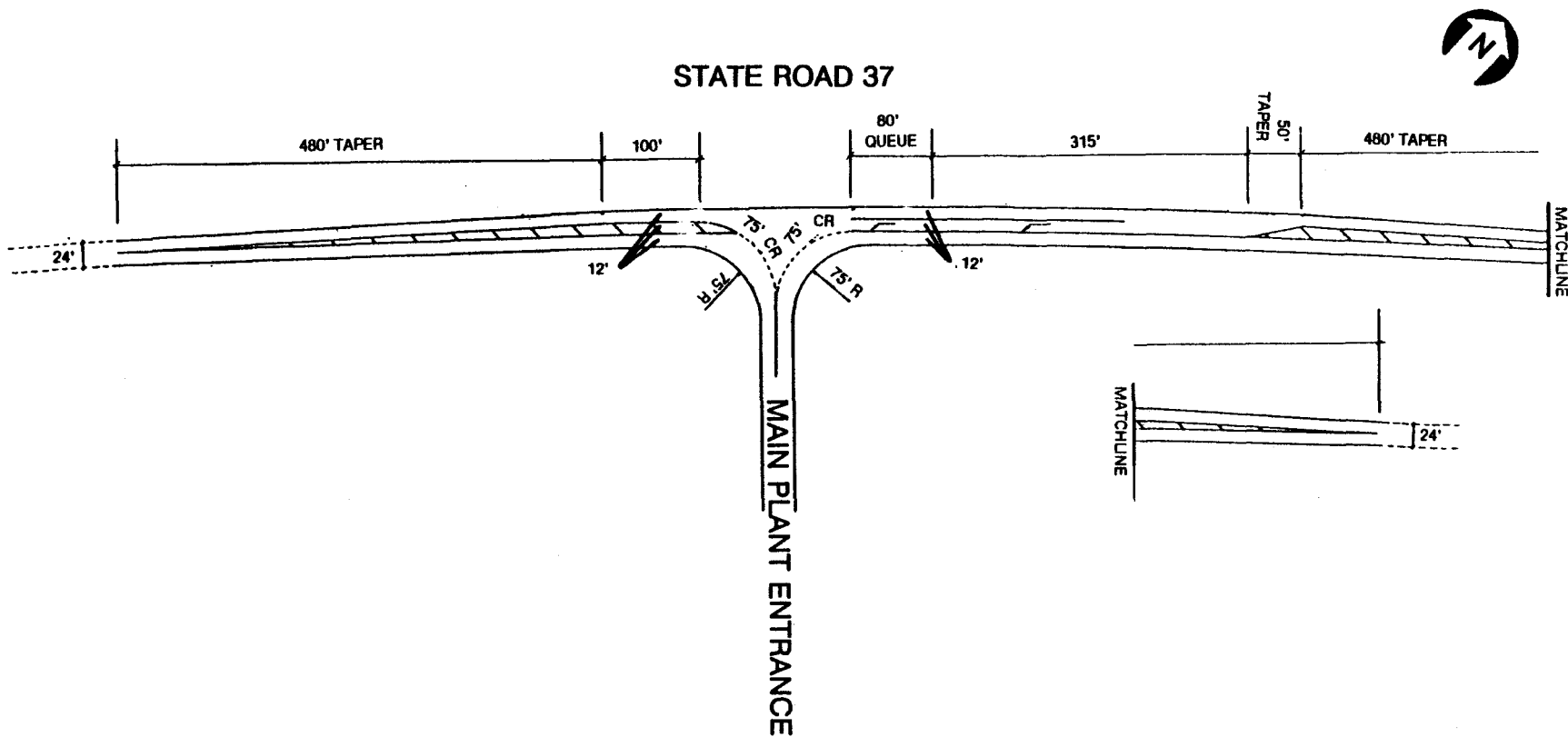
Under contractual arrangements with Tampa Electric Company, individual contractors will be responsible for handling any potential hazardous materials and wastes resulting from their onsite activities, including the appropriate offsite disposal of any wastes.

4.1.2 ROADS

During the initial construction phase of the Polk Power Station, the three planned access roads for the facility operations will be constructed (see Figure 3.2.0-2). Two of these roads will access SR 37 and one road will provide access to and from Fort Green Road (CR 663). The main plant and operational employee entrance road will connect with SR 37 at a point approximately 2,500 ft to the north of the Albritton Road intersection with SR 37 (i.e., approximately halfway between the Albritton Road and Bethlehem Road intersections on SR 37). The other entrance road on SR 37 will be located opposite the Bethlehem Road intersection. This entrance will primarily provide access for contracted construction labor and construction and operational deliveries. The Fort Green entrance road will also provide access for the construction workforce and construction and operational deliveries. All three of these entrance roads will have security checkpoints or be gated to control access to the plant site.

The planned access roads will be constructed in accordance with applicable FDOT and Polk County requirements to provide safe access to the site. Also, during the initial construction activities, Tampa Electric Company will construct certain geometric improvements at the intersections with SR 37 and Fort Green Road to accommodate the projected construction and operational workforces, while not adversely affecting the operations (i.e., LOS) of the existing roadways. Based on FDOT standards, schematic representations of these proposed driveway entrance improvements on the state road are shown in Figure 4.1.2-1 and 4.1.2-2 for the main and Bethlehem Road entrances, respectively. A detailed transportation analysis conducted for the Polk Power Station project (Lincks, 1992) demonstrated that the projected construction-related traffic will not lower other existing roadway links and intersections in the project area to unacceptable LOS levels in their current conditions and geometries (see Appendix 11.6).

As shown in Figure 3.2.0-2, two transmission line service roads will also be constructed for the project. One service road for the northern transmission line



NOTES:

1. TAPERS BASED ON 60 MPH DESIGN SPEED AND CENTERED WIDENING.
2. QUEUE LENGTH BASED ON OPERATIONAL PROJECT TRAFFIC.
3. THIS IS A CONCEPTUAL LAYOUT OF THE PROPOSED ROADWAY IMPROVEMENTS. THE ACTUAL DIMENSIONS ARE SUBJECT TO CHANGE BASED ON THE FINAL DESIGN AND FDOT APPROVAL.

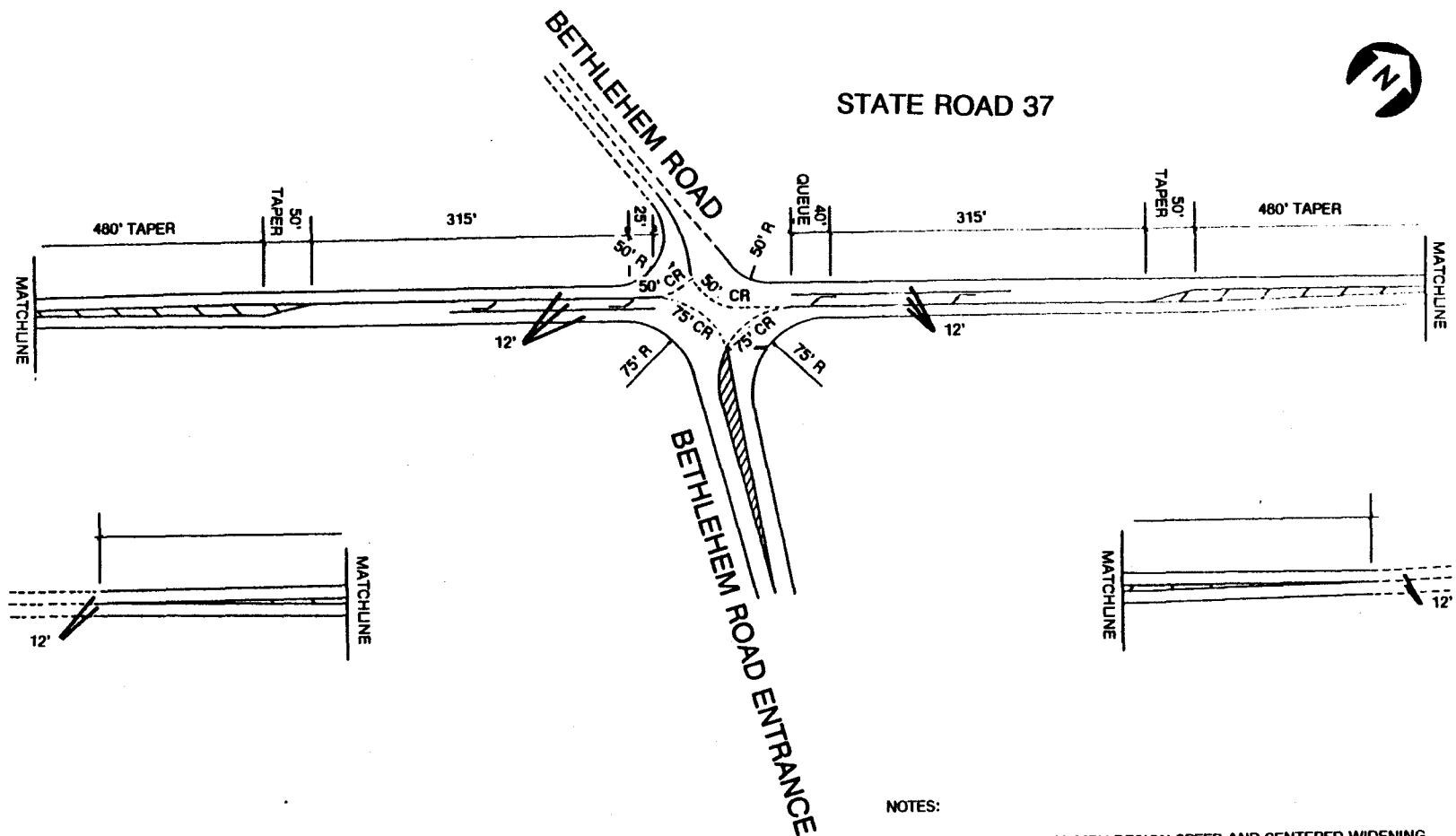
FIGURE 4.1.2-1.

SCHEMATIC DRIVEWAY IMPROVEMENTS, SR 37 AT POLK POWER STATION MAIN PLANT ENTRANCE

Sources: FDOT, 1992. Lincks and Associates, 1992.



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NOTES:

1. TAPERS BASED ON 60 MPH DESIGN SPEED AND CENTERED WIDENING.
2. QUEUE LENGTH BASED ON OPERATIONAL PROJECT TRAFFIC.
3. THIS IS A CONCEPTUAL LAYOUT OF THE PROPOSED ROADWAY IMPROVEMENTS. THE ACTUAL DIMENSIONS ARE SUBJECT TO CHANGE BASED ON THE FINAL DESIGN AND FDOT APPROVAL.

FIGURE 4.1.2-2.

SCHEMATIC DRIVEWAY IMPROVEMENTS, SR 37 AT POLK POWER STATION BETHLEHEM ROAD ENTRANCE

Sources: FDOT, 1992. Lincks and Associates, 1992.



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corridor will access SR 37 at a point approximately 1,500 ft to the north of the Bethlehem Road entrance and the other service road for the eastern transmission line corridor will access Fort Green Road at a point approximately 1,300 ft south of CR 630. These service roads will only be used for periodic transmission line and corridor maintenance and inspection purposes and will have locked gates to control access from the existing roadways. Therefore, only a limited number of vehicles will be occasionally using these service roads and their construction and use will have no impacts on existing roadways.

4.1.3 FLOOD ZONES

As shown in Figure 2.1.0-1, portions of the Polk Power Station site were designated as 100-year floodplain areas by FEMA under land conditions which existed prior to recent phosphate mining activities (i.e., prior to 1983). These pre-mining floodplains were primarily associated with the headwater areas of Little Payne Creek and Payne Creek and the floodplain of the South Prong Alafia River. In general, the areas designated as 100-year floodplains were at elevations of less than 140 ft-NGVD. As shown in the recent aerial photograph of the site in Figure 2.1.0-2, the majority of these pre-mining floodplains on the site have been mined and are not currently connected to the creek and river systems. Mining of the floodplains was conducted in accordance with agency-approved mining and reclamation plans.

As discussed in Section 4.1.1, an unmined portion of the Polk Power Station site to the east of SR 37 will be cleared and filled to serve as the location for the main power plant facilities. The final elevations in this filled area will range from 140 to 145 ft-NGVD. Therefore, the main power plant facilities and structures will be located in areas with elevations above the 100-year floodplain elevation in compliance with federal and local flood program regulations.

In addition, all plant facilities and stormwater management systems have been designed to comply with all applicable SWFWMD, FDNR, and Polk County requirements regarding flood protection and control. After site development/reclamation, the proposed stormwater management systems, including the cooling reservoir, have been designed to significantly reduce the contribution of the site area to potential flooding conditions in downstream areas of the Little Payne Creek, Payne Creek, and South Prong Alafia River systems compared to pre-mining conditions on the site. As discussed in Section 3.8, the proposed onsite stormwater management and drainage systems will control and significantly reduce peak flow runoff rates from the site during extreme storm events (e.g., the 24-hour, 25-year design storm). Therefore, the proposed project will not have any adverse flooding impacts on offsite properties and

will have beneficial effects by reducing the contribution of the site to potential downstream flooding conditions during extreme storm events.

4.1.4 TOPOGRAPHY AND SOILS

Previous and ongoing phosphate mining activities have significantly altered the historical topography of the Polk Power Station site. As discussed in Section 2.3.1, prior to the recent (i.e., since the early 1980s) mining activities, land surface elevations ranged from approximately 130 to 200 ft-NGVD. The low elevation occurred in the southeast corner of the site, while the high elevations occurred in the northeast portion of the site where old mine sand tailings mounds from mining activities in the early 1900s are located. Other pre-recent mining elevations on the site generally ranged from 130 to 150 ft-NGVD on the site tract to the east of SR 37 and from 110 to 145 ft-NGVD on the tract to the west of SR 37. Again, prior to recent mining, the land surface on the site was relatively flat with gentle slopes, except for the old mine tailing mound areas and along the unnamed tributary to the South Prong Alafia River in the northwest corner of the site.

The recent and ongoing mining activities have created or will create topographic features primarily consisting of mine cuts and spoil piles. The highest spoil pile elevations range from 170 to 180 ft-NGVD. The mine cuts, mostly water-filled, generally have bottom elevations ranging from approximately 100 to 120 ft-NGVD.

The proposed site preparation and construction activities will involve altering the existing topography of the site to facilitate construction of the plant facilities and cooling reservoir and to reclaim other mined areas in accordance with agency-approved reclamation plans. Also, as discussed in Section 3.8, the proposed plans include the re-establishment of drainage system watershed divides and acreages to pre-mining conditions. The general site preparation activities will involve the use of cut and fill soil materials from within the site. Soil materials will not be imported to or exported from the site, except for specific foundation supporting materials such as crushed limerock and gravel for structures and onsite roads and possibly clay to reduce seepage through the reservoir berms. Therefore, except in the immediate areas of the main plant facilities and roads, general onsite soil conditions, percolation rates, and stormwater runoff rates after site development/reclamation will be similar

to those which currently exist on the site or existed prior to mining. The immediate areas for the main plant facilities comprise only approximately 150 acres of the entire 4,348-acre site.

With appropriate compaction and densification activities, the bearing strengths and stability of soils on the site are expected to be suitable for general foundation preparation activities and construction of the berms surrounding and inside the cooling reservoir. Depending on the site-specific soil conditions and load bearing requirements of specific structures, foundations for the proposed facilities will consist of concrete or crushed stone mats, individual spread footings, or pile-supported foundations. These site preparation measures and foundation construction techniques will minimize any potential settlement impacts for the main plant structures.

The cooling reservoir will be constructed in mined-out lands to the east and south of the main plant facility site. The proposed design of the reservoir is described in Section 3.5.1. The cooling reservoir will be primarily a below-grade facility with bottom elevations of approximately 120 ft-NGVD and a normal operating water surface elevation of approximately 136 ft-NGVD. The earthen berms surrounding and inside the reservoir will be constructed with soil materials excavated from within the mined-out reservoir area. The berms will have top elevations of approximately 145 ft-NGVD and gentle interior and exterior slopes of 4:1 (horizontal and vertical) to provide for structural stability and minimize potential soil erosion impacts. The berms will be grassed and/or planted with other materials, and the vegetation growth will be actively managed and controlled to prevent soil erosion. Stone rip-rap or other appropriate materials will also be used, as needed, along berm areas with relatively higher velocity water flows (e.g., near internal intake and discharge structures and the outfall control structure) to prevent potential erosion impacts. The construction and operation of the cooling reservoir will increase evaporation and groundwater seepage to the surficial aquifer compared to pre-mining conditions in the reservoir area (see Section 5.1).

The coal and fuel oil storage areas, temporary slag by-product and industrial wastewater treatment sludge storage areas, and permanent storage cells for brine from the gasification process water system will be lined with low-permeability materials which will preclude groundwater seepage from the areas. Also, stormwater runoff from these areas will be collected and appropriately treated prior to being routed to the cooling reservoir for reuse. The design and operation of these areas and systems are described in Section 3.0. By design, the stormwater runoff and groundwater percolation rates from these areas will be altered from pre-mining and existing conditions. However, as discussed in Section 5.3, these alterations will not adversely impact groundwater and surface water quality and quantities on the Polk Power Station site or on offsite properties.

As discussed in Section 2.3.2.2, the potential for sinkhole development on the Polk Power Station site is relatively low compared to most other areas in Polk County. The proposed site preparation and construction activities as well as the facility operations are not expected to adversely impact site conditions for, or be conducive to, potential sinkhole development (see Appendix 11.7.5).

As discussed in Section 4.2, an appropriately designed soil erosion and sedimentation plan will be implemented during site preparation and construction activities to minimize potential soil erosion impacts. According to this plan, all stormwater runoff from areas under preparation and construction during the initial site development phase will be collected and maintained on the site within specific subareas or basins. The plan also includes the use of sediment control measures such as straw bailing and silt fences, as needed, in specific areas under construction. After final grading and contouring, the areas will be seeded and/or planted with other vegetation to stabilize the soils. The onsite stormwater runoff management plan after the initial site preparation and construction activities is described in Section 3.8.

Construction-related alterations in site topography and soils will have no adverse effects on aesthetics and visual qualities in the site vicinity, especially relative to

currently existing condition on the site. As shown on Figure 3.2.0-1, the proposed site development/reclamation activities will include the creation of planted vegetation buffer areas along public roadways surrounding the main plant facility and cooling reservoir areas on the site tract to the east of SR 37. In addition, the main plant structures are set back from these nearest public viewsheds by at least 2,500 ft. Therefore, after construction, only the relatively taller plant structures (e.g., CG facilities and certain exhaust stacks) will be potentially visible from nearby public viewpoints. Further, since the property tract to the west of SR 37 will not contain power plant facilities and will develop as a wildlife habitat/corridor area, the proposed site development activities for this area will enhance aesthetic and visual qualities in the vicinity of the Polk Power Station site.

4.2 IMPACT ON SURFACE WATER BODIES AND USES

4.2.1 IMPACT ASSESSMENT

4.2.1.1 Hydrological Impacts

Significant construction activities with respect to surface water will involve the construction of the cooling reservoir, plant facilities, and overall site reclamation activities. Construction of the reservoir will essentially involve moving the overburden piles between the mine cuts to form the surrounding and internal berms, significantly reducing the requirements for fill and excavation. The cooling reservoir itself will be primarily below-grade. The surrounding berm will provide above-grade storage to accommodate stormwater primarily falling directly on the reservoir. The base of the cooling reservoir will have a maximum elevation of 120 ft-NGVD and the top of the berm will be at approximately 145 ft-NGVD. The perimeter berm of the cooling reservoir will have an inner and outer slope of 4:1 (4-ft horizontal to 1-ft vertical), and the top width of the berm is 25 ft.

The earthmoving activities will include excavation, fill, and grading of the soil onsite. To minimize the amount of cut and fill quantity, the existing onsite mine pits will be used for the reservoir construction. A total of approximately 4.9 million cubic yards of excavated material will be removed from the existing mined-out area to create the 860-acre, including surrounding berm, cooling water reservoir. This material will be used as fill material for the main plant facility site and reservoir berm construction. During construction of the reservoir, portions of the construction site will be dewatered to accommodate the construction equipment, e.g., pan scrappers, bulldozers, backhoes, motoring graders, etc. To minimize the hydrologic and water quality impacts during construction, the construction plan has been designed so that the dewatering activities will not cause any offsite surface water discharges.

The cooling reservoir will be divided into three subareas separated by temporary berms. Each subarea of the cooling reservoir will be constructed in phases. The water in the active subarea under construction will be pumped into the inactive subareas or to other onsite mined-out or reclaimed areas.

The inactive subareas of the cooling reservoir and the onsite reclaimed lakes will have sufficient storage capacity to eliminate the need for offsite surface water discharges. The proposed dewatering plan is described in detail in Section 4.3.

In addition to redistribution of the overburden on the site, excavation activities will occur for the required foundations, overall site grading and leveling, road construction, rail spur construction, and reclamation activities. All of these activities will require the moving, leveling, and compacting of soils. Mining has significantly altered the historical topography of the area. Some of the overburden will be redistributed to accommodate the plant facilities and replicate pre-mining drainage patterns. The foundation for the plant facilities will be at 140 to 145 ft-NGVD. The old mine cut lake located south of SR 630 and the reclaimed lake near Fort Green Road, on the eastern Polk Power Station boundary, will remain essentially unaltered, except for minor grading to improve drainage patterns to pre-mining conditions.

A comprehensive sedimentation and erosion control plan will be developed for the Polk Power Station in compliance with the requirements of the appropriate regulatory agencies. The erosion control plan will prevent soil loss caused by stormwater runoff during project construction and operation. Both structural and non-structural (vegetative) erosion control measures will be designed, implemented, and properly maintained in accordance with best management practices.

The erosion and sedimentation control practices will include the following:

- Scheduling of activities to minimize the amount of disturbed area at any one time;
- Locating roads, railroad spurs, and parking areas on contour;
- Limiting construction traffic to access roads and areas to be graded and traffic avoidance to the extent feasible at streams or drainage ditches;
- Compacting loose soil as soon as possible after excavation, grading, or filling;

- Using silt fences, straw bales, temporary rip-rap, etc., to minimize transport of sediment;
- Implementing the erosion and sedimentation control plan and ensuring that construction personnel are familiar with and adhere to the plan; and
- Managing runoff during construction.

In addition to the erosion control practices described previously, Tampa Electric Company will employ various vegetative practices to control erosion and sedimentation, including seeding of the cooling reservoir berms and swales.

Other erosion control structure practices will include, as necessary, the construction of temporary perimeter berms, rip-rap in potentially high-velocity areas, straw bales or other barriers, silt fences, diversionary berms or swales, and graveled road and railroad beds.

The construction plan is to direct nearly all stormwater under normal rainfall conditions into the cooling reservoir area and other mined-out areas on the site. The mine cuts, which are below-grade, will be capable of retaining a considerable amount of stormwater. This capacity will increase as the above-grade berm surrounding the reservoir area is constructed from the overburden. By capturing the dewatering water and stormwater runoff, Tampa Electric Company will begin filling the cooling reservoir so that there will be sufficient water available prior to operation.

In the event that small isolated sedimentation basins during construction activities are required, these will be constructed by excavation. These basins will be cleaned out as needed. A typical cross-section of the sediment basin is shown in Figure 4.2.1-1.

Swales will be constructed for directing runoff around the construction site to the cooling reservoir or to sedimentation basins. These swales will be excavated, graded,

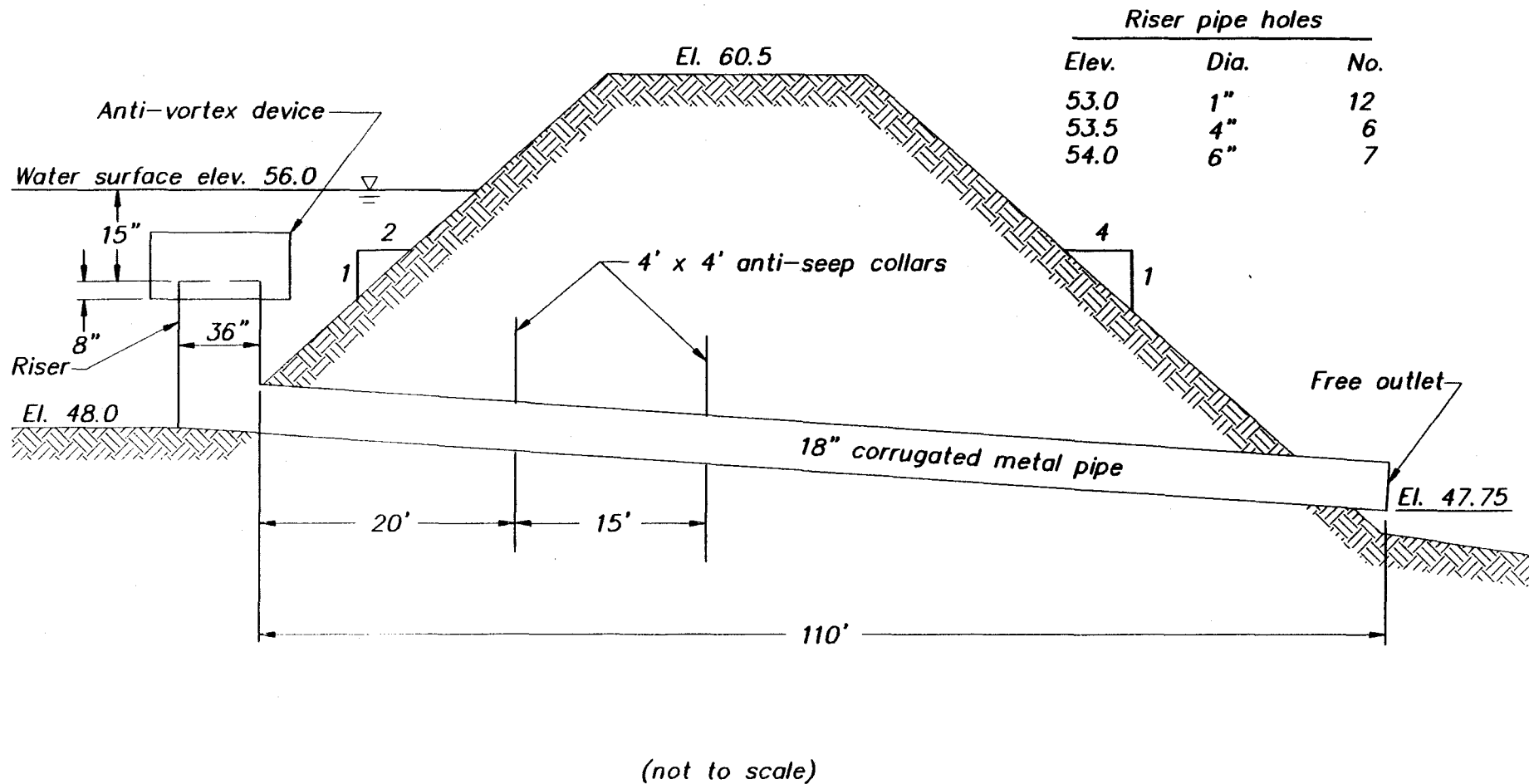


FIGURE 4.2.1-1.

TYPICAL CROSS SECTION
OF SEDIMENT BASIN

Source: UE&C, 1992.



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and stabilized with gravel, sod, etc. The cross-sectional area of these swales will be designed such that erosional velocities are not reached.

Straw bale berms and silt fences will be constructed as needed. These barriers will be embedded (4 inches for bales and 8 inches for silt fences) into the soil to prevent washout. Steel rods or steel posts will be used as required to anchor these barriers. The construction detail of a typical silt fence is shown in Figure 4.2.1-2.

Some stormwater runoff may need to be discharged offsite to the adjacent surface water body systems. The runoff will be initially detained within the cooling reservoir and mined-out areas or in sedimentation basins. Also, sediment transport associated with any discharges from these areas will be further controlled by use of appropriate measures such as straw bales and silt fences.

In summary, the construction activities will cause no consumption of the surface water and will create no surface discharge of sanitary and industrial wastes. Any dewatering water from areas under construction will be detained on the site and sediments in any stormwater runoff discharges from the site will be controlled by appropriate design measures. Any potential effects of the proposed activities will be similar to those associated with the reclamation of mined-out lands in the site area and would occur from the required reclamation of the site even without the proposed project. Therefore, the site preparation and construction of the proposed project are not expected to have adverse hydrologic and water quality impacts on offsite surface water bodies.

4.2.1.2 Ecological Impacts

No direct impacts to the aquatic systems of Little Payne Creek, Payne Creek, or South Prong Alafia River from site preparation and plant and associated facilities construction are anticipated. No structures will be constructed either within streambeds or floodplains within the existing drainages. The majority of the power plant and associated facilities will be constructed within lands that have been

previously mined or highly altered from mining operations. The mined lands within the areas of the proposed development support open water mine cuts and littoral zone wetlands artificially created through mining operations. Small, isolated areas of unmined but disturbed lands within the area of the main plant facilities contain hydrologically isolated remnant wetlands which have been highly altered through surface water drainage, groundwater drawdowns, and other disturbances associated with mining equipment.

Approximately 32 acres of disturbed mixed herbaceous and early successional forested wetlands will be filled on the site for construction of the main power plant facilities. Tampa Electric Company has submitted a dredge-and-fill application for the development of these wetlands and mine cuts as part of this project (see Appendix 11.12). No significant or unique wildlife habitats will be lost due to the proposed project. As stated previously, the proposed site development and reclamation plans for the site will provide for mitigation of the disturbed wetland losses and increase the wetland and upland forested acreages on the site over pre-mining conditions, thereby increasing the available wildlife habitat for local and regional wildlife populations.

4.2.2 MEASURING AND MONITORING PROGRAMS

In general, all erosion and sedimentation controls will be checked weekly and after major storms and maintained, as necessary. The following items will be checked:

- Sedimentation basins, if used, will be cleaned;
- Gravel and rip-rap will be checked for washout or sediment buildup and replaced or cleaned as necessary;
- Straw bale barriers will be checked for washout or deterioration and replaced or reinforced as necessary;
- Seeded areas will be checked, re-seeded if necessary, and if required, fertilized carefully so that excess nutrients are not introduced into surface waters;
- Silt fences will be checked for washout and will be repaired, reinforced, or replaced as necessary; and
- Sediment deposits at any of the aforementioned barriers will be periodically removed as necessary.

All stormwater runoff will be collected and managed using appropriate erosion and sedimentation controls. Therefore, by use of the proposed control measures, monitoring is unnecessary in the surrounding water bodies, i.e, Payne Creek, Little Payne Creek, and South Prong Alafia River, since no adverse water quality impacts are expected during construction activities.

4.3 GROUNDWATER IMPACTS

4.3.1 IMPACT ASSESSMENT

The proposed site preparation and facility construction activities for the Polk Power Station will have potential short-term effects on groundwater in the surficial aquifer on the site and in certain offsite areas due to temporary dewatering activities. These temporary (i.e., approximately 1 year) dewatering activities will be primarily required during the excavation and construction activities for the cooling reservoir and reclaimed wetland areas within mined-out areas on the site. Some limited, temporary dewatering will also be required for several plant facilities which have relatively deeper foundations or locational requirements for their operation.

These temporary dewatering activities are expected to be of similar scales and have similar potential effects on the onsite and offsite surficial aquifer system as that created by the previous and ongoing phosphate mining activities and/or would occur during similar, agency-required land reclamation activities for mined-out lands in the central Florida phosphate district. These activities are not anticipated to affect the intermediate and Floridan aquifers on or in the vicinity of the site. Therefore, the proposed temporary dewatering activities for the Polk Power Station are not expected to adversely impact onsite and offsite groundwater resources. Also, any potential impacts will be temporary and will be relatively similar to impacts previously or currently occurring in the area due to mining activities or would be experienced during reclamation of the mined areas. The following describes the specific dewatering activities proposed for the preparation and construction of the project.

The primary dewatering requirements will involve the excavation, earthmoving, and construction activities for the cooling reservoir and its surrounding and internal berms and the reclaimed wetland areas on the site within mined areas. The proposed construction of the cooling reservoir within mined-out lands will actually limit the amount of disturbance of soils and groundwater systems required for the facility. The design bottom elevation of the cooling reservoir is 120 ft-NGVD. Therefore, to allow for the proposed earthmoving activities, the reservoir area will

need to be dewatered to a depth of approximately 120 ft-NGVD, which also occurred during mining of these areas.

As discussed in Section 4.1, these dewatering requirements will be accomplished according to a specifically designed plan to sequentially dewater subareas of the site to allow the required earthmoving activities to proceed, while maintaining the dewatering water within other subareas of the site with no offsite discharges of the water. As shown in Figure 4.3.1-1, the site preparation and construction activities for the cooling reservoir, main plant facilities, and adjacent reclaimed wetland areas on the site tract to the east of SR 37 will involve the sequential dewatering of five subareas. The proposed schedule and plan for these dewatering activities, including the modeled, estimated dewatering withdrawal rates, are provided in Table 4.3.1-1. As indicated on this table, some of the dewatering water from the subareas on the site to the east of SR 37 will be temporarily routed to and contained within mined-out subareas on the site to the west of SR 37 in order to provide for adequate storage capacity for the water within the site boundaries.

In general, since the withdrawn dewatering water is sequentially routed to and maintained within adjacent mined-out subareas or subareas in which construction activities have been completed, the proposed withdrawals from the surficial aquifer system are balanced by the increased infiltration and replenishment of water to the system from the adjacent water storage subareas. Therefore, potential surficial aquifer groundwater impacts from dewatering activities for the cooling reservoir, plant facilities, and adjacent, reclaimed wetland areas on the site tract to the east of SR 37 will be limited and short-term. Based on groundwater flow modeling analyses conducted for the project, the primary surficial aquifer drawdown impacts will occur within the Polk Power Station site boundaries. The modeled potential offsite groundwater impacts show that short-term drawdowns of the surficial aquifer will be approximately 8 to 10 ft at the site boundary north of Bethlehem Road and west of SR 37 and approximately 8 ft at the eastern site boundary. The modeled potential drawdown effects will be approximately 12 ft along the southern property boundary

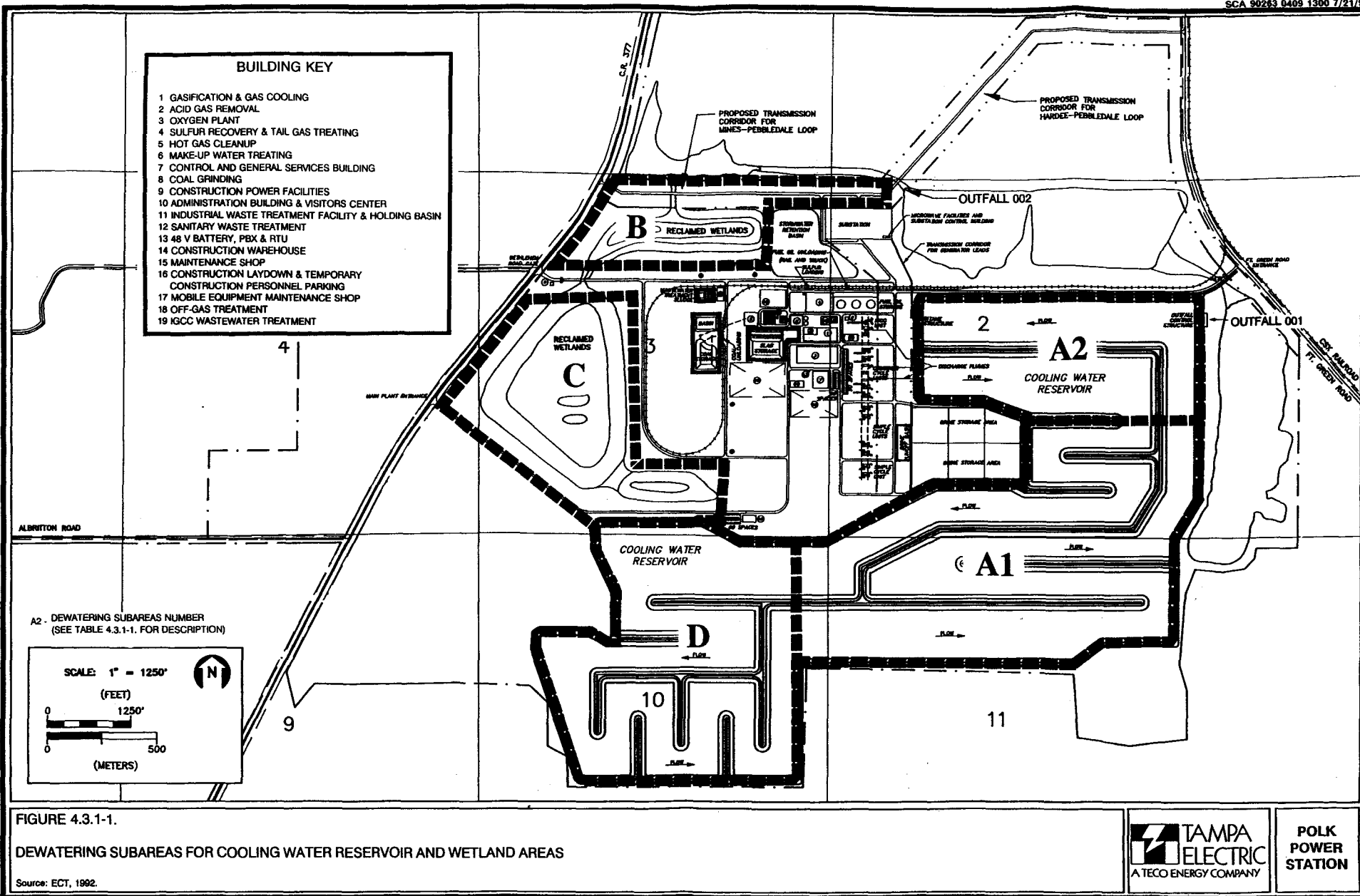


Table 4.3.1-1. Proposed Dewatering Schedule and Plan Summary

Dates	Dewatered Units	Withdrawn Water Application to	Approximate Dewatering Duration (days)	Main Dewatering Duration (days)	Estimated Withdrawal Rates	
					(gpd)	(gpm)
START DEWATERING						
Late 1993 and early 1994	A1	A2 and D (75 percent)/ west wetland (25 percent)	31		87,480,000	60,750
	B	C	31		16,126,000	11,200
Mid-1994	A1	A2 and D		122	32,595,000	22,635
	B	C		122	8,842,000	6,140
	A2	A1	15		28,936,000	20,090
	A2	A1		30	18,656,000	12,955
		Removing berm 2		15	--	--
Late 1994	D	A1 and A2	31		16,974,000	11,790
	C	A1 and A2	31		33,614,000	23,340
	D	A1 and A2		120	1,996,000	1,385
	C	A1 and A2		120	15,334,000	10,650
FINISH DEWATERING						
Early 1995						

Sources: UEC, 1992.
ECT, 1992.

which is adjacent to a series of clay settling areas. Detailed descriptions of the groundwater modeling analyses and results used to simulate and assess the proposed dewatering activities are provided in Appendix 11.7.6.

These modeled potential groundwater drawdown effects on the surficial aquifer are similar to impacts which would have occurred during required reclamation activities of the mined areas. Based on existing site and adjacent offsite conditions, these potential groundwater drawdowns will have no significant impacts on wetlands and surface water bodies in the vicinity of the site. Also, since the surficial aquifer in the site area is not used for potable water supply purposes and due to the confining layer between the aquifers, the temporary surficial aquifer drawdowns will not affect drinking water supplies and other uses of deeper aquifer systems in the Polk Power Station site area.

In addition to the cooling reservoir and reclaimed wetland areas, plant structures which will require dewatering activities for construction include:

- Coal unloading dump hopper,
- Recirculating water pipelines, and
- Recirculating water pumping facilities.

The proposed foundation/excavation dimensions and depths and dewatering plans for these structures are provided in Table 4.3.1-2. Other plant facility and structure foundations will consist of concrete or crushed stone mats or spread footings for relatively lighter load-bearing facilities and pilings for heavier structures. Construction of these types of foundations generally will not require dewatering activities. Water withdrawn by dewatering to facilitate construction of proposed facilities and structures on the site will be managed and routed to the site subareas which are planned for the sequential storage of water from the required dewatering of the cooling reservoir and reclaimed wetland areas.

Table 4.3.1-2. Plant Structures Requiring Dewatering Activities and Dewatering Plans

Coal Unloading Dump Hopper

Foundation dimensions	120 ft x 60 ft x 40 ft
Excavation method	Sheet pile and shoring
Dewatering method	Well points or perimeter drain
Dewatering depth	Approximately 35 ft
Pumping duration	4 months
Subarea receiving water	A1 and A2

Recirculating Water Lines

Excavation dimensions	1,075 ft x 23 ft x 8 ft
Excavation method	Open cut or sheet pile and shoring
Dewatering method	Well points or perimeter drain
Dewatering depth	Approximately 8 ft
Pumping duration	3 months
Subarea receiving water	A1 and A2

Recirculating Water Pump Structure

Excavation dimensions	58 ft x 24 ft x 22 ft
Excavation method	Sheet pile and shoring
Dewatering method	Well points or perimeter drain
Dewatering depth	Approximately 22 ft
Pumping duration	7 months
Subarea receiving water	A1

Source: UEC, 1992.

Potential chemical effects from dewatering activities can result from the disturbance (mobilization) of constituents from the soils into the water and from oxidation of the groundwater. The undifferentiated, surficial soils on the site are composed primarily of quartz sands with several soluble constituents (including calcite, phosphate, and iron). The oxidation can cause the disassociation of calcite releasing bicarbonate and calcium anions which can increase the hardness of water. Oxidation of the dissolved iron can cause ferrous iron to form ferric iron. However, in the onsite aquifer system composed primarily of silica sands, the oxidation reactions will be minimal and potential groundwater quality impacts will be insignificant.

Additionally, the engineering tests discussed in Section 2.3.2 indicated that the undisturbed aquifer will act to filter out suspended constituents and limit migration of these constituents in the surficial aquifer.

4.3.2 MEASURING AND MONITORING PROGRAMS

The modeling program used to assess the potential dewatering drawdown effects on the surficial aquifer and the detailed modeling results are described in Appendix 11.7.6. This modeling program used information on the surficial aquifer characteristics which was collected during the site-specific geohydrology monitoring and testing program on the Polk Power Station site. The site-specific monitoring program is described in Section 2.3.2.

No additional groundwater measuring and monitoring programs are needed during the site preparation and construction activities. However, a groundwater monitoring program will be developed and implemented for the operation of the proposed project in accordance with applicable FDER regulatory requirements under Chapter 17-28, Part VII, F.A.C. (see Appendix 11.7.8).

4.4 ECOLOGICAL IMPACTS

4.4.1 IMPACT ASSESSMENT

4.4.1.1 Aquatic Systems

The aquatic systems that will be impacted by construction of the Polk Power Station are primarily waters in mine cuts. However, the net effect of construction will be similar to agency-required reclamation of the site and will result in increased acreage of aquatic habitats onsite. No natural aquatic systems onsite or offsite will be impacted.

Construction of the main plant facility and cooling reservoir areas will occur in stages with various portions of the site (subareas) being developed sequentially. As a subarea is dewatered, those manmade aquatic habitats will be lost. But as each subarea of the reservoir is completed, it will receive waters from other portions of the site, thereby creating new aquatic habitats.

Stormwater runoff during construction will generally be directed to these subareas or to constructed stormwater detention basins. Other various sediment and erosion control measures will be used to control erosion and sediment transport from the site (Section 4.2.1.2). Some stormwater may be discharged from the site during reservoir and initial plant facilities construction. This potential runoff will be appropriately controlled and managed as described in Section 4.2. As future units are added to the project, some stormwater runoff due to construction may then be routed through the permanent onsite stormwater management system and ultimately discharged into the Little Payne Creek. Stormwater runoff due to construction activities will not adversely affect any natural aquatic systems nor will it significantly affect water quality or quantity within the Little Payne Creek, Payne Creek, or South Prong Alafia River drainages. The net effect of reservoir creation will be an increase in aquatic habitats onsite.

4.4.1.2 Terrestrial Systems

Vegetation

The power plant, cooling water reservoir, and other associated onsite power facilities such as parking lots, by-product storage, stormwater retention, wastewater, sanitary and industrial waste treatment basins, substation, transmission line, railspur, and roads will occupy approximately 1,090 acres of land. Most of the project facilities (primarily the cooling reservoir) will be located on mined, highly disturbed through mining, or otherwise altered/converted land. Approximately 98 acres or 4.7 percent of the disturbed, remnant, or artificially created upland and wetland habitats will be eliminated through development of the power plant facilities (see Table 4.4.1-1). Therefore, the construction of the Tampa Electric Company Polk Power Station will have little relative impact on local or regional natural vegetation communities. By comparison, the majority of past, current, and future impacts to onsite vegetative communities is associated with the mining of phosphate ore.

Previous and ongoing onsite mining activities include the clearing of vegetation; excavation of overburden and phosphate matrix; and construction of access roads, material storage areas, and other related facilities. Dragline mining operations have a direct impact on the flora and fauna on the site. Short- and long-term impacts to biota on and in areas adjoining the mined areas may also occur as a result of the activities. As stated previously, the majority of the property has or will be disturbed by mining prior to Tampa Electric Company's use of the site. The land remaining after mining will either be left intact (i.e., unmined areas), reclaimed, or used for the proposed Polk Power Station facilities. Potential impacts associated with the phosphate mining and/or power plant facility construction are the direct loss of plant communities/wildlife habitats and a portion of the resident animal populations. However, the overall significance of these impacts depends upon the relative ecological value, regional abundance, and ability to restore the altered resources.

To mitigate for the impacts to biota associated with mining and power plant development, the natural functions of the pre-existing important habitats will be restored or

Table 4.4.1-1. Estimated Premining, Disturbed, and Post-Reclamation Acreages and Percentages of Land Use/Cover on the Tampa Electric Company Polk Power Station

Code	Land Use/Cover*	Premining†		Pre-1992 Disturbances from Mining**		Pre-1992 Disturbances from Powerline**		Post-1992 Disturbances from Mining††		Post-1992 Disturbances from Tampa Electric Company Polk Power Station††		Agrico's Current Post-Reclamation Plan		Tampa Electric Company Polk Power Station Post-Reclamation	
		Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
140	Transportation	0	0	0	0	0	0	0	0	0	0	0	0	3	0.1
148	Gas transmission pipeline	13	0.3	0	0	0	0	0	0	0	0	13	0.3	14 †††	0.3
151	Electrical power facilities	0	0	0	0	0	0	0	0	0	0	0	0	337	7.8
152	Electrical transmission line	0	0	0	0	0	0	0	0	0	0	27	0.6	141 †††	3.2
210	Pastureland	886	20.3	381	13.7	11	40.7	82	14.9	60	36.6	973	22.4	500	11.5
230	Citrus grove	59	1.4	42	1.5	0	0	1	0.2	0	0	0	0	18	0.5
310	Grassland	20	0.4	20	0.7	0	0	0	0	0	0	49	1.1	0	0
320	Shrub and brushland	995	22.9	856	30.9	0	0	12	2.2	6	3.7	57	1.3	581	13.4
330	Mixed rangeland	159	3.7	159	5.9	0	0	0	0	0	0	1,067	24.5	6	0.1
410	Coniferous forest	439	10.1	355	12.8	0	0	65	11.8	0	0	59	1.4	0	0
420	Upland hardwood forest	53	1.2	85	3.1	3	11.1	24	4.4	9	5.5	38	0.9	101	2.3
430	Upland mixed forest	965	22.2	423	15.3	11	40.7	294	53.5	59	36.0	565	13.0	756	17.4
520	Lakes***	147	3.4	11	0.4	0	0	18	3.3	0	0	710	16.3	252	5.8
530	Reservoirs	0	0	0	0	0	0	0	0	0	0	0	0	840 ****	19.3
620	Wetland hardwood forest	68	1.6	0	0	2	7.5	17	3.1	5	3.0	59	1.4	61	1.4
630	Wetland mixed forest	267	6.1	267	9.6	0	0	0	0	0	0	264	6.1	310	7.1
640	Herbaceous wetland	277	6.4	170	6.1	0	0	36	6.6	25	15.2	467	10.7	428	9.8
TOTAL		4,348	100	2,769	100	27	100	549	100	164	100	4,348	100	4,348	100

*The FLUCCS, 1976 was utilized for the land use and cover classification on the Tampa Electric Company Polk Power Station project. Level II FLUCCS is used for 200 to 600 series classifications, while urban or built-up (100) uses are classified at Level III.

†Refers to the land uses and cover present on the site prior to mining activities circa 1981.

**Pre-1992 disturbances refer to all disturbances from mining (Agrico, Inc.; IMC Fertilizer, Inc.; and American Cyanamid, Inc.) and powerline (Tampa Electric Company Hardee-Pebbledale 230-kV) construction to premining land uses and cover prior to 1992.

††Post-1992 disturbances refer to all proposed disturbances from mining and power plant development to premining land uses and cover after 1992. An additional 926 acres of formerly altered land (154 acres of scraped-over areas and spoil piles and 772 acres of phosphate mined land) are also proposed to be used in the construction of the power plant facilities and cooling water reservoir (total acreage, 1,090 acres).

***The 520, Lakes classification refers to all man-made, open surface waters on the property other than the proposed cooling water reservoir.

†††Approximately 13 acres of the gas transmission pipeline (148) will remain in pasture; 141 acres of the electric transmission line rights-of-way (152) will also be maintained as pastureland.

****The approximate acreage of the proposed cooling reservoir including the inside portions of the surrounding berm and the area of the internal berms.

Source: ECT, 1992.

enhanced through the proposed reclamation plans for the site. The pre-existing land forms on the site were primarily pine flatwoods/pine plantation, oak/pine woods, hardwood hammock, mixed swamp, hardwood swamp, freshwater marsh, shrub and brushland, grassland, mixed rangeland, lakes, citrus groves, and pastureland. The proposed reclamation plan for the site is summarized in Chapter 9.0 of this SCA. Reclamation plan objectives include restoring the disturbed lands to physical and functional conditions that are as similar to pre-mining/pre-development conditions, as practicable. To achieve these goals and mitigate potential habitat losses, all of the disturbed wetland and upland hardwood forest acreage will be increased through reclamation and the majority of the remaining lands will either be developed for the power plant facilities, left intact, or reclaimed. Furthermore, the proposed reclamation plans for the site will meet FDNR's phosphate mining reclamation rules (Sections 211 and 378, F.S.; Chapters 16C-16 and 16C-17, F.A.C.), and the goals of Polk County's Comprehensive Plan and the Polk County Phosphate Mining Ordinance 88-19.

Table 4.4.1-1 lists the acreages of the various land use/cover categories for pre-mining, disturbed, and reclaimed land. Pre-mining acreages refer to the land uses and cover present on the site circa 1981. Although mining occurred prior to 1981, no figures are available for land use/cover at that time. Disturbed acreages by FLUCCS include all disturbances from mining and power plant/transmission line development for pre- and post-1992 site conditions. Reclaimed acreages by FLUCCS categories are based on both the post-reclamation plans which are currently approved for Agrico's Fort Green Mine and proposed by Tampa Electric Company for the Polk Power Station site. As indicated in Table 4.4.1-1, taken collectively, the four dominant land forms to be restored on the site, according to Tampa Electric Company's proposed reclamation plan, include improved pasture, forested uplands, forested wetlands, and nonforested wetlands, in addition to the cooling reservoir area.

According to Tampa Electric Company's proposed plans, improved pasture areas have been or will be planted in forage grasses and legumes on approximate-

ly 655 acres of the site. This planting of forage grasses and legumes for the establishment of pastureland will be a dominant vegetation type on the site. Pasture was chosen as a dominant post-reclamation land use because of the following reasons:

1. Seeding the majority of land with grasses stabilizes reclaimed soils, limits erosion, encourages the development of organic matter, and increases nutrient/moisture retention;
2. Improved pasture can be easily converted to alternative future land uses as desired; and
3. A total of 155-acres of pasture located underneath the electrical transmission lines and over the gas transmission line allows for easy maintenance and accessibility.

The particular grass and legume species to be planted will be selected based on soil characteristics, topography, and other site-specific attributes.

Approximately 857 acres of upland forest will be left intact or reclaimed on the site. Whenever possible, these forest types will be mulched with topsoil acquired from donor sites and then planted with native xeric and/or mesic species common to the region. Reclaimed hardwood forest will be planted with a variety of hardwood tree species such as laurel oak, water oak, live oak, sweet gum, persimmon, and black cherry. However, the actual composition of planted seedlings will depend upon the availability of various species from commercial native plant nurseries. Bare root, potted, or containerized seedlings will be planted in a random pattern to yield an initial density of 200 trees per acre. Reclaimed upland forest will also be planted with pines and oaks. Slash pine, longleaf pine, and various oak seedlings will be hand planted in a random pattern at a density of 400 trees per acre to ensure a final density of 200 trees per acre for the reclamation of oak/pine woods. Saw palmetto will be planted throughout the pine and oak/pine dominated areas on 5-ft centers to mimic a typical flatwoods understory stratum. Other understory native woody and herbaceous species such as gallberry, dwarf live oak, running oak, gopher apple,

prickly pear, and others will also be planted randomly throughout each oak/pine woods area. All planting densities will be based upon FDNR reclamation rules [Chapter 16C-16.0051(9), F.A.C.]. The final selection of herbaceous and understory woody species and the timing/spacing of plantings will be based upon the availability of nursery-grown plant species at the time of planting and past success with similar plantings on reclaimed lands.

Tampa Electric Company's proposed plan provides for the reclamation of all pre-mining acreages of forested and nonforested wetland types on the site disturbed by mining, power plant development, and related activities. Wetlands within mined areas will mostly be created by recontouring overburden to create a topography resulting in a favorable hydroperiod. The regraded lowland areas will then be planted with indigenous aquatic herbaceous, shrub and/or tree species. Species selected for planting will be based upon the community type to be created and the onsite dominant plant species associated with the reference wetland types previously mined.

Approximately 371 acres of freshwater swamp will either be reclaimed or left in an undisturbed condition on the site. Reclaimed hardwood swamp will be planted with a mixture of aquatic hardwoods such as swamp redbay, red maple, black gum, sweet bay, dahoon holly, buttonbush, and wax myrtle. In addition to the referenced hardwood species, approximately 310 acres of the site will also be planted with pond and/or bald cypress for the creation of mixed conifer-hardwood swamp. All of the swampland will also be planted with herbaceous hydrophytes such as maidencane, pickerelweed, and arrowhead in the ground stratum. Bare root, potted, or containerized seedlings will be planted to yield an initial density of 800 trees per acre to ensure a final density of 400 trees per acre. It is expected that the tree cover will exceed 33 percent of the vegetational cover 5 years after planting, and in no area of an acre or more in size will the tree cover be less than 20 percent. Herbaceous vegetation will be planted on 3-ft centers and, thereafter, allowed to reproduce naturally within the forested wetland.

Approximately 428 acres of freshwater marsh will either be reclaimed or left in a pre-existing condition on the site. The proposed revegetation plan for these marshes is to plant bare root or liner size wetland herbs on 3-ft centers. Aquatic macrophytes anticipated to be used for marsh restoration, include arrowhead, maidencane, pickerelweed, sand cordgrass, and fire flag. It is anticipated that these reclaimed marshes will exhibit a plant cover of at least 80 percent of desirable wetland species per each restored acre after two growing seasons. To ensure plant survival rates, reclaimed swamps and marshes will undergo a periodic maintenance and monitoring program over a minimum 2- to 5-year period which will include noxious exotic species eradication, ecological surveys/reports to evaluate success, and replantings, if necessary.

The reclaimed wetlands will be located on the site tracts both to the east and west of SR 37 within all three of the onsite drainage basins: South Prong Alafia River, Payne Creek, and Little Payne Creek.

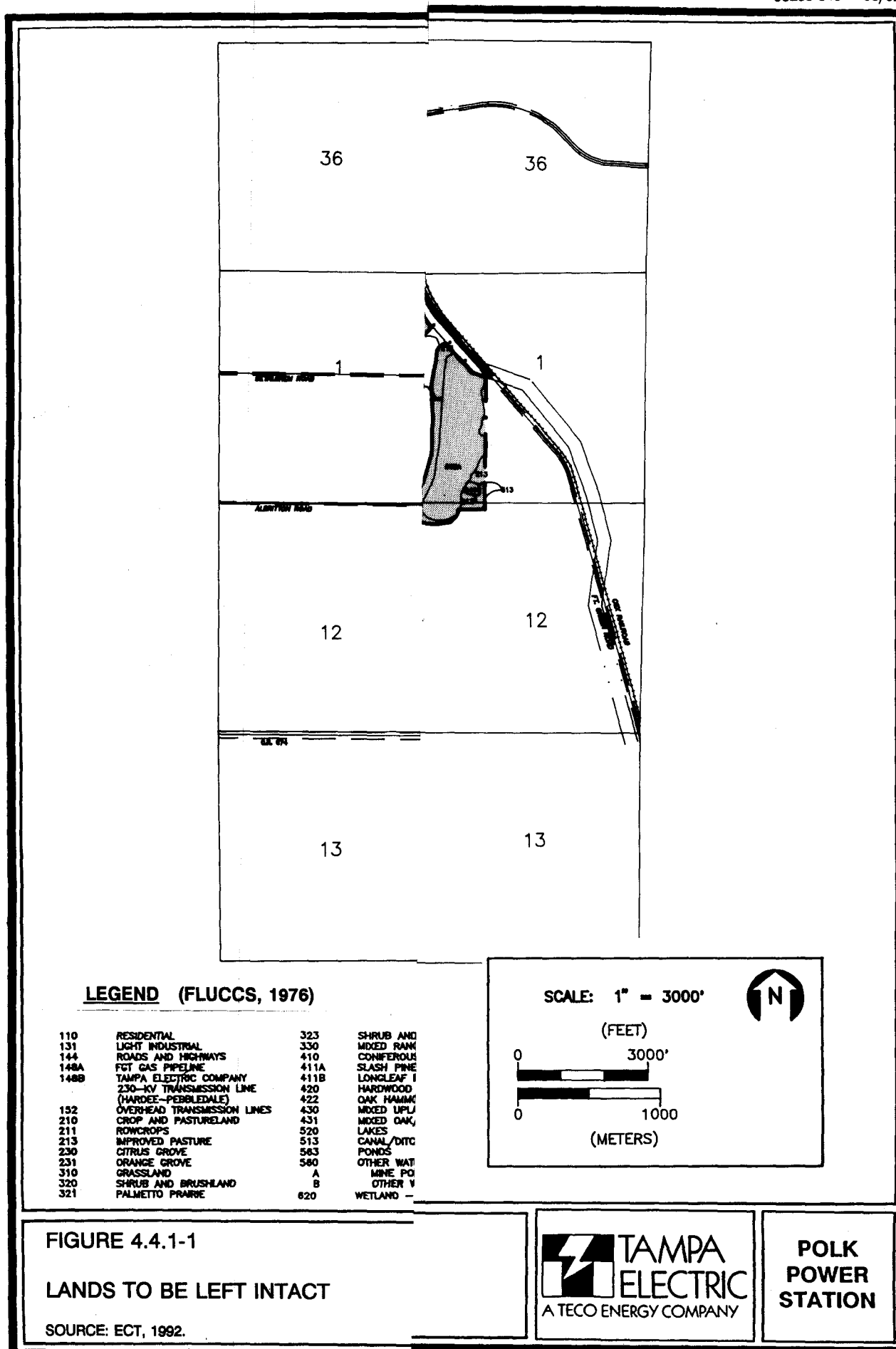
The proposed reclamation operations will proceed immediately after certification of the Polk Power Station project or earlier if appropriate agency approvals are granted prior to final certification of the project. Mining of the western tract of the property is expected to conclude in 1994. Reclamation is anticipated to be completed within 3 years after mining ends; allowing 2 years for development operations and 1 year for planting.

According to the currently approved reclamation plan for the site tract to the west of SR 37, the property was scheduled for a land-and-lakes type reclamation as indicated on Table 4.4.1-1. This reclamation process would have resulted in the recontouring of overburden and mined-out areas for land-and-lakes. The land-and-lakes land form would have been reclaimed to agricultural land, pine flatwoods, hardwood forest, mixed forest, wetlands, and lakes. The predominant feature of post-reclamation would have been a mosaic of lakes constructed from the former mine cuts. The resultant post-reclamation land would have had less wetland and

forested upland acreage than that proposed for this project (approximately 204 acres less overall). The area to the east of SR 37 was scheduled for primarily above-grade clay waste disposal under the currently approved reclamation plan. This would have eventually developed into pastureland and mixed rangeland. This area will now be dominated by the proposed power plant facility and cooling reservoir.

Based upon the Polk County Comprehensive Plan Conservation Element Support Document (July 1990), it is estimated that approximately 353,724 acres or 28 percent of the county consists of native habitat. Approximately 144,573 acres of these native lands comprise freshwater wetlands. The reclamation of wetlands on the site will result in a net increase in wetland habitat county-wide.

According to the proposed reclamation/development plans, approximately 996 acres of remnant, but previously disturbed uplands, wetlands, and surface waters on the property following all mining, power plant development, and reclamation activities will be relatively disturbed by the project (see Figure 4.4.1-1). Except for some minor sites (69 acres) distributed along the northern boundary of the western tract, the areas to be left intact after all mining/development/reclamation ceases consist of five distinct and separate parcels of land. On the western tract of the site, all of the unmined portions within the area west of the FGT pipeline will be mostly left undisturbed, except for the creation of a vegetated, drainage swale. The swale will connect the western terminus of the South Prong Alafia River drainage basin on the property directly to the unnamed tributary of the South Prong Alafia River along the northwestern property boundary. The swale will almost be entirely located within improved pasture situated to the east of the unnamed tributary. Approximately 98 acres of remnant upland, wetland, and surface water communities (i.e., longleaf pine flatwoods, shrub and brushland, mixed hardwood swamp, mixed oak/pine forest, pasture, oak hammock, disturbed mixed marsh, citrus grove, a pond, and an intermittent creek) will be left at this location. An old, inactive bald eagle's nest is located within the pine flatwoods at this locale.



The four remaining parcels to be left undisturbed are situated in the eastern tract of the site. These parcels include a 33-acre area of primarily pine flatwoods situated at the southeastern corner of the eastern tract which contains 27 acres of pine flatwoods, 3 acres of marsh, and 3 acres of grassy altered land. This parcel also contains an abandoned eagle's nest that was used by great horned owls in 1991. A 215-acre area located at the southwestern corner of the eastern tract just east of SR 37 is also not scheduled for development. The land cover types within this parcel to be left intact after development include marsh, mixed oak/pine forest, shrub and brushland, grassy altered land, and some lands disturbed by associated mining activities. This parcel contains marginally suitable habitat for a variety of plant and animal species, including important taxa such as the wild coco orchid. A third parcel to be left intact is located at the east-central edge of the tract. This 103-acre parcel contains 27 acres of reclaimed pasture, 1 acre of ditches, 2 acres of disturbed marsh, and a 73-acre reclaimed lake. The fourth area to be left intact is a large area covering both the northeastern and northwestern portions of the tract east of SR 37 and south of CR 630. The northeastern portion of this area consists of old mined but unreclaimed lands. This parcel mostly consists of pasture, naturally revegetated unreclaimed uplands, and wetlands and old mine cut lakes. The northwestern portion of this area has been recently mined and reclaimed but will also be left intact by the proposed power plant construction. This area now consists of reclaimed pasture, wetlands, and reclaimed lakes.

Vegetation communities/wildlife habitats to be left relatively intact on the site and other undisturbed uplands and wetlands in the project vicinity that are not directly disturbed by the previous and ongoing mining activities or proposed project construction activities have the potential to be indirectly affected. These secondary effects could include a temporary lowering of surface and groundwater levels, increased sedimentation, increased surface runoff, erosion, fugitive dust, and mechanical damage. As discussed in Section 4.3, the water table level in the vicinity of the cooling water reservoir area will fluctuate due to dewatering activities during the reservoir construction. These dewatering activities could potentially decrease the

amount of soil moisture or standing water in adjacent wetlands depending upon the period of drawdown, the proximity of the wetlands to the dewatered area, and ambient rainfall. Such dewatering effects could result in changes in plant biomass, species composition, and the proportion of aquatic plant species within wetlands. However, as discussed in Section 4.3.1, the impacts to the surficial aquifer as a result of dewatering activities for the proposed project will be limited and short-term. Furthermore, these impacts will be similar to those already experienced onsite as a result of past and ongoing activities. Therefore, the proposed dewatering activities will have no significant impact on vegetation and wildlife habitats.

Clearing of vegetation and subsequent excavations associated with construction will expose soils to erosion by winds and stormwaters. Increased stormwater runoff and erosion into downstream wetlands and surface waters have the potential to accelerate eutrophication. Eutrophic waters exhibit an increase in turbidity, nutrient and bacterial levels, and oxygen demands, and a decrease in dissolved oxygen, producing an environment that favors plant over animal life. Fugitive dust from clearing operations may affect vegetation in the vicinity of the project site. Dust particles can accumulate on leaf surfaces reducing evapotranspiration and photosynthesis. Such long-term exposure could potentially result in the mortality of some terrestrial and epiphytic herbaceous plants. Damage to vegetation could also result as a consequence of vehicular traffic and heavy machinery during construction activities in the area. As discussed in Sections 4.2 and 4.5, potential erosion, sediment transport, and fugitive dust from the site will be controlled by a variety of techniques during the construction of the proposed project. Also, the potential for such impacts for the proposed project would be similar to that from agency-required reclamation activities for the site.

No significant impacts to the surficial aquifer are expected to occur during project excavations because the withdrawals will be balanced by the application of the water into the adjacent mine cuts and reservoir areas (see Section 4.3). Stormwater runoff into Payne Creek, Little Payne Creek, South Prong Alafia River, and onsite wetlands

Table 4.4.1-1. Estimated Premining, Disturbed, and Post-Reclamation Acreages and Percentages of Land Use/Cover on the Tampa Electric Company Polk Power Station

Code	Land Use/Cover*	Premining†		Pre-1992 Disturbances from Mining**		Pre-1992 Disturbances from Powerline**		Post-1992 Disturbances from Mining††		Post-1992 Disturbances from Tampa Electric Company Polk Power Station††		Agrico's Current Post-Reclamation Plan		Tampa Electric Company Polk Power Station Post-Reclamation	
		Acre	Percent	Acre	Percent	Acre	Percent	Acre	Percent	Acre	Percent	Acre	Percent	Acre	Percent
140	Transportation	0	0	0	0	0	0	0	0	0	0	0	0	3	0.1
148	Gas transmission pipeline	13	0.3	0	0	0	0	0	0	0	0	13	0.3	14 †††	0.3
151	Electrical power facilities	0	0	0	0	0	0	0	0	0	0	0	0	337	7.8
152	Electrical transmission line	0	0	0	0	0	0	0	0	0	0	27	0.6	141 †††	3.2
210	Pastureland	886	20.3	381	13.7	11	40.7	82	14.9	60	36.6	973	22.4	500	11.5
230	Citrus grove	59	1.4	42	1.5	0	0	1	0.2	0	0	0	0	18	0.5
310	Grassland	20	0.4	20	0.7	0	0	0	0	0	0	49	1.1	0	0
320	Shrub and brushland	995	22.9	856	30.9	0	0	12	2.2	6	3.7	57	1.3	581	13.4
330	Mixed rangeland	159	3.7	159	5.9	0	0	0	0	0	0	1,067	24.5	6	0.1
410	Coniferous forest	439	10.1	355	12.8	0	0	65	11.8	0	0	59	1.4	0	0
420	Upland hardwood forest	53	1.2	85	3.1	3	11.1	24	4.4	9	5.5	38	0.9	101	2.3
430	Upland mixed forest	965	22.2	423	15.3	11	40.7	294	53.5	59	36.0	565	13.0	756	17.4
520	Lakes***	147	3.4	11	0.4	0	0	18	3.3	0	0	710	16.3	252	5.8
530	Reservoirs	0	0	0	0	0	0	0	0	0	0	0	0	840 ****	19.3
620	Wetland hardwood forest	68	1.6	0	0	2	7.5	17	3.1	5	3.0	59	1.4	61	1.4
630	Wetland mixed forest	267	6.1	267	9.6	0	0	0	0	0	0	264	6.1	310	7.1
640	Herbaceous wetland	277	6.4	170	6.1	0	0	36	6.6	25	15.2	467	10.7	428	9.8
	TOTAL	4,348	100	2,769	100	27	100	549	100	164	100	4,348	100	4,348	100

*The FLUCCS, 1976 was utilized for the land use and cover classification on the Tampa Electric Company Polk Power Station project. Level II FLUCCS is used for 200 to 600 series classifications, while urban or built-up (100) uses are classified at Level III.

†Refers to the land uses and cover present on the site prior to mining activities circa 1981.

**Pre-1992 disturbances refer to all disturbances from mining (Agrico, Inc.; IMC Fertilizer, Inc.; and American Cyanamid, Inc.) and powerline (Tampa Electric Company Hardee-Pebbledale 230-kV) construction to premining land uses and cover prior to 1992.

††Post-1992 disturbances refer to all proposed disturbances from mining and power plant development to premining land uses and cover after 1992. An additional 926 acres of formerly altered land (154 acres of scraped-over areas and spoil piles and 772 acres of phosphate mined land) are also proposed to be used in the construction of the power plant facilities and cooling water reservoir (total acreage, 1,090 acres).

***The 520, Lakes classification refers to all man-made, open surface waters on the property other than the proposed cooling water reservoir.

†††Approximately 13 acres of the gas transmission pipeline (148) will remain in pasture; 141 acres of the electric transmission line rights-of-way (152) will also be maintained as pastureland.

****The approximate acreage of the proposed cooling reservoir including the inside portions of the surrounding berm and the area of the internal berms.

Source: ECT, 1992.

enhanced through the proposed reclamation plans for the site. The pre-existing land forms on the site were primarily pine flatwoods/pine plantation, oak/pine woods, hardwood hammock, mixed swamp, hardwood swamp, freshwater marsh, shrub and brushland, grassland, mixed rangeland, lakes, citrus groves, and pastureland. The proposed reclamation plan for the site is summarized in Chapter 9.0 of this SCA. Reclamation plan objectives include restoring the disturbed lands to physical and functional conditions that are as similar to pre-mining/pre-development conditions, as practicable. To achieve these goals and mitigate potential habitat losses, all of the disturbed wetland and upland hardwood forest acreage will be increased through reclamation and the majority of the remaining lands will either be developed for the power plant facilities, left intact, or reclaimed. Furthermore, the proposed reclamation plans for the site will meet FDNR's phosphate mining reclamation rules (Sections 211 and 378, F.S.; Chapters 16C-16 and 16C-17, F.A.C.), and the goals of Polk County's Comprehensive Plan and the Polk County Phosphate Mining Ordinance 88-19.

Table 4.4.1-1 lists the acreages of the various land use/cover categories for pre-mining, disturbed, and reclaimed land. Pre-mining acreages refer to the land uses and cover present on the site circa 1981. Although mining occurred prior to 1981, no figures are available for land use/cover at that time. Disturbed acreages by FLUCCS include all disturbances from mining and power plant/transmission line development for pre- and post-1992 site conditions. Reclaimed acreages by FLUCCS categories are based on both the post-reclamation plans which are currently approved for Agrico's Fort Green Mine and proposed by Tampa Electric Company for the Polk Power Station site. As indicated in Table 4.4.1-1, taken collectively, the four dominant land forms to be restored on the site, according to Tampa Electric Company's proposed reclamation plan, include improved pasture, forested uplands, forested wetlands, and nonforested wetlands, in addition to the cooling reservoir area.

According to Tampa Electric Company's proposed plans, improved pasture areas have been or will be planted in forage grasses and legumes on approximate-

ly 655 acres of the site. This planting of forage grasses and legumes for the establishment of pastureland will be a dominant vegetation type on the site. Pasture was chosen as a dominant post-reclamation land use because of the following reasons:

1. Seeding the majority of land with grasses stabilizes reclaimed soils, limits erosion, encourages the development of organic matter, and increases nutrient/moisture retention;
2. Improved pasture can be easily converted to alternative future land uses as desired; and
3. A total of 155-acres of pasture located underneath the electrical transmission lines and over the gas transmission line allows for easy maintenance and accessibility.

The particular grass and legume species to be planted will be selected based on soil characteristics, topography, and other site-specific attributes.

Approximately 857 acres of upland forest will be left intact or reclaimed on the site. Whenever possible, these forest types will be mulched with topsoil acquired from donor sites and then planted with native xeric and/or mesic species common to the region. Reclaimed hardwood forest will be planted with a variety of hardwood tree species such as laurel oak, water oak, live oak, sweet gum, persimmon, and black cherry. However, the actual composition of planted seedlings will depend upon the availability of various species from commercial native plant nurseries. Bare root, potted, or containerized seedlings will be planted in a random pattern to yield an initial density of 200 trees per acre. Reclaimed upland forest will also be planted with pines and oaks. Slash pine, longleaf pine, and various oak seedlings will be hand planted in a random pattern at a density of 400 trees per acre to ensure a final density of 200 trees per acre for the reclamation of oak/pine woods. Saw palmetto will be planted throughout the pine and oak/pine dominated areas on 5-ft centers to mimic a typical flatwoods understory stratum. Other understory native woody and herbaceous species such as gallberry, dwarf live oak, running oak, gopher apple,

prickly pear, and others will also be planted randomly throughout each oak/pine woods area. All planting densities will be based upon FDNR reclamation rules [Chapter 16C-16.0051(9), F.A.C.]. The final selection of herbaceous and understory woody species and the timing/spacing of plantings will be based upon the availability of nursery-grown plant species at the time of planting and past success with similar plantings on reclaimed lands.

Tampa Electric Company's proposed plan provides for the reclamation of all pre-mining acreages of forested and nonforested wetland types on the site disturbed by mining, power plant development, and related activities. Wetlands within mined areas will mostly be created by recontouring overburden to create a topography resulting in a favorable hydroperiod. The regraded lowland areas will then be planted with indigenous aquatic herbaceous, shrub and/or tree species. Species selected for planting will be based upon the community type to be created and the onsite dominant plant species associated with the reference wetland types previously mined.

Approximately 371 acres of freshwater swamp will either be reclaimed or left in an undisturbed condition on the site. Reclaimed hardwood swamp will be planted with a mixture of aquatic hardwoods such as swamp redbay, red maple, black gum, sweet bay, dahoon holly, buttonbush, and wax myrtle. In addition to the referenced hardwood species, approximately 310 acres of the site will also be planted with pond and/or bald cypress for the creation of mixed conifer-hardwood swamp. All of the swampland will also be planted with herbaceous hydrophytes such as maidencane, pickerelweed, and arrowhead in the ground stratum. Bare root, potted, or containerized seedlings will be planted to yield an initial density of 800 trees per acre to ensure a final density of 400 trees per acre. It is expected that the tree cover will exceed 33 percent of the vegetational cover 5 years after planting, and in no area of an acre or more in size will the tree cover be less than 20 percent. Herbaceous vegetation will be planted on 3-ft centers and, thereafter, allowed to reproduce naturally within the forested wetland.

Approximately 428 acres of freshwater marsh will either be reclaimed or left in a pre-existing condition on the site. The proposed revegetation plan for these marshes is to plant bare root or liner size wetland herbs on 3-ft centers. Aquatic macrophytes anticipated to be used for marsh restoration, include arrowhead, maidencane, pickerelweed, sand cordgrass, and fire flag. It is anticipated that these reclaimed marshes will exhibit a plant cover of at least 80 percent of desirable wetland species per each restored acre after two growing seasons. To ensure plant survival rates, reclaimed swamps and marshes will undergo a periodic maintenance and monitoring program over a minimum 2- to 5-year period which will include noxious exotic species eradication, ecological surveys/reports to evaluate success, and replantings, if necessary.

The reclaimed wetlands will be located on the site tracts both to the east and west of SR 37 within all three of the onsite drainage basins: South Prong Alafia River, Payne Creek, and Little Payne Creek.

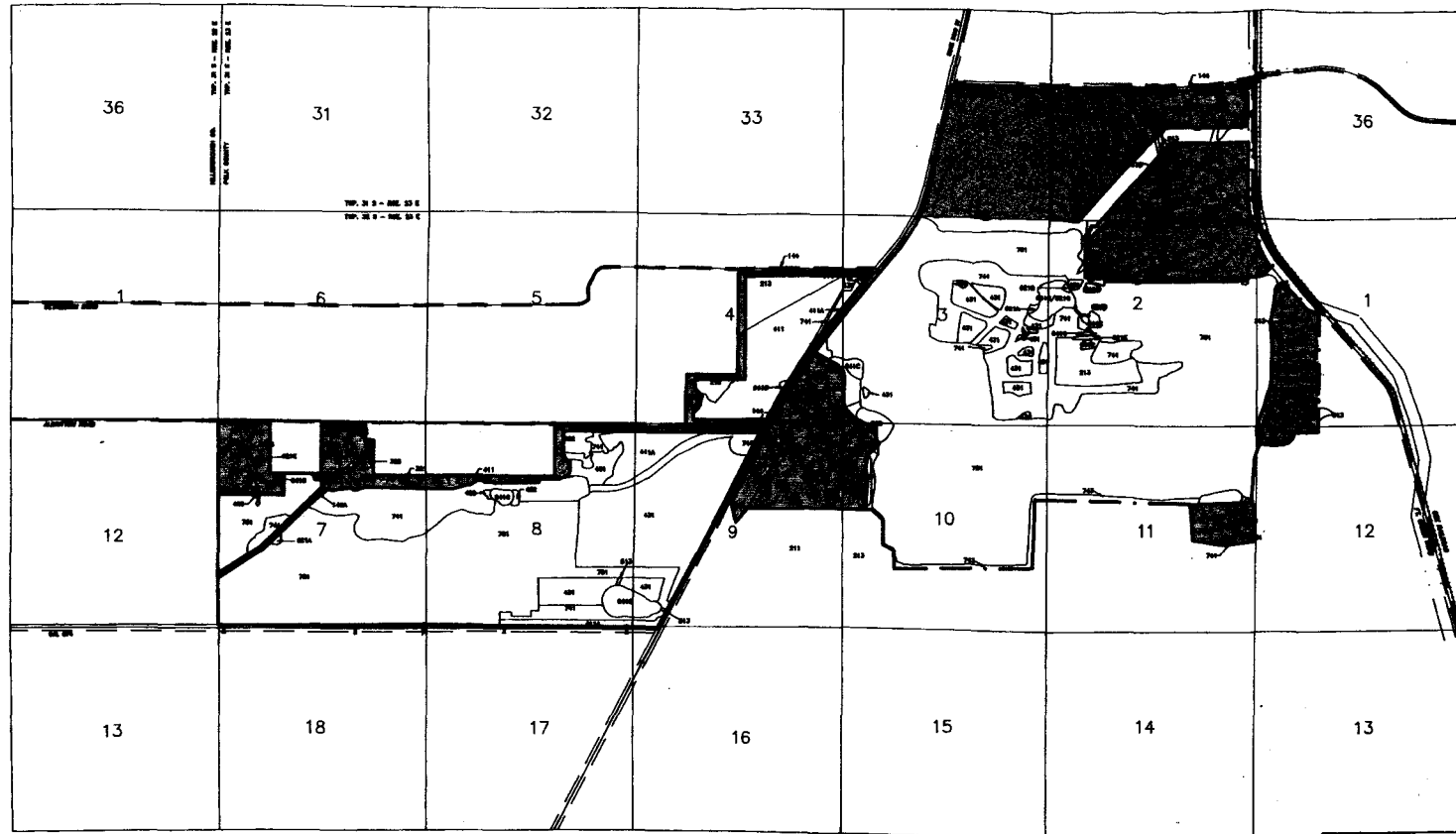
The proposed reclamation operations will proceed immediately after certification of the Polk Power Station project or earlier if appropriate agency approvals are granted prior to final certification of the project. Mining of the western tract of the property is expected to conclude in 1994. Reclamation is anticipated to be completed within 3 years after mining ends; allowing 2 years for development operations and 1 year for planting.

According to the currently approved reclamation plan for the site tract to the west of SR 37, the property was scheduled for a land-and-lakes type reclamation as indicated on Table 4.4.1-1. This reclamation process would have resulted in the recontouring of overburden and mined-out areas for land-and-lakes. The land-and-lakes land form would have been reclaimed to agricultural land, pine flatwoods, hardwood forest, mixed forest, wetlands, and lakes. The predominant feature of post-reclamation would have been a mosaic of lakes constructed from the former mine cuts. The resultant post-reclamation land would have had less wetland and

forested upland acreage than that proposed for this project (approximately 204 acres less overall). The area to the east of SR 37 was scheduled for primarily above-grade clay waste disposal under the currently approved reclamation plan. This would have eventually developed into pastureland and mixed rangeland. This area will now be dominated by the proposed power plant facility and cooling reservoir.

Based upon the Polk County Comprehensive Plan Conservation Element Support Document (July 1990), it is estimated that approximately 353,724 acres or 28 percent of the county consists of native habitat. Approximately 144,573 acres of these native lands comprise freshwater wetlands. The reclamation of wetlands on the site will result in a net increase in wetland habitat county-wide.

According to the proposed reclamation/development plans, approximately 996 acres of remnant, but previously disturbed uplands, wetlands, and surface waters on the property following all mining, power plant development, and reclamation activities will be relatively disturbed by the project (see Figure 4.4.1-1). Except for some minor sites (69 acres) distributed along the northern boundary of the western tract, the areas to be left intact after all mining/development/reclamation ceases consist of five distinct and separate parcels of land. On the western tract of the site, all of the unmined portions within the area west of the FGT pipeline will be mostly left undisturbed, except for the creation of a vegetated, drainage swale. The swale will connect the western terminus of the South Prong Alafia River drainage basin on the property directly to the unnamed tributary of the South Prong Alafia River along the northwestern property boundary. The swale will almost be entirely located within improved pasture situated to the east of the unnamed tributary. Approximately 98 acres of remnant upland, wetland, and surface water communities (i.e., longleaf pine flatwoods, shrub and brushland, mixed hardwood swamp, mixed oak/pine forest, pasture, oak hammock, disturbed mixed marsh, citrus grove, a pond, and an intermittent creek) will be left at this location. An old, inactive bald eagle's nest is located within the pine flatwoods at this locale.

**LEGEND (FLUCCS, 1976)**

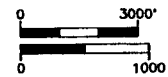
110	RESIDENTIAL	323	SHRUB AND BRUSHLAND	621	WETLAND FORESTED
131	LIGHT INDUSTRIAL	330	MIXED PINE/SLAND	A	BAY HEAD SWAMP
144	ROADS AND HIGHWAYS	410	CONIFEROUS FOREST	B	RED MAPLE SWAMP
148A	FOT GAS PIPELINE	411A	SLASH PINE PLANTWOODS	C	WETLAND - MIXED FOREST
148B	TAMPA ELECTRIC COMPANY	411B	LONGLEAF PINE PLANTWOODS	D	WETLAND - MIXED FOREST
	220-KV TRANSMISSION LINE	420	HARDWOOD FOREST	E	WETLAND - MIXED FOREST
	(THRU-TOURDALE)	422	ONE HAMMICK		WETLAND - MIXED FOREST
152	OVERHEAD TRANSMISSION LINES	430	MIXED UPLAND FOREST	640	WETLAND - MIXED FOREST
210	CROP AND PASTURELAND	431	MIXED OAK/PINE FOREST	641	NON-FORESTED WETLAND
211	ROADWAYS	520	LAKES	A	WETLAND - MIXED FOREST
213	IMPROVED PASTURE	513	CANAL/DITCH	B	WETLAND - MIXED FOREST
230	OTHER GRADE	563	POWERS	C	WETLAND - MIXED FOREST
310	ORANGE GROVE	580	OTHER WATER AREAS	741	SCRAPED AREAS/OLD FIELDS
320	GRASSLAND	A	MIRE POADS	751	PHOSPHATE MINE BANK
321	SHRUB AND BRUSHLAND	B	OTHER WATER AREAS	763	VEGETATED SPIKE BANK
	PALMETTO PRABE	620	WETLAND - HARDWOOD FOREST		

AREAS TO REMAIN INTACT

NOTES
 INFORMATION FROM AERIAL PHOTOGRAPHY DATED 8-12-91
 BY J. J. BROWN & ASSOCIATES, INC.
 1400 BAYVIEW AVENUE, SUITE 100
 PALM BEACH, FLORIDA 33480
 DATA ACQUIRED FROM 12-10-91

SCALE: 1" = 3000'

(FEET)



(METERS)



FIGURE 4.4.1-1

LANDS TO BE LEFT INTACT

SOURCE: ECT, 1992.



**POLK
POWER
STATION**

The four remaining parcels to be left undisturbed are situated in the eastern tract of the site. These parcels include a 33-acre area of primarily pine flatwoods situated at the southeastern corner of the eastern tract which contains 27 acres of pine flatwoods, 3 acres of marsh, and 3 acres of grassy altered land. This parcel also contains an abandoned eagle's nest that was used by great horned owls in 1991. A 215-acre area located at the southwestern corner of the eastern tract just east of SR 37 is also not scheduled for development. The land cover types within this parcel to be left intact after development include marsh, mixed oak/pine forest, shrub and brushland, grassy altered land, and some lands disturbed by associated mining activities. This parcel contains marginally suitable habitat for a variety of plant and animal species, including important taxa such as the wild coco orchid. A third parcel to be left intact is located at the east-central edge of the tract. This 103-acre parcel contains 27 acres of reclaimed pasture, 1 acre of ditches, 2 acres of disturbed marsh, and a 73-acre reclaimed lake. The fourth area to be left intact is a large area covering both the northeastern and northwestern portions of the tract east of SR 37 and south of CR 630. The northeastern portion of this area consists of old mined but unreclaimed lands. This parcel mostly consists of pasture, naturally revegetated unreclaimed uplands, and wetlands and old mine cut lakes. The northwestern portion of this area has been recently mined and reclaimed but will also be left intact by the proposed power plant construction. This area now consists of reclaimed pasture, wetlands, and reclaimed lakes.

Vegetation communities/wildlife habitats to be left relatively intact on the site and other undisturbed uplands and wetlands in the project vicinity that are not directly disturbed by the previous and ongoing mining activities or proposed project construction activities have the potential to be indirectly affected. These secondary effects could include a temporary lowering of surface and groundwater levels, increased sedimentation, increased surface runoff, erosion, fugitive dust, and mechanical damage. As discussed in Section 4.3, the water table level in the vicinity of the cooling water reservoir area will fluctuate due to dewatering activities during the reservoir construction. These dewatering activities could potentially decrease the

amount of soil moisture or standing water in adjacent wetlands depending upon the period of drawdown, the proximity of the wetlands to the dewatered area, and ambient rainfall. Such dewatering effects could result in changes in plant biomass, species composition, and the proportion of aquatic plant species within wetlands. However, as discussed in Section 4.3.1, the impacts to the surficial aquifer as a result of dewatering activities for the proposed project will be limited and short-term. Furthermore, these impacts will be similar to those already experienced onsite as a result of past and ongoing activities. Therefore, the proposed dewatering activities will have no significant impact on vegetation and wildlife habitats.

Clearing of vegetation and subsequent excavations associated with construction will expose soils to erosion by winds and stormwaters. Increased stormwater runoff and erosion into downstream wetlands and surface waters have the potential to accelerate eutrophication. Eutrophic waters exhibit an increase in turbidity, nutrient and bacterial levels, and oxygen demands, and a decrease in dissolved oxygen, producing an environment that favors plant over animal life. Fugitive dust from clearing operations may affect vegetation in the vicinity of the project site. Dust particles can accumulate on leaf surfaces reducing evapotranspiration and photosynthesis. Such long-term exposure could potentially result in the mortality of some terrestrial and epiphytic herbaceous plants. Damage to vegetation could also result as a consequence of vehicular traffic and heavy machinery during construction activities in the area. As discussed in Sections 4.2 and 4.5, potential erosion, sediment transport, and fugitive dust from the site will be controlled by a variety of techniques during the construction of the proposed project. Also, the potential for such impacts for the proposed project would be similar to that from agency-required reclamation activities for the site.

No significant impacts to the surficial aquifer are expected to occur during project excavations because the withdrawals will be balanced by the application of the water into the adjacent mine cuts and reservoir areas (see Section 4.3). Stormwater runoff into Payne Creek, Little Payne Creek, South Prong Alafia River, and onsite wetlands

will be appropriately managed by the implementation of both temporary and permanent measures to control sediment transport. Erosion and sediment control methods will be implemented during and after construction, such as, seeding, or mulching along newly exposed areas, silt screens and hay bales along the sloped edges of surface water features and wetlands, and redirection of stormwater runoff by the construction of swales, basins, and berms. Thus, any stormwater runoff discharges exiting site boundaries will not adversely degrade the water quality or significantly alter the water quantity within the three drainage systems on the site.

Overall, any secondary impacts to downstream, nearby, or onsite systems are expected to be negligible to minimal. The existing vegetation communities to be left intact have been previously disturbed through mining operations. These systems exhibit the effects of numerous past perturbations from clearing activities, dumping, removal of large oak trees for nursery purposes, absence of periodic fires, fugitive dust from mining, altered hydroperiods from drainage interruptions, and lowered groundwater levels associated with mining. The continued mining operations and construction of the power plant facilities on the site are not expected to result in a significant change to current conditions within the existing habitats to be left intact. After reclamation has been completed, these areas will be managed along with the newly reclaimed lands to promote a natural ecological conditions.

All of the plant species considered to be of local and/or regional importance by USFWS, FNAI, FCREPA, CITES, and FDACS for the study area were reviewed for likelihood of occurrence on the property based upon range and habitat suitability. Of the 18 species determined to have a low to high probability of occurrence on the site, only 10 were actually observed within property boundaries. *Aspidium* fern, wild azalea, bluestem, golden polypody, dahoon holly, netted chain fern, cinnamon fern, and royal fern are common associates of forested wetlands in Florida. These listed species were mostly observed within the floodplain swamp contiguous to the unnamed tributary to the South Prong Alafia River in the northwest corner of the site. The forested wetland reaches of this tributary on the property are not proposed

to be mined or distributed by the proposed project. Therefore, no significant impacts to regional or local populations of the referenced important species are anticipated from the proposed project.

Prickly pear inhabits the drier, unmined forested areas of the property. Prickly pear occurs within the northeastern unmined area of the eastern tract which is scheduled for construction of the power plant. However, this species is common throughout the state and no significant adverse effects to regional populations of prickly pear are expected.

Populations in excess of 500 individuals of the wild coco orchid were observed flowering within the old fields on the northeastern portion of the unmined area of the eastern site tract where the main power facilities will be located. Typically, this species inhabits the well-drained sandy soils of sandhill, scrub, and flatwoods communities in central and south Florida. The occurrence of wild coco within the highly altered, scraped-over old field areas on the site attests to its adaptability after major disturbances. Smaller populations of this orchid were also observed within the unmined parcel of the southwestern area of the eastern tract. Since this southwestern area is not scheduled for mining or power plant development, wild coco should persist and eventually extend into the open, wooded communities to be reclaimed on the site.

Although not observed on the site, six other listed plant taxa, namely three Habenaria orchids, the red-needle leaf bromeliad, spoon-flower, and shoestring fern, have a high likelihood for occurrence on the site. These plant species are either listed as threatened by FDACS or rare by FCREPA. Although listed as threatened species, most of these plants are actually quite common and widespread throughout Florida. These species were listed as threatened by FDACS to control their commercial exploitation in the nursery trade, rather than to provide an indication of their biological status. Therefore, the potential occurrence of these species is not considered regionally significant. None of these species were actually observed

during site field surveys. However, the floodplain swamp located along the unnamed tributary to the South Prong Alafia River in the northwest corner of the site could provide suitable habitat for these shade tolerant and/or canopy dwelling species. This tributary and associated floodplain swamp are not proposed for mining and will not be affected by power plant construction or operation. Therefore, no significant adverse impacts to regional populations of the listed taxa are anticipated due to the proposed action.

Wildlife

Construction impacts to wildlife resources at the Polk Power Station may potentially occur in the form of direct impacts (displacement, mortality) or indirect impacts (habitat changes, noise, or human presence). Consideration of any impacts due to the plant construction activities are tempered by the fact that the site is extremely disturbed due to past and ongoing mining activities and that noise and human presence are already present on the site. Also, any such potential impacts would occur as the result of required reclamation activities for mined-out areas on the site even if the proposed Polk Power Station project were not constructed on the site.

Proposed plant construction activities such as habitat alteration, earth-moving, human presence, and noise will force some species to be either permanently or temporarily displaced. Certain species currently inhabiting areas in the main plant facility or reservoir locations will be permanently displaced. Some less motile or fossorial species may be lost during earth-moving activities. Species inhabiting the areas outside the plant facility and reservoir areas may be temporarily displaced while activities are underway. Once the activities are completed, remaining habitats or newly created habitats will again attract similar species. The great diversity of water birds and wading birds associated with the reclaimed and unreclaimed lakes on the eastern portion of the site may move elsewhere for feeding and roosting during construction, but should return and utilize these areas once construction is completed.

As previously discussed, the proposed site development/reclamation plan will actually increase the wetland acreage on the site compared to pre-mining conditions, thereby increasing habitat for water-dependent species. The old mine cut lake on the northeastern portion of the eastern tract where the greatest water and wading bird activity was observed will not be significantly disturbed by the proposed project activities. No nesting areas for these species were identified onsite, so no impacts to nesting of these water-dependent species are expected.

The proposed increase in natural habitats as a result of reclamation/mitigation on the western tract will potentially increase species diversity and use of the site. Other important naturally vegetated areas previously described will be left undisturbed.

Wildlife habitats which will actually be increased from pre-mining conditions include upland hardwood forest, reservoirs, wetland mixed forest, and herbaceous wetlands. This could eventually result in an increase in wetland-dependent species on the site. Also, other indirect impacts (human presence and noise) will not result in significant effects on wildlife since such impacts are currently present as a result of ongoing mining operations.

Since recreational use of the site is currently limited and controlled, no impacts to the recreational use of the site will occur as a result of power plant development. Recreational species (game birds, mammals, and fish) occurring on the site are expected to occur after construction is completed.

The Polk Power Station construction is not expected to affect regional populations of any endangered, threatened, or species of special concern. Of the 31 important wildlife species evaluated for this project (Section 2.3.6), 23 were observed onsite or considered to have a moderate to high likelihood of occurring on the site. Of those, the wetland dependent species such as alligator, osprey, little blue heron, great egret, snowy egret, tricolored heron, black-crowned night heron, least bittern, glossy ibis, white ibis, woodstork, sandhill crane, limpkin, and round-tailed muskrat may

experience temporary displacement during plant construction and site reclamation activities. Similar habitats are abundant on other areas of the site as well as offsite for these species. However, the proposed net increase in open water/wetland habitats created by this project should increase potential use of the site by these species in the future.

The gopher tortoise and potential commensals such as indigo snake, pine snake, short-tailed snake, and gopher frog are generally expected in areas on the site not scheduled for power plant development. Therefore, impacts to these species should be minimal.

The Florida scrub jay was observed once in the area scheduled to be developed for the main plant facilities. However, repeated field survey efforts to confirm its presence or nesting on the site were unsuccessful. Therefore, it is believed no impacts to this species will occur.

Other upland species such as the southeastern kestrel, Cooper's hawk, and Sherman's fox squirrel occur on the fringes of the site or in areas not scheduled for power plant development. Therefore, no impacts to these species are anticipated.

The presence of bald eagles in the site area is exhibited by one active nest adjacent to the site and two abandoned nests onsite. The two abandoned nests are in areas not scheduled for power plant development or disturbance by reclamation activities. The one active nest previously described in Section 2.3.6 occurs offsite along Fort Green Road. Since this nest is 1.5 miles away from the main power block area and 2,500 ft away from the cooling reservoir, construction impacts to this nest are not expected. The pair of eagles are also accustomed to human presence and noise due to the fact their nest is located on a farmstead and close to a county road and active railroad. Since wetland habitats both on- and offsite will be available for foraging, the eagles should continue to use this area. After construction is completed, more open water habitat will be available for foraging.

In summary, the proposed construction/reclamation activities for the Polk Power Station will not significantly affect regional populations of any wildlife species, particularly those that are endangered or threatened. Overall, species will benefit from the proposed project due to the creation of additional higher quality wetland and upland habitats in place of disturbed mined lands. The proposed reclamation plan for the western tract of the site as a wildlife habitat/corridor area will ensure the creation and maintenance of quality wildlife habitats on the Polk Power Station property.

4.4.2 MEASURING AND MONITORING PROGRAMS

The ecological monitoring program conducted on the site in support of this SCA is described in Section 2.3.6. No continued monitoring programs are proposed for biological resources during the proposed construction/reclamation of the site.

4.5 AIR IMPACT

4.5.1 EMISSIONS

Three general activities will generate air emissions during construction of the Polk Power Station. First, land clearing, site preparation and vehicle movement will generate fugitive dust emissions. Second, open burning of cleared land debris may be required and would result in air emissions. And third, internal combustion engines will release nitrogen oxides, carbon monoxide and other combustion products.

The quantity of any emissions released during the construction process will generally be very low, but will vary on an hourly and daily basis as construction progresses. Fugitive dust emissions will be greater during the land clearing and site preparation phases. Fugitive dust emissions will also be greater during the more active construction periods as a result of increased vehicle traffic on the site.

Open burning would result in emissions of PM, CO, NO_x, and hydrocarbons. This activity would be conducted for short periods at a time. The land clearing and construction debris will generally consist of wood products and other relatively clean-burning components. Emissions would depend upon the amount and moisture content of the debris.

Increased emissions from internal combustion engines will occur during the site preparation and facility construction due to the amount of onsite equipment using engines for site excavation and grading, concrete placement, and structural steel and major equipment installation. Potential minor sources of volatile organic compounds include:

1. Evaporative losses from onsite painting,
2. Refueling of construction equipment, and
3. The application of adhesives and waterproofing chemicals.

4.5.2 EMISSION CONTROL MEASURES

Fugitive dust emissions from the construction site will be minimized using appropriate dust suppression control methods. These control methods will include paving roads, applying dust suppressing chemicals or water to roads and other exposed surfaces, or other methods, as needed. Existing public roads leaving the site are currently paved. Permanent, more heavily travelled roads on the site will be paved during the construction period. Spilled and tracked dirt (or other materials) will be removed from roadways and other paved areas in a timely manner. Of course, all construction related fugitive dust emissions will be temporary and will stop once construction is completed. Emissions from open burning will be limited by removing materials whose burning would produce excessive smoke (e.g., green vegetative materials), and by conducting this activity in compliance with applicable state and local regulations and ordinances.

The implementation of appropriate erosion and sedimentation controls will also minimize fugitive dust emission and water quality impacts.

4.5.3 POTENTIAL IMPACTS AND MONITORING PROGRAMS

The air quality impacts caused by construction activity will vary as a function of the level of activity, the specific nature of the activity, the weather conditions while the activity is occurring, and the emission controls applied to the activity. However, even under worst-case conditions, the maximum ambient impacts caused by construction emissions are expected to be very small and limited to the specific area of the site under construction. Also, any potential emissions are expected to be well below any applicable ambient air quality standard. Therefore, no air quality monitoring programs are needed or will be conducted during the construction of the Polk Power Station. As required, Tampa Electric Company will conduct an air quality monitoring program during the project operations (see Section 5.6.2).

4.6 IMPACT ON HUMAN POPULATIONS

4.6.1 LAND USE IMPACTS

Projected construction impacts to the existing land uses within the Polk Power Station site are expected to be insignificant due to its existing disturbed condition resulting from previous and ongoing phosphate mining activities. As previously stated, more than 94 percent of the site has been or will be disturbed by mining operations prior to development and use of the site by Tampa Electric Company.

Similarly, projected construction impacts to the surrounding land uses are expected to be minimal based on the predominance of phosphate mining activities in the area. The nearest single-family residence to the planned location of the Polk Power Station power block and fuel storage area is located approximately 7,000 ft (1.3 miles) east, along Fort Green Road. Approximately 85 homes are located west of SR 37 and north of the Polk Power Station site along Bethlehem and Albritton Roads, with the closest residence in this grouping being approximately 8,000 ft (1.5 miles) west of the power block and fuel storage area. Another 30 homes are located west of the Polk Power Station site boundary in Hillsborough County along and near SR 674, approximately 20,500 ft (3.9 miles) west of the power block and fuel storage area. Further, 14 homes are located along Mills Road off Fort Green Road, approximately 14,700 ft (2.8 miles) southeast of the power block and fuel storage area.

The conceptual site and reclamation plan was previously shown in Figure 3.2.0-1. The site plan shows the planned locations for construction of the main power plant structures (i.e., power block, fuel storage, and by-product storage), parking areas, and road and railroad accesses. This plan also conceptually shows Tampa Electric Company's plans to provide setbacks from the site boundaries and to provide visual buffers for the main power plant facilities along SR 37, CR 630, and Fort Green Road from potential public viewpoints.

The main power block, fuel storage, and associated facilities will occupy only approximately 150 acres of the entire 4,348-acre site. These facilities will be

constructed in the central portion of the site property to the east of SR 37. The mined-out lands surrounding the eastern and southern sides of the site for the main facilities will be developed into an approximately 860-acre, including the earthen berms, cooling reservoir which will be primarily below the pre-mining elevations after development/ reclamation of the site. The development of the Polk Power Station main power plant facilities will not adversely impact existing conditions and land uses onsite.

The power block and fuel storage facilities will be located approximately 2,600 ft from the nearest roadway, SR 37, or to offsite properties which are located northwest of the facility location. In all other directions, the power block and fuel storage areas are located at least 1 mile from offsite properties. Tampa Electric Company is planning to provide vegetative visual buffers along SR 37 and Fort Green Road so that only the tallest structures onsite (i.e., CG facilities and exhaust stacks) will be potentially visible from roadways or offsite property. The combination of significant setback distances and vegetative visual buffers will minimize any adverse offsite visual and land use impacts. Potential noise impacts resulting from the project construction activities are discussed in Section 4.9.

After completion of current phosphate mining activities, the approximately 1,511-acre portion of the site west of SR 37 will be reclaimed in accordance with the proposed reclamation plans, as approved by FDNR and Polk County. As previously shown in Figure 3.2.0-1, the proposed conceptual plans for this tract provide for reclaiming the mined-out lands into a natural system of forested and non-forested wetlands and uplands. No active power plant-related activities are planned on this tract. After reclamation, the tract will be allowed to evolve into a natural wildlife habitat system. Access to this 1,511-acre tract will be controlled which will allow the property to develop into a significant wildlife habitat resource in southwestern Polk County.

Scattered areas of single-family residential uses are located to the north of this western tract along Albritton and Bethlehem Roads and to the west in Hillsborough

County. The closest of these residences is located approximately 8,000 ft (1.5 miles) west of the planned power blocks and fuel storage areas. These residential uses will not be affected by the Polk Power Station development and operation since this western portion of the site will be reclaimed and used only as a natural area of wetlands and uplands and will not contain any of the main power plant facilities.

Due to the nature of proposed development plans of the Polk Power Station site west of SR 37, this portion of the site is compatible with the residential uses in the vicinity of the Polk Power Station site along Bethlehem and Albritton Roads.

4.6.2 COMPREHENSIVE PLANS IMPACTS

The Polk Power Station project is consistent with the goals and policies of the State Comprehensive Plan, Central Florida Comprehensive Regional Policy Plan, and the Polk County Comprehensive Plan. The development of the Polk Power Station will be consistent with, or will further several goals, objectives, and policies of each of these planning documents. Copies of these goals and policies are contained in Appendix 11.4. Table 4.6.2-1 provides a listing of the goals, objectives, and policies according to each plan.

As a Certified Electric-Power Generating Facility, the Polk Power Station is an allowed use within the phosphate mining future land use category designated for the Polk Power Station site, according to the Future Land Use Element of the Polk County Comprehensive Plan. The Comprehensive Plan allows for the development of Certified Electric Power Generating Facilities in the phosphate mining future land use category when such proposed development is reviewed and approved by Polk County by a CUP. The Polk Power Station power block site also satisfies locational, environmental, and development approval of Section 2.114-C of the Polk County Comprehensive Plan. Adjacent future land use categories are compatible with the power station and associated stormwater management areas. The suitability of the Polk Power Station site for the development of an electric-power generating facility is also supported by statements contained within Appendix B2.100 of the Future Land Use Support Document.

Therefore, the construction of the Polk Power Station and associated facilities will be consistent with future land use and comprehensive planning programs in Polk County and will not significantly impact the future use of lands adjacent to the Polk Power Station site.

Table 4.6.2-1. Listing of Goals, Objectives, and Policies of Planning Documents

- State Comprehensive Plan (Section 187, F.S.):
 - Energy, Policy 6;
 - Land Use, Policy 1; and
 - Public Facilities, Policies 1 and 6;
 - Central Florida Comprehensive Regional Policy Plan:
 - Energy, Regional Issue (2), Regional Goal (a), Regional Policy (4);
 - Mining, Regional Issue (1), Regional Goal (a), Regional Policy (2);
 - Land Use, Regional Issue (1), Regional Goal (a), Regional Policy (2);
 - Public Facilities, Regional Issue (1), Regional Goal (a), Regional Policies (1) and (2); and
 - Transportation, Regional Issue (2), Regional Goal (1), Regional Policy (2);
 - Polk County Comprehensive Plan:
 - Future Land Use Element:

Objective 2.102-A;

 - Policy 2.102-A1(a), Compatibility (of land uses);
 - Policy 2.102-A2, Distribution (of land uses); and
 - Policy 2.125-D1(b), Utilities Permitted Uses
 - Conservation Element:

Objective 2.302-A, Air Quality;

 - Policy 2.304-A4, Mineral Resources;
 - Policy 2.307-A3, Floodplains;
 - Policy 2.308-A3, Wetlands; and
 - Policy 2.310-A2, Hazardous Waste/Materials;
 - Economic Element:
 - Policy 2.402-A1, Economic Base Maintenance;
 - Policy 2.402-A5, Economic Base Maintenance;
 - Policy 2.403-A2, Economic Base Diversification; and
 - Policy 2.404-A4, Economic Development Integrated with Planning;
 - Infrastructure Element:
 - Policy 3.102-A1, Sanitary Sewer;
 - Policy 3.102-A2, Sanitary Sewer;
 - Policy 3.102-A3, Sanitary Sewer;
 - Policy 3.102-B4, Sanitary Sewer;
 - Policy 3.102-C1, Sanitary Sewer;
 - Policy 3.104-A5, Drainage;
 - Policy 3.104-A7, Drainage;
 - Policy 3.105-A1, Potable Water;
 - Policy 3.105-A2(d)(e), Potable Water;
 - Policy 3.105-A3, Potable Water; and
 - Policy 3.105-C1, Potable Water; and
 - Traffic Circulation Element:

Policy 3.205-A1, Protection of Rights-of-Way.
-

Source: ECT, 1992.

4.6.3 ZONING ORDINANCES IMPACTS

The Polk Power Station is considered a Class III Essential Service, which is an allowed conditional use for the RC zoning district designated for the Polk Power Station site. Therefore, a CUP was required for compliance with the Polk County Zoning Code. Under the county's zoning ordinance, CUPs are established to allow the approval of specific uses in addition to the permitted uses in each zoning district, and a CUP may be issued for the Polk Power Station site based on the recommendations of the Polk County Zoning Advisory Board and approval of the Board of County Commissioners. A CUP application was filed with Polk County on January 24, 1992, and provided the information required by the Polk County Zoning Ordinance to demonstrate that the Tampa Electric Company Polk Power Station complies with the applicable standards for approval of the CUP. The CUP application was approved by the Polk County Zoning Advisory Board on May 13, 1992, and by the Board of County Commissioners on June 2, 1992.

4.6.4 CONCURRENCY MANAGEMENT IMPACTS

The Polk Power Station will comply with the Polk County Concurrency Management Ordinance. As part of the concurrency determination, capacity will be reserved for transportation and solid waste and drainage standards will need to be met. As presented in the transportation analysis (see Appendix 11.6), based on projected traffic impacts and existing and projected traffic volumes, construction-related traffic is not expected to lower the LOS on roadway links and intersections to unacceptable levels in their current geometries. Sufficient capacity exists on roadways serving the Polk Power Station site. Adequate capacity also exists in county landfills to meet the solid waste disposal needs of the project. Drainage standards will be met through the appropriate design of drainage features and facilities. Capacity for potable water and wastewater will not have to be reserved because connections to municipal services are not required. Concurrency provisions for recreation and open space are not required as the Polk Power Station contains no residential element.

4.6.5 CONSTRUCTION EMPLOYMENT

As shown in Table 4.6.5-1 and Figure 4.6.5-1, the construction workforce is estimated to peak at approximately 600 workers for a 9-month duration. Employment is expected to be highest during the initial project phases (i.e., 1994 to mid-1996) because of the construction activities associated with overall site reclamation, the coal gasification facilities, and ancillary facilities (e.g., cooling reservoir, administrative/control buildings, parking) which will be constructed for ultimate build-out. Construction employment is expected to average approximately 400 workers throughout the projected 27-month initial construction phase. Beyond this initial construction timeframe, an average of 15 and peak of 20 construction workers would be employed for 6 to 9 months for the free-standing CT units, and an average of 40 and peak of 60 construction workers would be employed for 12 to 18 months for the CC units.

The construction workforce is expected to be primarily drawn from Hillsborough and Polk Counties; however, weekly construction commutes of up to 200 miles are possible (EPRI, 1982). It is estimated that approximately 60 percent of the construction workforce will be drawn from Polk County, 30 percent from Hillsborough County, 5 percent total combined from both Manatee and Hardee Counties, and 5 percent from outside the region or state. The geographic distribution of this construction workforce is shown in Table 4.6.5-2, which shows that the 5 percent drawn from outside the region is expected to range from 20 to 30 persons respectively at average and peak employment during the initial (through IGCC unit) construction phase. This 5 percent of the construction workforce drawn from outside the region is anticipated to occupy available rental housing units or recreational vehicle (RV) park sites. However, at 20 to 30 persons, the associated potential impacts on housing, schools, and other public facilities and services will be minimal. Based on the predicted size of the construction workforce to be employed for the subsequent construction of the CT and CC units (see Table 4.6.5-2), their impact on public services and facilities is expected to be negligible. Construction is expected to occur

Table 4.6.5-1. Construction Personnel Requirements

Year	Unit Additions	Total Nominal Station Capacity (MW)	Construction Personnel		Comments
			Average	Peak	
1994	None	0	400	400	Construction of CT and IGCC starts January
1995	One 150-MW CT	150	400	600	Peak personnel, January through September 1995
1996	CG conversion of one 150-MW CT	260	400	400	Construction ends July 1996
1998	None	260	15	20	Construction of next 75-MW unit starts in April; peak personnel, July through September 1998
1999	One 75-MW CT	335	15	20	Construction of next 75-MW unit starts in April; peak personnel, July through September 1999
2000	One 75-MW CT	410	15	20	Construction of CC plant starts in April; peak personnel, July through September 2000
2001	CC conversion of two 75-MW CTs	480	40	60	Construction of next 75-MW CT and 220-MW CC units starts in April 2001; peak at December
2002	One 75-MW CT	555	40	60	Peak personnel, January through May 2002
2003	One 220-MW CC	775	40	40	Construction ends January 2003
2005	None	775	15	20	Construction of next 75-MW unit starts in April; peak personnel, July through September 2005
2006	One 75-MW CT	850	15	20	Construction of next 75-MW unit starts in April; peak personnel, July through September 2006
2007	One 75-MW CT	925	15	20	Construction of next 75-MW unit starts in April; peak personnel, July through September 2007

4.6.5-2

Table 4.6.5-1. Construction Personnel Requirements (Continued, Page 2 of 2)

Year	Unit Additions	Total Nominal Station Capacity (MW)	Construction Personnel		Comments
			Average	Peak	
2008	One 75-MW CT	1,000	15	20	Construction of next 75-MW unit starts in April; peak personnel, July through September 2008
2009	One 75-MW CT	1,075	15	20	Construction of next 75-MW unit starts in April; peak personnel, July through September 2009
2010	One 75-MW CT	1,150	15	20	Construction ends January 2010

Source: UE&C, 1992.

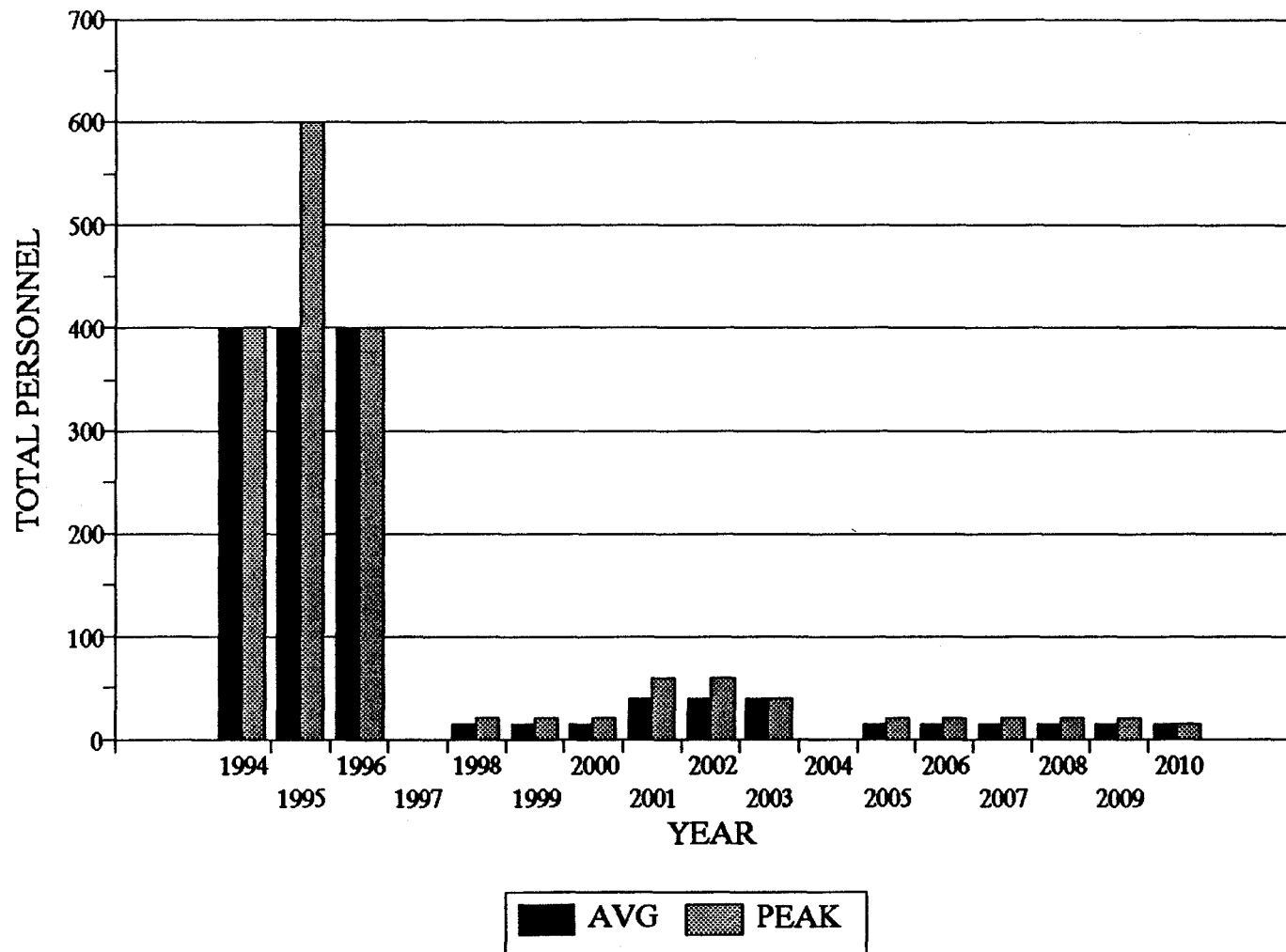


FIGURE 4.6.5-1.

TAMPA ELECTRIC COMPANY POLK POWER STATION CONSTRUCTION PERSONNEL REQUIREMENTS

Source: UEC, 1992.



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Table 4.6.5-2. Estimated Distribution of Construction Workforce

County	Average Construction Workforce	Peak Construction Workforce	Peak CT Construction Employment	Peak CC Construction Employment
Polk (60 percent)	240	360	12	36
Hillsborough (30 percent)	120	180	6	18
Hardee and Manatee (5 percent)	20	30	1	3
Outside region/state (5 percent)	20	30	1	3
TOTAL	400	600	20	60

Sources: UE&C, 1992.
ECT, 1992.

during daylight hours, with the majority of the construction workers onsite between 7 a.m. and 4 p.m.

4.6.6 TRANSPORTATION IMPACTS

Some construction-related transportation impacts are expected as a result of the movement of construction workers, machines, and equipment to and from the Polk Power Station site. The transportation analysis for the Polk Power Station indicates that these impacts are expected to be temporary and will not have significant adverse effects on the LOS ratings of roadway links and intersections in the vicinity of the site (see Appendix 11.6).

Access points for the construction workforce and deliveries will be provided by two entrance roadways: Bethlehem Road entrance from SR 37 and the Fort Green Road entrance. The main plant entrance roadway will be used for operational employees and visitors. All entrances will be gated and access to the plant site will be controlled. These entrances will be designed with appropriate geometric improvements, deceleration, acceleration, and turn lanes, based on FDOT standards, to accommodate construction and operational traffic so that roadway volumes are not lowered to an unacceptable LOS. As previously discussed, these roadway improvements will be constructed during the initial construction activities to accommodate construction-related traffic. A copy of the letter request to FDOT for conceptual review of driveway connections to SR 37 is provided in Appendix 11.2.4.

Based on past construction experience and traffic analyses for similar power plants, a construction-related trip generation rate of 2.0 and a vehicle occupancy rate of 1.4 is expected for the Polk Power Station. Based on these trip generation and vehicle occupancy rates and an assumed trip distribution of 75 percent northbound and 25 percent southbound, a maximum of 644 northbound and 214 southbound daily trips are expected during the 9-month peak of construction. For the expected average of 400 construction workers, 429 northbound and 143 southbound daily trips are estimated for the remaining 18 months of the 27-month initial construction phase. The estimated traffic impacts associated with the subsequent CT and CC units range from a total of 22 to 86 daily trips during the peak of each construction phase. These maximum daily and average trips during initial construction phase and total

daily trips for subsequent construction of CT and CC units are not expected to lower regional road networks to unacceptable LOS standards.

Further, Tampa Electric Company will encourage transportation demand management techniques to reduce the number of temporary construction-related vehicle trips on the road networks. These techniques will include placing a bulletin board onsite which may be used by construction contractors to place car-pooling advertisements. All construction contractors will be requested to inform their employees that this service is available.

During the peak construction activities, construction vehicles (e.g., graders, bulldozers, dump trucks) will also access the site. However, the majority of these heavy construction vehicles are anticipated to remain onsite for the duration of the initial construction activities, entering at initiation and exiting at completion. Since the majority of these vehicles are not expected to make daily trips to and from the site, the potential traffic impacts from the vehicles are expected to be minimal to the regional road network.

4.6.7 HOUSING IMPACTS

For the year 1990, FDLES reported more than 35,000 construction workers in the four-county study area of Polk, Hillsborough, Hardee, and Manatee Counties (BEBR, 1991). Based on this available construction workforce and as previously discussed in Section 4.6.5, the majority of construction workers are expected to be drawn from within the four-county area and will not permanently relocated to the area. It is therefore expected for the majority of these construction workers to commute daily to and from the Polk Power Station site. Some construction workers may choose to drive an RV to the area and stay at available camp sites during the week, returning to their families on the weekends. Because the majority of the construction workforce is anticipated to commute daily, those using RVs and campground facilities are not expected to significantly increase demands upon RV campground facilities.

As previously discussed in Section 4.6.5 and as shown in Table 4.6.5-2, the number of construction workers expected to be drawn from outside the region is predicted to range from an average of 20 to a peak of 30 persons during the initial (through IGCC unit) construction phase. These 20 to 30 persons are anticipated to occupy available rental housing and/or RV sites in the area. Relatively few construction workers are anticipated to be employed during subsequent construction of CT and CC units (see Tables 4.6.5-1 and 4.6.5-2), and consequently, associated impacts on housing are anticipated to be negligible.

As previously discussed in Section 2.2.7, and as shown in Table 4.6.5-2 (1990 Housing Stock), 1990 rental housing vacancy rates ranged from 11.8 percent in Manatee County to 12.6 percent in Polk, 13.5 percent in Hillsborough, and 15.5 percent in Hardee County. In 1990, 30,256 available rental units including seasonal and recreational units were recorded in Polk County, with a total of 98,859 available housing units in the four-county area (BEBR, 1991). Therefore, the relatively small additional temporary demand for rental housing associated with the Polk Power Station construction workforce is expected to be readily absorbed by available rental housing in Polk County and/or the four-county region. Those commuting workers

are expected to maintain their established patterns of use based on their existing residences, which should not create any additional housing demands to the area.

4.6.8 PUBLIC SERVICES AND FACILITIES IMPACTS

As with potential housing impacts, construction-related impacts to public services and facilities are not expected to be significant. The majority of the construction workforce is anticipated to commute from their current residences, with only minimal temporary relocations expected. Therefore, because the workforce is currently provided with public services and facilities associated with their existing residences, no significant changes in the patterns of use or demands upon public services are expected.

4.7 IMPACT ON LANDMARKS AND SENSITIVE AREAS

No federal, state, regional, or local scenic, cultural, or natural landmarks are located within the 5-mile study area surrounding the Polk Power Station. Therefore, the construction of the Polk Power Station will have no impact upon such resources.

4.8 IMPACT OF ARCHAEOLOGICAL AND HISTORIC SITES

Based on the cultural resources assessment conducted for the site and confirmation of those results by FDHR (see Appendix 11.5), the construction of the Polk Power Station is not expected to disturb any archaeological or historical features eligible for the National Register of Historic Places. Therefore, no mitigation to such impacts will be required. In the unexpected event that such a feature is encountered during construction, activities will be halted until a certified archaeologist evaluates the site or find and determines its significance. If the find is significant, Tampa Electric Company will take the appropriate measures to preserve or mitigate the impact to the site or find in coordination with FDHR.

4.9 NOISE IMPACTS

The major construction activities for the Polk Power Station project involve the construction of the IGCC and overall site reclamation, the two CC units, and the six simple-cycle CTs. The construction activities can be divided into four stages for purposes of assessing potential noise impacts:

1. Site preparation and excavation,
2. Foundation preparation and pouring,
3. Steel erection and equipment installation, and
4. Site cleanup and plant startup.

During the initial stage, heavy diesel-powered earthmoving equipment will be the major source of noise. This equipment will include bulldozers, graders, backhoes, front-end loaders, dump trucks, scraper pans, sheepsfoot rollers, and dewatering pumps. Typical noise levels such equipment produces could approach 91 dBA at 50 ft [United Engineers & Constructors, Inc. (UE&C), 1992]. Noise levels for each piece of equipment are listed in Table 4.9.0-1. The location of activity in this stage includes reclamation over the entire site, heavy activity at the plant site and the cooling reservoir, and activities near the site boundaries such as access roads and gates and the rail spur (UE&C, 1992).

For the addition of the CC units and CTs in the later phases of construction, site preparation and excavation activities will be limited to the immediate power block areas and the circulating water lines for the CC units.

Equipment used during second stage activities will include concrete trucks, cranes, pile drivers, air compressors, concrete pumps, and some earthmoving equipment. Typical maximum noise levels could reach 95 dBA at 50 ft (UE&C, 1992). A list of this equipment is given in Table 4.9.0-2. The heaviest activity for all phases will be at the power block and gasifiers. Pile driving may be required for the air separation unit, CTs, and ST generators.

Table 4.9.0-1. Equipment and Noise Levels for the Site Preparation and Excavation Stage

Equipment	Maximum Noise Level at 50 ft (dBA)
Bulldozers	90
Graders	83
Backhoes	84
Front-end loaders	90
Dump trucks	89
Scraper pans	91
Sheepsfoot rollers	83
Dewatering pumps	78

Source: UE&C, 1992.

Table 4.9.0-2. Equipment and Noise Levels for the Foundation Preparation and Pouring Stage

Equipment	Maximum Noise Level at 50 ft (dBA)
Pile drivers	95
Concrete pouring/trucks	87
Cranes	86
Air compressors	89
Concrete pumps	84
Excavation equipment	90
Trucks	87

Source: UE&C, 1992.

Cranes, air compressors, welders, asphalt pavers, dump trucks, and delivery trucks will be required during the third stage for all construction phases. There will also be 12 to 30 rail deliveries of certain equipment and materials on an infrequent basis during the IGCC unit construction activities. The number of rail deliveries for construction purposes will be reduced to 6 to 12 for the CC and CT units. Noise levels produced during equipment installation and erection will be in the range of 78 to 89 dBA at 50 ft (UE&C, 1992), and diesel locomotives will produce a maximum of 97 dBA at 50 ft (UE&C, 1992). Table 4.9.0-3 lists this equipment and their respective noise levels.

The final stage, site cleanup and plant startup, will be approximately 10 dBA quieter than the other stages (BBN, 1977), except during the short periods of time when the steam lines are being cleaned. During steam line cleaning, high-pressure steam is blown through the steam piping between the HRSGs and the ST generators to remove scale or welding debris which could damage the ST blades. The steam is vented directly to the atmosphere through a temporary bypass line constructed specifically for that purpose. Cleaning of the steam lines will require approximately 3 to 10 blows of 1 to 15 minutes per blow over a 2- to 5-day time period. A significant peak sound pressure level at 50 ft of 131 dBA (UE&C, 1992) will be produced. The temporary steam line blow-out activity is predicted to produce a maximum instantaneous noise level of 80 to 83 dBA at the nearest residences. Construction noise mitigation for steam blow-out activities will involve publishing advance notices in the local newspapers of such scheduled events. The earthmoving equipment will be operated according to design specifications and only during daytime working hours.

Figure 4.9.0-1 shows the composite construction noise-level contours overlaid on the power block portion of the project site. The noise contours are based on time-integrated averaged noise data measured during the construction of several power plants (BBN, 1977). These data represent typical noise levels during construction. The site preparation and steel erection stages produce the highest levels of

Table 4.9.0-3. Equipment and Noise Levels for the Steel Erection and Equipment Installation Stage

Equipment	Maximum Noise Level at 50 ft (dBA)
Cranes	86
Air compressors	89
Welders	73
Delivery trucks	87
Diesel locomotives (12 to 30 infrequent rail deliveries)	97
Asphalt paver	89
Dump trucks	87

Source: UE&C, 1992.

NOTE: VALUES ARE GIVEN AS L_{eq} .

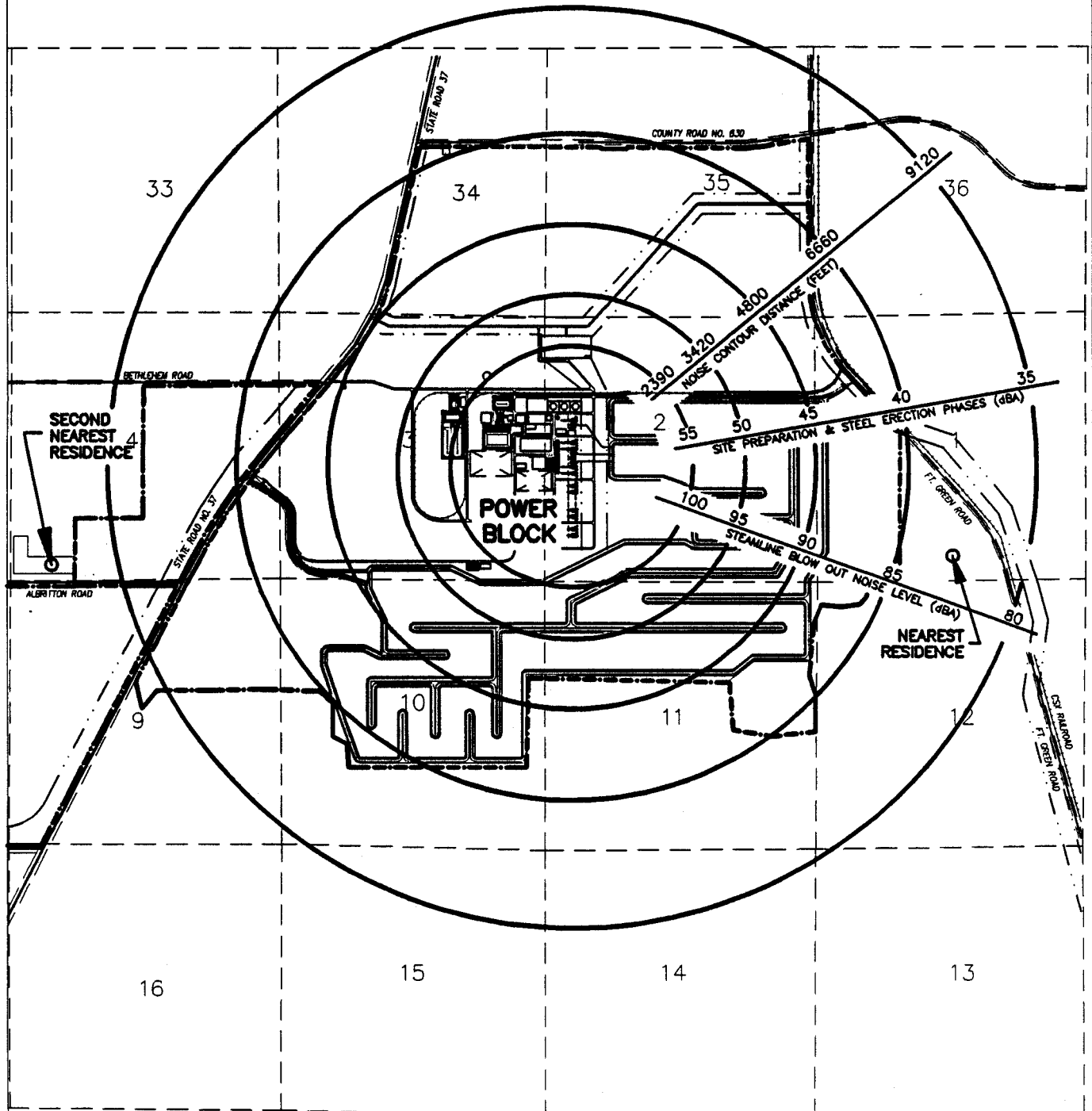
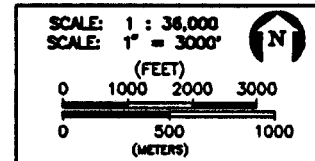


FIGURE 4.9.0-1.

COMPOSITE CONSTRUCTION NOISE-LEVEL CONTOURS

Sources: BBN, 1977. UEC, 1992. ECT, 1992.



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continuous daytime noise. However, due to the large separation between the plant site and the nearest residence, the construction noise levels will be reduced to approximately an equivalent noise level (L_{eq}) of 40 dBA. This level is significantly below the existing L_{eq} of 51 dBA measured near the residence. Consequently, since noise is not additive, normal construction activities at the plant site will have a minor and temporary impacts on the noise environment at residences around the plant.

Noise related to truck traffic could be significant during construction due to noise levels generated [91 dBA at 50 ft (EPA, 1971)] and frequency. However, such impacts will be temporary since it would be limited to the construction phase.

4.10 SPECIAL FEATURES

Construction of the Polk Power Station will involve no unusual products, raw material, garbage disposal services, and incinerator effluents and residues which will have an influence on the environment and ecological systems of the plant site and adjacent areas.

4.11 BENEFITS FROM CONSTRUCTION

The site preparation and construction of the Polk Power Station will create numerous economic benefits to the area. These benefits include increased construction employment and sales taxes levied on construction materials. A detailed description of these benefits is presented in Section 7.0 of this SCA.

4.12 VARIANCES

As part of the state site certification proceedings, two variances are sought from Chapter 16C-16.0051, F.A.C., FDNR Reclamation and Restoration Standards for the development and reclamation of the Polk Power Station site on mined and disturbed phosphate lands. Specifically, a variance from Chapter 16C-16.0051(5), F.A.C., Wetlands and Water Bodies, is needed for the construction of the proposed cooling reservoir and from Chapter 16C-16.0051(11), F.A.C., Time Schedule. Discussions of these variances are provided in Chapter 9.0 of this SCA and in the Conceptual Reclamation Plan Application submitted as a separate document to FDNR. No significant or adverse impacts will result from granting these variances.

No other construction related variances from applicable local, regional, state, or federal standards or guidelines are expected to be required as part of the state site certification proceedings.

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CHAPTER 5.0

EFFECTS OF PLANT OPERATION

This chapter describes the operational interactions of the proposed Tampa Electric Company Polk Power Station and directly associated facilities on the environment on and in the vicinity of the site. The descriptions focus on the potential environmental interactions of the proposed project operations relative to applicable federal, state, and local regulatory requirements and standards. To the extent practicable, the potential impacts of the facility operations are quantified and systematically presented and proposed impact mitigation measures are described to provide reasonable assurance that applicable regulatory requirements and standards will be met during the project operations. In this chapter, appropriate references are provided to other chapters and sections of this SCA, particularly to Chapters 2.0 and 3.0 which present detailed information on the existing environmental conditions on the site and the proposed project facilities, systems, and operations.

5.1 EFFECTS OF THE OPERATIONS OF THE HEAT DISSIPATION SYSTEM

5.1.1 TEMPERATURE EFFECT ON RECEIVING BODY OF WATER

Continuous supply of cooling water at the rate of approximately 247,000 gpm (355.7 MGD) will be needed for cooling purposes for the two 220 MW CC units, the 260 MW IGCC unit, and certain other facilities at the proposed Polk Power Station. A 727-acre (water surface) cooling reservoir will be used as the cooling water supply and will also receive the warmed water discharge and dissipate heat energy during recirculation. The cooling reservoir is designed to have sufficient heat rejection capacity to continuously supply cool water to the power generating units for cooling purposes. The design features of the reservoir are described in Section 3.5.

As discussed previously in Section 3.5, the reservoir will be designed to optimize the plant operation and maximize water reuse; therefore, minimizing the consumptive uses of groundwater while maintaining water quality in the reservoir. To assess the water quality impacts from the cooling reservoir operations, a water quality model,

in conjunction with a groundwater flow model, MODFLOW, was used to predict the long-term water quality in the reservoir considering various makeup, blowdown, and treatment scenarios. The modeling efforts indicated that the optimum design with the least hydrologic and water quality impacts, for both surface water and groundwater, would be a recirculating system having the following design and operating features:

- The reservoir will be maintained at a water level of approximately 136.0 ft-NGVD;
- The reservoir will receive and reuse treated water from the IWT system, sanitary treatment plant, oil/water separators, and R.O. units. The average quantity of the reused water will be approximately 887,600 gpd;
- The reservoir will be replenished by groundwater from the Floridan Aquifer at an average annual rate of 4.91 MGD (or approximately 5.0 MGD); and
- The reservoir will have continuous discharge of approximately 3.1 MGD to control the water quality in the reservoir and of offsite discharges.

The water level of the reservoir will be controlled by the operation of the makeup water supply from the Floridan aquifer. To optimize water quality conditions, a blowdown structure (i.e., Outfall 001) will be provided to prevent continuous accumulation of dissolved material in the reservoir (see Figure 3.5.1-2). As discussed in Section 3.5, the receiving water for discharges from the reservoir will be the reclaimed lake located along the eastern edge of the reservoir and within the project site.

To evaluate the potential temperature impacts of the cooling reservoir operation on the receiving water at Outfall 001, a thermal balance and thermal model were used to predict the monthly water temperatures of the reservoir discharges. The methodology of the thermal model is described in Peterson (1971) and the EPA publication (Tetra Tech, 1985). The model included the effects of short-wave solar radiation, long-wave atmospheric radiation, heat load from the power plant, reflected

short-wave solar radiation, reflected long-wave atmospheric radiation, long-wave back radiation, conductive heat loss, and evaporative heat loss. The forced evaporation due to warmed water was computed according to Harbeck (1964). Various meteorological data, including air temperature, dew point temperature, relative humidity, and windspeed were used for the model inputs.

The water temperature of the reservoir was computed for two scenarios: (1) normal operating conditions, and (2) full load (worst case) conditions. The monthly temperatures at the water intake, the point of blowdown discharge, and within the reclaimed lake receiving water body are shown in Table 5.1.1-1 for average operating conditions. Monthly temperatures for full load conditions are shown in Table 5.1.1-2.

As shown in these tables, the results of the thermal analysis predict that under normal operating conditions the water temperature of the cooling reservoir blowdown will not be higher than receiving water by more than 3.0°F. The worst month of the year in term of thermal stress is December when the discharge temperature is 64.7°F, approximately 2.6°F above ambient water temperature. The highest discharge temperature will occur in August when the blowdown is 87.7°F, approximately 1.6°F above the ambient temperature. According to FDER water quality standards (Chapter 17.302, F.A.C.), the thermal discharge should not exceed 92°F and should not be more than 3°F higher than the ambient temperature of a receiving lake. Therefore, under normal operating conditions, the cooling reservoir discharge will meet these standards and will not have significant adverse impacts in the receiving water (i.e., the onsite reclaimed lake to the east of the cooling reservoir).

When the plant facilities are operating at full load during periods of extremely high power demand, the discharge temperature will be 66.2°F in December, approximately 4.1°F above receiving lake temperature which would exceed the FDER standards of a delta temperature of not more than 3°F. As shown in Table 5.1.1-2, this temperature standard is also predicted to be exceeded in January, February, and November under these full load operating conditions. The maximum blowdown

Table 5.1.1-1. Heat Budget Summary for the Proposed Tampa Electric Company Polk Power Station Cooling Pond--Average Load Conditions

Item	Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ambient air temperature	AF	61.2	62.7	66.0	71.4	76.8	80.6	81.6	82.0	80.5	74.7	66.8	62.3
Ambient air relative humidity	%	75.5	73.0	73.5	71.0	68.5	73.5	76.5	79.0	77.0	76.0	75.5	75.8
Ambient air water vapor pressure	mm Hg	10.4	10.6	12.0	13.9	16.1	19.5	21.0	22.0	20.4	16.6	12.7	10.9
Barometric pressure	mb	1,017	1,016	1,015	1,014	1,012	1,013	1,014	1,014	1,013	1,014	1,015	1,017
	mm Hg	782	781	780	780	778	779	780	780	779	779	781	782
Windspeed	mph	9.1	9.7	10.0	9.7	9.2	8.4	7.6	7.4	8.6	9.1	8.9	8.9
Cloud cover	%	53	47	48	47	46	58	63	61	60	47	46	52
Solar radiation, shortwave at surface	Btu/ft ² /day	1,210	1,447	1,754	1,994	2,205	2,124	1,976	1,828	1,672	1,480	1,317	1,110
Net shortwave solar radiation	Btu/ft ² /day	1,174	1,403	1,701	1,934	2,139	2,060	1,917	1,773	1,622	1,436	1,278	1,077
Net longwave atmospheric radiation	Btu/ft ² /day	2,348	2,359	2,472	2,639	2,817	3,070	3,168	3,195	3,106	2,795	2,503	2,380
Longwave back radiation	Btu/ft ² /day	2,986	3,039	3,154	3,291	3,424	3,542	3,576	3,581	3,501	3,321	3,118	2,991
Evaporative heat loss	Btu/ft ² /day	518	674	893	1,146	1,404	1,442	1,356	1,242	1,136	859	628	467
Conductive heat loss	Btu/ft ² /day	25	56	119	127	121	144	149	140	92	45	28	(7)
Discharge flow	cfs	550	550	550	550	550	550	550	550	550	550	550	550
Reservoir area	acres	727	727	727	727	727	727	727	727	727	727	727	727
Thermal exchange coefficient	Btu/ft ² /day	170	186	207	221	230	229	216	212	230	214	184	169
Relative humidity at pond surface	%	100	100	100	100	100	100	100	100	100	100	100	100
Vapor pressure (sat'd at pond surface)	mm Hg	19.9	21.1	24.1	28.3	32.9	37.6	39.9	40.2	36.5	29.7	23.6	20.4
Plant load factor	%	75	75	75	75	75	75	81	81	81	78	78	78
Heat load to cooling pond	Btu/ft ² /day	1,410	1,410	1,410	1,410	1,410	1,410	1,520	1,520	1,520	1,460	1,460	1,460
Natural water equilibrium temperature	AF	61.9	64.2	69.1	74.7	80.0	84.6	85.9	86.1	83.0	75.9	67.6	62.1
Thermal increase	AF	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Temperature at condenser intake	AF	63.8	65.7	70.2	75.6	80.8	85.4	87.2	87.4	84.1	77.0	69.3	64.3
Hot side temperature	AF	83.8	85.7	90.2	95.6	100.8	105.4	107.2	107.4	104.1	97.0	79.3	84.3
Blowdown temperature	AF	64.2	66.0	70.5	75.9	81.1	85.7	87.5	87.7	84.3	77.3	69.7	64.7
Delta-T (blowdown, ambient)	AF	2.3	1.8	1.4	1.2	1.1	1.1	1.6	1.6	1.3	1.4	2.1	2.6

Note: mm Hg = millimeters of mercury.

mb = millibar.

Btu/ft²/day= British thermal unit per square foot per day.

Source: ECT, 1992.

Table 5.1.1-2. Heat Budget Summary for the Proposed Tampa Electric Company Polk Power Station Cooling Pond--Full Load Conditions

Item	Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ambient air temperature	AF	61.2	62.7	66.0	71.4	76.8	80.6	81.6	82.0	80.5	74.7	66.8	62.3
Ambient air relative humidity	%	75.5	73.0	73.5	71.0	68.5	73.5	76.5	79.0	77.0	76.0	75.5	75.8
Ambient air water vapor pressure	mm Hg	10.4	10.6	12.0	13.9	16.1	19.5	21.0	22.0	20.4	16.6	12.7	10.9
Barometric pressure	mb	1,017	1,016	1,015	1,014	1,012	1,013	1,014	1,014	1,013	1,014	1,015	1,017
	mm Hg	782	781	780	780	778	779	780	780	779	779	781	782
Windspeed	mph	9.1	9.7	10.0	9.7	9.2	8.4	7.6	7.4	8.6	9.1	8.9	8.9
Cloud cover	%	53	47	48	47	46	58	63	61	60	47	46	52
Solar radiation, shortwave at surface	Btu/ft ² /day	1,210	1,447	1,754	1,994	2,205	2,124	1,976	1,828	1,672	1,480	1,317	1,110
Net shortwave solar radiation	Btu/ft ² /day	1,174	1,403	1,701	1,934	2,139	2,060	1,917	1,773	1,622	1,436	1,278	1,077
Net longwave atmospheric radiation	Btu/ft ² /day	2,348	2,359	2,472	2,639	2,817	3,070	3,168	3,195	3,106	2,795	2,503	2,380
Longwave back radiation	Btu/ft ² /day	2,986	3,039	3,154	3,291	3,424	3,542	3,576	3,581	3,501	3,321	3,118	2,991
Evaporative heat loss	Btu/ft ² /day	518	674	893	1,146	1,404	1,442	1,356	1,242	1,136	859	628	467
Conductive heat loss	Btu/ft ² /day	25	56	119	127	121	144	149	140	92	45	28	(7)
Discharge flow	cfs	550	550	550	550	550	550	550	550	550	550	550	550
Reservoir area	acres	727	727	727	727	727	727	727	727	727	727	727	727
Thermal exchange coefficient	Btu/ftc/day	180	196	216	230	239	237	222	218	236	223	193	177
Relative humidity at pond surface	%	100	100	100	100	100	100	100	100	100	100	100	100
Vapor pressure (sat'd at pond surface)	mm Hg	21.9	23.0	26.1	30.5	35.3	40.0	41.8	42.1	38.3	31.7	25.6	22.1
Plant load factor	%	100	100	100	100	100	100	100	100	100	100	100	100
Heat load to cooling pond	Btu/ft ² /day	1,870	1,870	1,870	1,870	1,870	1,870	1,870	1,870	1,870	1,870	1,870	1,870
Natural water equilibrium temperature	AF	61.9	64.2	69.1	74.7	80.0	84.6	85.9	86.1	83.0	75.9	67.6	62.1
Thermal increase	AF	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Temperature at condenser intake	AF	65.3	67.0	71.3	76.6	81.7	86.4	88.0	88.3	84.8	78.0	70.5	65.7
Hot side temperature	AF	85.3	87.0	91.3	97.6	101.7	106.4	108.0	108.3	104.8	98.0	90.5	85.7
Blowdown temperature	AF	65.9	67.5	71.7	77.0	82.1	86.7	88.4	88.7	85.2	78.4	71.0	66.2
Delta-T (blowdown, ambient)	AF	4.0	3.3	2.6	2.3	2.1	2.1	2.5	2.6	2.2	2.5	3.4	4.1

Note: mm Hg = millimeters of mercury.

mb = millibar.

Btu/ft²/day= British thermal unit per square foot per day.

Source: ECT, 1992.

temperature is predicted to be 88.7°F in August, approximately 2.6°F above receiving lake temperature. The thermal analysis assumes that the plant loads are 100 percent at all times during the year and for all units after full built-out. In reality, however, such full load conditions are unlikely to occur, and if they do, will only occur for a few days per year. Therefore, the results of the analysis are extremely conservative, especially considering the fact that the time of one cycle of cooling water recirculation through the reservoir is greater than 10 days, and the travel time of the cooling water to reach the point of discharge is greater than 9 days.

To assess the thermal impacts of the cooling water blowdown in the receiving lake under the worst-case conditions (long-term full load in December), a mixing zone analysis was conducted. The thermal mixing zone analysis used a conservative approach in that only the effects of heat exchange in the receiving water were considered, while turbulent mixing, a more effective mechanism of temperature reduction, is not considered in the analysis. Table 5.1.1-3 presents the results of the thermal mixing zone analysis which indicate that within an approximately 200-ft distance from the point of discharge, the temperature will be reduced to less than 3°F above the ambient temperature in the receiving water body. The receiving reclaimed lake is approximately 3,800 ft long and 900 ft wide, and this 200-ft radius mixing zone only represents approximately 1.8 percent of the total lake surface area.

As described in Section 3.5.1-1, in addition to the continuous blowdown structure, a 10-ft wide overflow weir will be provided at Outfall 001 to drain excessive rainfall during extreme storm events. The stormwater overflow structure is designed so that it will allow stormwater overflow only for storm events greater than 7.2 inches.

Although extreme storm events (i.e., 25-year, 24-hour) will create greater discharge, up to 8.2 cfs from the cooling reservoir than under the normal operating conditions, the onsite runoff into the reclaimed lake will significantly mix the reservoir blowdown as discussed in Section 3.8.4 and depicted in Figure 3.8.4-4. The maximum mixing ratio is estimated to be about 82:1 at the peak of the storm and is estimated to

Table 5.1.1-3. Thermal Mixing Zone Analysis

Distance (ft)	Temperature Difference (°F)	Water Temperature (°F)
0	4.10	66.2
50	3.99	66.1
100	3.68	65.8
200	2.67	64.8
300	1.56	63.7
400	0.73	62.8
500	0.28	62.4
1,000	0.00	62.1

Note: Blowdown rate = 3.1 MGD.
 Heat exchange coefficient = 177 Btu/ft²/day/°F.
 Water depth = 15 ft.
 Ambient water temperature = 62.1°F.
 Temperature at POD = 66.2°F.

Source: ECT, 1992.

decrease to 1.8:1 after 300 hours (12.5 days) when the reservoir discharge predicted is dropped to 5.5 cfs. In addition to the mixing effects of the onsite runoff, the precipitation will also provide further cooling. Therefore, the increased warmed water discharge from the reservoir during extreme storm events may not create a greater mixing zone than under normal conditions. To quantify the size of the mixing zone during extreme storm events; however, an even more conservative approach than the one describe above was used. The analysis assumed the following:

- The cooling reservoir discharge is at a constant rate of 8.2 cfs, which is the peak discharge;
- The mixing flow (up to 90:1 mixing ratio) is ignored in the analysis;
- Turbulent mixing is ignored;
- Cooling effects of the precipitation is neglected; and
- Only the surface heat exchange is considered in the analysis.

The size of the mixing zone given the above conservative assumptions is calculated to be less than 250 ft from the point of discharge, and is estimated to represent approximately 2.9 percent of the total receiving reclaimed lake area.

Based on the results of the thermal and mixing zone analyses, the normal operation of the cooling reservoir will cause no adverse impacts in the receiving reclaimed lake. Only during full load and with extremely high water level in the reservoir will a mixing zone of less than 250 ft radius from point of discharge be expected. The location and size of this worst-case thermal mixing zone is shown in Figure 5.1.1-1. The cooling reservoir discharge will have no thermal impacts on the receiving water bodies, including Little Payne Creek which flows to Payne Creek and then to the Peace River.

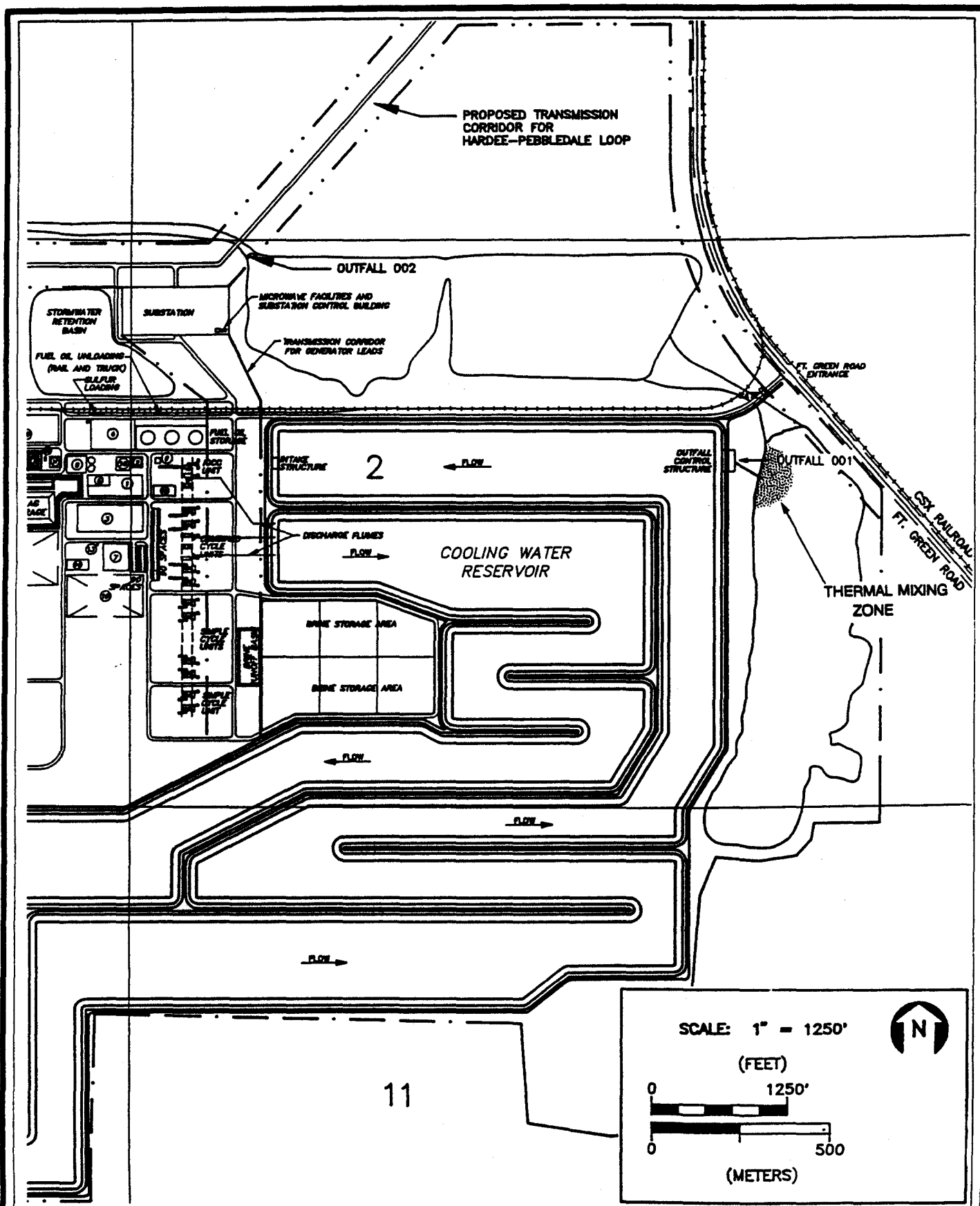


FIGURE 5.1.1-1.

THERMAL MIXING ZONE (WORSE CASE CONDITION - FULL LOAD AND MAXIMUM DISCHARGES)

Source: UEC, 1992; ECT, 1992.



POLK
POWER
STATION

5.1.2 EFFECTS ON AQUATIC LIFE

5.1.2.1 Thermal Impacts

The proposed Polk Power Station cooling reservoir will discharge into the northwestern corner of the reclaimed lake located within the project boundaries on the east side of the site. Water will then drain from the lake through a swale on the southern edge of the lake into the Little Payne Creek drainage system. The predicted maximum average reservoir temperature on the cold side at the condenser intake is estimated to be 88.3°F in August. The maximum worst case monthly discharge temperature (August) would be 88.7°F under plant full load conditions. At the point of discharge, these worst case discharge temperatures are within the acceptable water quality criteria for peninsular Florida streams. The thermal criteria for maximum discharge temperature in the project area is 92°F, while the predicted worst case discharge temperature is 88.7°F. Additionally, the maximum water temperature increase over ambient conditions at point of discharge is predicted to be 4.1°F which is less than the state standard of 5°F for receiving streams but slightly higher than the standard for receiving lakes (3°F above ambient). In less than 250 ft from the point of discharge into the reclaimed lake, the thermal plume will be reduced to less than 3°F above ambient temperature. Based on these factors, no significant thermal impacts are anticipated to aquatic life not only within plant site boundaries but downstream and offsite as well.

5.1.2.2 Impingement and Entrainment

Plant makeup water will be groundwater and waters from the cooling reservoir. Therefore, impingement and entrainment are not potential sources of impacts to aquatic organisms since natural surface waters will not be used.

5.1.2.3 Thermal Shock

Based on a natural water equilibrium temperature of 62.1°F in December and a maximum cooling reservoir discharge temperature of 66.2°F during winter, a maximum temperature differential of 4.1°F may occur. The greatest potential for thermal shock will be localized within 250 ft from the point of discharge (i.e., the

mixing zone) during winter at the northwestern corner of the reclaimed lake on the site. The maximum summer temperature differential is estimated to be 2.6°F at the point of discharge. During summer, aquatic organisms will be acclimated to high temperatures and therefore, may be more tolerant to slight increases in ambient levels. At temperatures greater than their thermal preference, fish tend to avoid or move away from the heated waters (Talmage and Opresko, 1981). Because of the differences in thermal responses of different fish species, the seasonal changes in preference of species, and variation in temperatures across the mixing zone, fish will exhibit temporal and spatial variation near a thermal discharge. However, this very seldom results in a permanent loss of species from the local population.

Class III water quality standards for receiving streams will be met at the point of discharge (5°F limit in receiving streams), and the state standard for receiving lakes (3°F limit above receiving lake temperature) will be met beyond the mixing zone, an area of less than 250 ft from the point of discharge. Thus based on the worst cases modelled for this project, no impacts to aquatic organisms are anticipated outside the mixing zone.

5.1.3 BIOLOGICAL EFFECTS OF MODIFIED CIRCULATION

No water intake structures will be placed in any natural drainages located on or off the project site. Discharges from the cooling reservoir will enter the reclaimed lake on the eastern side of the property and eventually enter Little Payne Creek. As previously discussed, a mixing zone of less than 250 ft from the point of discharge at the northwestern corner of the reclaimed lake and the retention time in the lake will limit thermal impacts. When waters are discharged to Little Payne Creek, no temperature impacts to aquatic organisms are anticipated.

Cooling reservoir blowdown will be discharged at a rate of approximately 3.1 MGD. This relatively small amount will have two hydrological and ecological benefits to Little Payne Creek downstream of the site. First, the average volume of water entering the creek will be increased slightly over pre-mining conditions, which will help maintain water in the creek on a more permanent basis. Second, the peak flood levels will be reduced in exchange for a more constant flow throughout the year. These two benefits will serve to maintain aquatic habitats year round, thereby maintaining use of the system by aquatic organisms.

The increased volume and flow are not anticipated to be significant enough to cause scouring, bank erosion, or deposition of suspended solids in Little Payne Creek. Therefore, such negative effects on aquatic organisms are not anticipated from cooling reservoir discharges.

5.1.4 EFFECTS OF OFFSTREAM COOLING

The proposed project will use a 727-acre (water surface area) recirculating cooling reservoir as the heat rejection/dissipation system. Since cooling towers will not be used, significant fogging and drift impacts associated with cooling tower operations will not occur. The warm side temperature in the cooling reservoir is approximately 23.5°F above the equilibrium temperature under the full load worst-case conditions. Because of this warmer water temperature, slight fogging may occur during cool, humid, and no wind movement conditions, mostly during early mornings. However, the fogging will be noticeable only in a thin layer above the water surface, and strong updrafts carrying heavy vapors are not expected to occur. This thin layer of surface phenomena will be easily broken up even with slight wind movement. In addition, the reservoir surface is approximately 9 ft below the top of the surrounding berm; therefore, this thin layer of fog will be mostly confined within the immediate project area. Any fog escaping from the confining berm will be dispersed and is not expected to cause traffic hazards.

As discussed in Section 3.5.1, recycled wastewater to be used as supplemental makeup water will be treated prior to discharging into the reservoir. As a result, water in the cooling reservoir will meet surface water quality standards, and volatile substances will not be present in the water. Therefore, minor fogging will not have adverse health impacts. The discharges of treated stormwater runoff to the reservoir will have a fecal coliform concentration of no more than 200 counts per 100 milliliters (mpn/100 mL). With this loading rate, the long-term fecal coliform concentration will be less than 1 mpn/100 mL, even if the lowest decay rate found in literature was used for the calculation. Therefore, bacteria in the reservoir will not cause human health concerns.

5.1.5 MEASUREMENT PROGRAM

5.1.5.1 Groundwater

A groundwater monitoring program will be developed and implemented for the operation of the proposed Polk Power Station in accordance with applicable FDER regulatory requirements under Chapter 17-28, F.A.C. This plan is provided in Appendix 11.7.8.

5.1.5.2 Surface Water

For the proposed project operations, a surface water quality monitoring plan will be established to measure selected parameters in the cooling reservoir effluent at **Outfall 001**. The water discharge temperature of the blowdown as well as blowdown flow will be monitored on a weekly basis. A minimum of one grab sample will be taken daily for measurement of TSS, oil and grease, and pH. These effluent samples will be collected and analyzed in accordance with analytical methods approved under 40 CFR 136.

5.1.5.3 Biological

Due to lack of anticipated ecological impacts from cooling reservoir operation proposed for Polk Power Station, no biological monitoring is proposed.

5.2 EFFECTS OF CHEMICAL AND BIOCIDES DISCHARGES

5.2.1 INDUSTRIAL WASTEWATER DISCHARGES

5.2.1.1 Surface Water Discharges

The Polk Power Station operation will result in the discharge to surface waters of the following:

- Cooling water reservoir blowdown,
- Stormwater associated with industrial activity, and
- Stormwater not associated with industrial activity.

In addition to the recirculating cooling water, the following wastewater streams will contribute to the cooling reservoir blowdown:

- IWT system effluent;
- Sanitary treatment system effluent;
- Stormwater runoff from the fuel oil storage area, substation, and CT/CC areas; and
- R.O. concentrate.

The water quality of these streams is presented in Table 3.5.1-1, and the projected water quality in the cooling reservoir is presented in Table 3.5.1-2.

The recirculating cooling water will be chlorinated prior to entering the condensers. The discharge of recirculating cooling water will contain a maximum concentration of 0.2 mg/L total residual chlorine.

As described in Section 3.5.4.3, the IWT system will treat a number of low-volume waste streams including:

- Non-chemical cleaning waste;
- Water treatment filter backwash;
- Demineralizer regeneration waste; and
- Boiler blowdown.

In addition, the IWT system will receive stormwater runoff associated with industrial activities from the following areas:

- Slag storage,
- IWT system sludge storage,
- Coal pile,
- Active brine storage,
- Sulfur/H₂SO₄ storage, and
- CG equipment area.

Stormwater runoff from the slag, IWT sludge, brine, and coal pile storage areas will be treated in basins to provide settling prior to their discharge to the IWT system for further treatment. The design criteria for these basins and storage areas are detailed in Section 3.1.1.8, 3.1.4.6, and 3.3.1.3. Any leachate from the brine storage area will be sent to the brine concentrator for treatment.

As described in Section 3.5.4.3, stormwater runoff from the fuel oil storage switchyard, and CT/CC areas will be treated by an oil/water separator prior to being discharged to the cooling reservoir. Stormwater runoff from the sulfur storage and CG equipment areas is discharged directly to the IWT system for treatment prior to discharge to the cooling reservoir.

All of the streams receiving treatment in the IWT system are described in Section 3.5.4.3. The treatment system will be designed to meet NSPS effluent guidelines, as appropriate, and other applicable standards prior to the discharge of this effluent to the cooling reservoir.

Sanitary wastewater will be treated in the activated sludge package unit, as described in Section 3.5.2. The system will provide a level of treatment which will comply with applicable standards under Chapter 17-600, F.A.C., prior to its discharge to the cooling reservoir. The sludge generated will be disposed of at an approved offsite facility.

The R.O. concentrate is an additional low-volume wastewater which is discharged to the cooling reservoir as described in Section 3.5.4.2.

The use of the cooling water reservoir maximizes the retention and recycling of these wastewater flows while providing further water quality treatment prior to the discharge to offsite surface water. Based on the anticipated plant and cooling water balance (see Section 3.5) and the reservoir inflow quality, the long-term reservoir water quality has been estimated. This long-term reservoir quality reflects the quality of discharges from the reservoir to the reclaimed lake on the site which eventually flows to Little Payne Creek. As shown in Table 3.5.1-2, the water quality of the reservoir complies with all applicable surface water quality standards. As discussed in Section 5.12, the discharges from the reclaimed lake and off the Polk Power Station site will also meet all applicable water quality standards. Therefore, surface water discharge of cooling reservoir water is not expected to adversely impact the water quality conditions of Little Payne Creek, or impair or interfere with any current or future beneficial use of these waters.

These results are considered conservative because they are based on chemical mass balances only and do not take into account any chemical precipitation, sedimentation or biological activity which may occur in the reservoir. These processes may result in a significant amount of removal of suspended and/or dissolved solids from the water, resulting in an even better water quality of discharges than that presented in Table 3.5.1-2.

In addition to the areas previously described, stormwater runoff from other areas on the plant site associated with industrial activity will be collected and treated in the stormwater management system described in Section 3.8. The system will discharge to the old mine cut lake located northeast of the power block area (Outfall 002).

Stormwater runoff not associated with industrial activity will be primarily generated in the portion of the site located west of SR 37. As described in Section 3.8.1, these

wetland/wildlife corridor areas discharge stormwater runoff to unnamed tributaries of the South Prong Alafia River and to Payne Creek. Stormwater discharges from these areas will meet applicable water quality standards.

5.2.1.2 Groundwater Discharges

There will be no direct chemical or biocide discharges to groundwater, except for possible indirect discharges to groundwater which may occur due to accidental spills from chemical handling and storage areas. The proposed measures to prevent and manage such potential discharges are described in the facility's Preliminary SPCC Plan (Appendix 11.13.1), Preliminary RCRA Contingency Plan (Appendix 11.13.2), and in the Best Management Plan (Appendix 11.1.1).

The long-term water quality in the reservoir reflects the quality of seepage from the reservoir to shallow groundwater. As shown in Table 3.5.1-2, the seepage from the reservoir is expected to comply with applicable Florida primary and secondary drinking water standards (Chapter 17-550.310, F.A.C.) with the exception of iron and manganese, which are secondary drinking water standards. These standards apply to water which is delivered to the free-flowing outlet of the ultimate user of a public water system; however, they are generally used as groundwater quality standards in the State of Florida pursuant to Chapter 17-520.420, F.A.C. Because the quality of the reservoir water meets the primary maximum contaminant levels (MCLs) and because there are no shallow drinking water wells in the vicinity of the site, no significant impacts to human health are expected to occur as a result of the reservoir seepage to the shallow groundwater.

As shown in Table 3.5.1-2, the reservoir water quality does not meet the secondary MCLs for manganese and iron. The MCL for manganese is 0.05 mg/L, while the reservoir water concentration is predicted to be 0.081 mg/L. The MCL for iron is 0.3 mg/L, while the level in the reservoir water is predicted to be 0.959 mg/L.

Secondary drinking water MCLs are established to control contaminants in drinking water that primarily affect the aesthetic qualities relating to the public acceptance of drinking water (40 CFR 143.1). At considerably higher concentrations of these contaminants, health implications may also exist, as well as aesthetic degradation. Based on the data presented in Table 3.5.1-2, some aesthetic degradation of the shallow groundwater in the immediate site vicinity may be expected because the concentration of manganese and iron is above the ambient shallow groundwater concentrations.

The concentrations of these two parameters are relatively close to the secondary MCLs; therefore, no adverse impacts are expected from a human health perspective. The water seeping from the reservoir will receive a significant amount of mixing with water in the shallow aquifer. Because there are no drinking water wells in the vicinity of the site, no impacts to the aesthetic quality of drinking water supplies are expected. Any concentration of iron or manganese above the secondary standard is expected to remain localized near the cooling reservoir.

5.2.1.3 Biological Impacts

The cooling reservoir water quality was presented previously in Section 3.5.1. As shown in Table 3.5.1-2, all surface water quality parameters will meet state standards when discharged into the cooling reservoir, except for temperature during certain winter months and under extended periods of full load operation. The temperature of the discharge water will meet temperature standard within a mixing zone of less than 250 ft from the outfall. The water exiting the site at the southern edge of the lake will also meet all surface water quality standards.

Gaseous chlorine will be used as a biocide for cooling system protection and will be introduced in conformance with the allowable residual chlorine discharge requirements as specified in 40 CFR 423.15 (i.e., 0.2 mg/L for 2 hour daily intervals). Based on the anticipated travel time for the cooling water to reach the point of discharge (greater than 9 days), the mixing factors, and the natural decay, the level

of total residual oxidants near the reservoir outfall should be negligible. If other biocides are used in the cooling reservoir and the recirculating system in the future, under similar conditions, they should also be undetectable when discharged as part of the reservoir outfall discharges.

The sanitary wastewater system and the potable and process water treatment system will also use chemicals for their processes. Based on the treatment provided prior to discharge to the cooling reservoir, these influents to the cooling reservoir are not expected to result in a toxicity issue. Chemical cleaning wastewater generated by the periodic cleaning of the heat recovery steam generator boilers will be collected and temporarily stored in a chemical cleaning wastewater or holding tank. A boiler cleaning contractor will transport the chemical cleaning waste offsite for treatment and disposal.

Based on the above factors, no biological impacts from the cooling reservoir discharges are anticipated outside the thermal mixing zone of the onsite reclaimed lake or in any offsite waters.

5.2.1.4 Biological Measurement Program

Because of the lack of any anticipated ecological impacts, no biological monitoring is proposed.

5.2.2 COOLING TOWER BLOWDOWN

Cooling towers will not be used as the heat dissipation system. Analysis concerning the feasibility of using cooling towers as an alternative is discussed in Chapter 8.0.

5.2.3 MEASUREMENT PROGRAMS

The physical and chemical monitoring program for the surface water in the project area is described in Section 5.1.5.

5.3 IMPACTS ON WATER SUPPLIES

5.3.1 SURFACE WATER

5.3.1.1 Surface Water Consumptive Impacts

The proposed project will not withdraw, divert, or consume surface water from natural water bodies for plant operation purposes. An annual average of approximately 5.0 MGD of makeup water will be withdrawn from the Floridan aquifer and discharged into the cooling reservoir to compensate for the evaporative losses.

To maintain water quality in the cooling reservoir, an approximately 3.1-MGD discharge from the reservoir will be needed. This reservoir discharge will be received by a reclaimed lake on the eastern edge of the site and then routed downstream to Little Payne Creek. Therefore, the proposed project will augment the base flow of the eventual receiving waters, i.e., Little Payne Creek, Payne Creek, and Peace River, and prevent extended dry periods as frequently observed in these watersheds. The stormwater management system will also suppress peak flow and provide base flow for South Prong Alafia River and Payne Creek watersheds as discussed in Section 3.8.4. In addition, the water level in the cooling reservoir will be at an elevation of approximately 136 ft-NGVD which is slightly higher than the surficial groundwater level; therefore, a net seepage (approximately 250,000 gpd) from the reservoir into the surficial aquifer will occur. This additional groundwater recharge will in turn recharge the streams in the area. Therefore, the proposed project will have no adverse hydrologic impacts.

5.3.1.2 Surface Water Quality Impacts

According to the water quality modeling for the cooling reservoir, the water in the reservoir will not violate any Class III surface water quality standards after long-term operation (see Table 3.5.1-2). Therefore, potential surface water quality impacts are not expected from the proposed cooling reservoir discharges for the Polk Power Station operations.

5.3.2 GROUNDWATER

5.3.2.1 Consumptive Use Impacts

The main consumptive groundwater use impact from the Tampa Electric Company Polk Power Station is the planned withdrawal of potable, process, and makeup water from the Floridan aquifer. Four production wells will be required (two wells installed in two stages) for full build-out of the power plant. Two 10-inch inside diameter wells each providing yields of 230 to 290 gpm will be installed prior to January 1995 and operate until January 1999. Prior to January 1999, two 24-inch outside diameter wells will be installed. The yields for each of these larger wells will range from approximately 1,750 to 2,900 gpm. These wells will be capable of obtaining substantially higher yields, and with assistance of two 10-inch wells, achieve the required production. If one of the large wells requires unscheduled well maintenance or is temporarily lost, the makeup into the reservoir will also be temporarily stopped. Thus, no additional backup wells will be required. The annual average and annual maximum withdrawal rates are approximately 6.6 MGD and 9.3 MGD, respectively. Of the 6.6 MGD average annual withdrawal, approximately 5.0 MGD will be for makeup water to the reservoir, approximately 1.6 MGD for industrial process service water uses, and 0.01 MGD for potable water uses.

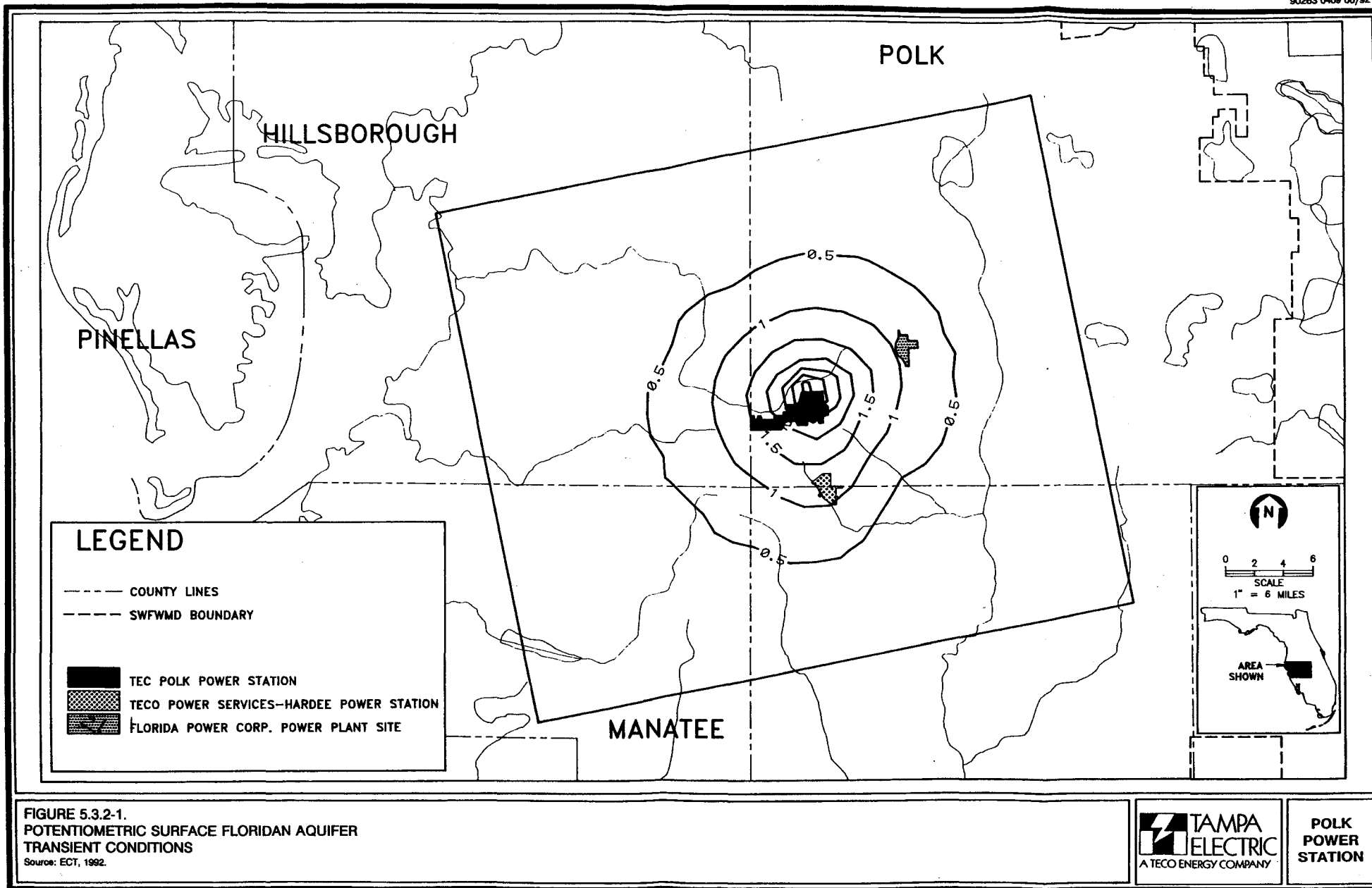
Two production wells, within each of the two well field stages, will be spaced approximately 350 ft apart to allow a better efficiency for pumps and wells to operate within their designed ranges. Additionally, this will distribute and minimize the drawdown within the cone of depression.

A regional, three-dimensional, groundwater flow model (MODFLOW) was used to evaluate drawdown impacts at the Tampa Electric Company Polk Power Station site, onsite and at the property boundaries. The results of the groundwater model were compared to analytical, steady-state, leaky confined aquifer results with excellent agreement. Two different types of simulations were completed with the model. First, a transient 45-day simulation at the maximum average annual withdrawal rate, and second, a steady-state simulation at the average annual withdrawal rate. The

results are shown in Figures 5.3.2-1 and 5.3.2-2, respectively. The modeled Floridan aquifer drawdown predictions for these and additional simulations including the future operations of the Hardee Power Station located approximately 4 miles south of the site are summarized in Table 5.3.2-1. From comparison of the modeled and analytical calculations and well field design, the projected Floridan aquifer drawdowns at the Tampa Electric Company Polk Power Station property boundary are expected to be approximately 5 ft. A detailed summary of the regional model including its application and results is provided in Appendix 11.7.7.

5.3.2.2 Recharge of Water Table Aquifer

Operation of the cooling reservoir will increase the amount of recharge the surficial aquifer receives. This results from the providing makeup from the Floridan aquifer to the cooling reservoir and increasing the hydraulic head in the reservoir. Water budgets calculated for full site build-out indicate that the cooling reservoir will provide approximately 500,000 gpd recharge to the surficial aquifer on an average annual basis. This indicates that groundwater mounding will occur around the reservoir for most of the year, but especially during the dry season when the water table is naturally depressed.



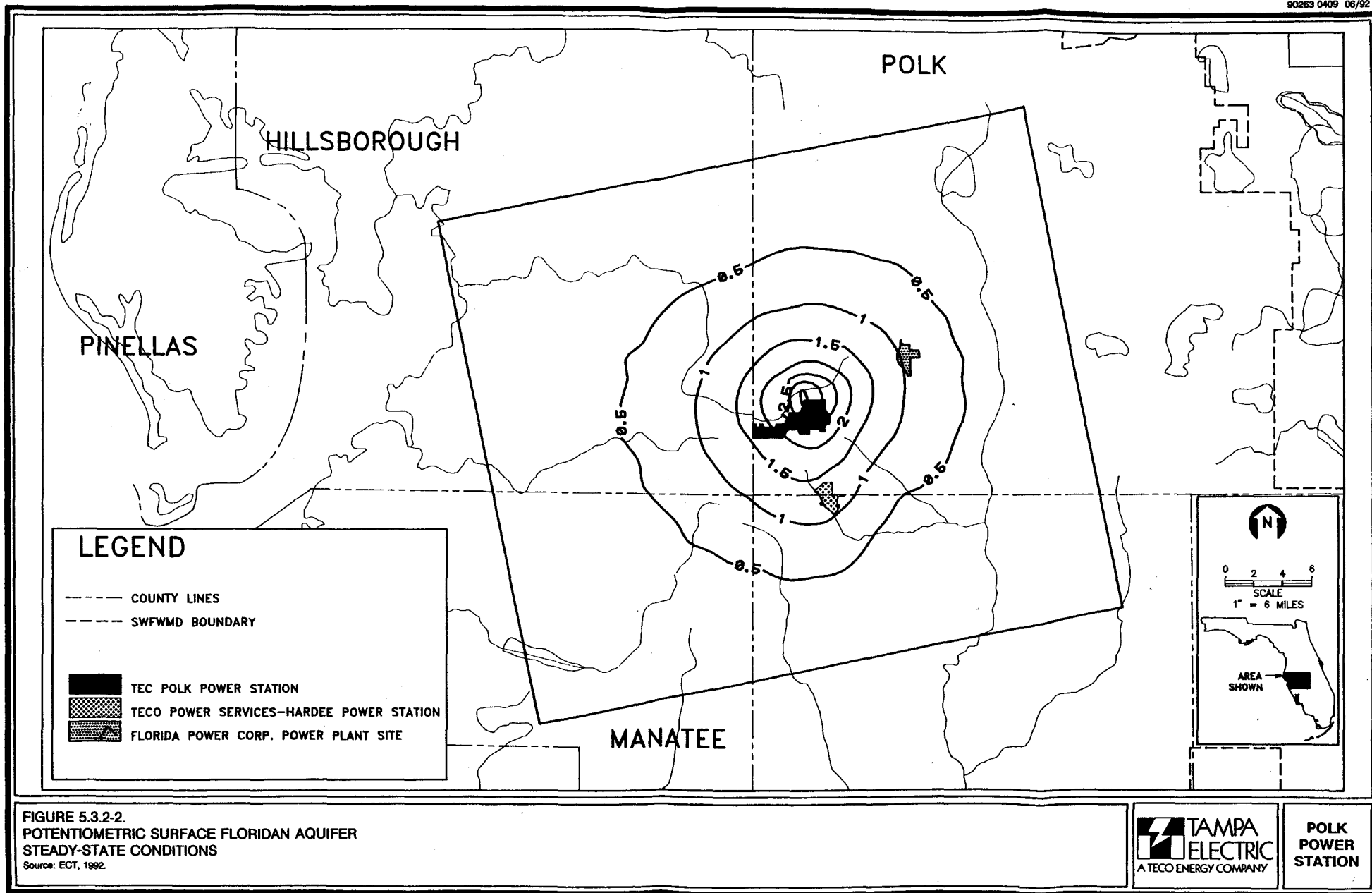


Table 5.3.2-1. Groundwater Numerical Model Simulated Pumpage and Drawdown Results

Condition Simulated	Simulated Pumpage	Tampa Electric Company Polk Power Station	Hardee Power Station
<u>Simulated Pumpage (mgd)</u>			
Transient (45 days)	Case 1	9.3	NA
Transient (45 days)	Case 2	9.3	8.64
Steady State	Case 1	6.6	NA
Steady State	Case 2	6.6	3.80
<u>Model Calculated Drawdowns (ft)</u>			
Transient (45 days)	Case 1	8.8	NA
Transient (45 days)	Case 2	10.3	8.6
Steady State	Case 1	6.7	NA
Steady State	Case 2	7.5	4.8

Note: NA = not applicable.

Source: ECT, 1992.

5.3.3 DRINKING WATER

The computer modeling efforts for the surficial and Floridan aquifer systems indicate there will be no adverse impacts to potable water supplies. There are no municipal wells within a 5-mile radius of the site. Most of the residential wells located primarily to the west of the site, along Bethlehem and Albritton Roads, use one of the two water-bearing units within the intermediate aquifer. Additionally, the modeling results indicate the drawdown impacts in this area will be approximately 2.5 ft or less in the Floridan aquifer. Anticipated drawdowns in the overlying intermediate aquifer system are expected to be minimal because of the confining unit that separates this system from the Floridan aquifer. Much of the surficial aquifer surrounding the Tampa Electric Company Polk Power Station site has been impacted by mining activities. Much of the land surrounding the site to the northeast, northwest, east, and south is presently clay settling ponds. Thus, the surficial aquifer is not used as a significant potable water source and is not expected to be adversely impacted from the Floridan aquifer withdrawals or the operation of the cooling reservoir.

5.3.4 LEACHATE AND RUNOFF

As described in Section 3.8.4, the onsite drainage system will collect runoff from areas where rainfall runoff has potentially contacted process materials. This collected runoff will be treated in the IWT system prior to discharging into the cooling water reservoir. The storage area for coal pile runoff, brine storage, slag storage, and wastewater treatment sludge storage will be lined with low-permeability materials; therefore, the potential groundwater contamination caused by leachate from these storage areas will be prevented.

The fuel oil storage area will be designed with a surrounding berm to contain any potential spills. Any spills will be appropriately managed and cleaned up to prevent groundwater contamination. A preliminary SPCC plan has been prepared for the proposed project and is provided in Appendix 11.13.1.

The stormwater runoff from other areas associated with industrial activity will be collected in detention basins for appropriate treatment prior to being discharged offsite. An NPDES permit will be filed for this offsite discharge, and a monitoring program has been developed to monitor the water quality of the stormwater discharge (see Appendix 11.1.1).

5.3.5 MEASUREMENT AND MONITORING PROGRAMS

A detailed summary of the regional model (MODFLOW) developed for these simulations including its development, application, and results is provided in Appendix 11.7.7. The regional model used information available from sources including SWFWMD, USGS, and the Florida Bureau of Geology. The results of the finite difference, numerical model were compared to analytical results to support the model's predictions.

The report summarizing the surficial aquifer model, including its development, application, and results is provided in Appendix 11.7.6. The surficial aquifer model used information on the surficial aquifer characteristics which were collected during the geohydrology monitoring and testing program at the Polk Power Station. The site-specific monitoring program is described in Section 2.3.2.

No additional groundwater measuring or monitoring programs will be needed during the site preparation and construction activities. However, a groundwater monitoring plan has been developed and will be implemented for the operation of the proposed project in accordance with applicable FDER regulatory requirements under Chapter 17-28, Part IIV, F.A.C. This plan is provided in Appendix 11.7.8.

5.4 SOLID/HAZARDOUS WASTE DISPOSAL IMPACTS

5.4.1 SOLID WASTE/BY-PRODUCT

The impacts resulting from the onsite disposal of solid wastes, in addition to the potential surface water and groundwater impacts discussed previously in Section 5.3 and in Chapter 3.0, are limited to topographic and associated changes in runoff patterns in the immediate vicinity of the solid waste disposal areas. The by-product slag and IWT system sludge storage areas are located in the western portion of the main plant facilities site and will have pile heights of approximately 50 and 25 ft, respectively. These two areas will encompass approximately 7 acres at full build-out. The brine storage area, located in the eastern portion of the site adjacent to the cooling reservoir, will have a pile height of approximately 4 to 6 ft and will encompass approximately 40 acres at full build-out. The active cell of the brine storage area will be 0.12 acres; the remaining portion of the area at full build-out will be clay-capped and lined to prevent the generation of contaminated runoff and leachate. The net land requirement for the solid waste and slag management units will be approximately 47 acres. Runoff collection basins associated with these units will require approximately 4 acres of additional land. The land impacted by the construction of these units has previously been impacted by former phosphate mining activities.

The rainfall runoff which may come in contact with the solid wastes and by-product slag will be collected and treated in the IWT system, except for leachate from the active cell of brine storage area which will be routed to the inlet of the brine concentrator unit.

No impacts are expected to result from the runoff and leachate from the solid waste and slag storage areas, except for the need for additional area to store brine solids.

As noted in Sections 3.5.2 and 3.7.1, the following solid wastes produced by the power station are expected to be non-hazardous and disposed of offsite in a licensed solid waste landfill:

- Sanitary wastewater treatment sludge,
- Spent supply water treatment media, and
- Miscellaneous solid wastes (e.g., trash).

In Polk County, the North Central Landfill is located nearest the Polk Power Station site and has a capacity of 1,000 tpd. The solid wastes generated from the Polk Power Station are conservatively expected to consume less than 0.2 percent of the available capacity of this landfill. The useful life of the three landfills which currently operate in Polk County is projected until the year 2010; however, Polk County has proposed a solid waste processing plant which, if constructed, could extend the useful life of the Polk County landfills to the year 2030.

Reclamation of a significant portion of the solid wastes produced at the power station is expected. As discussed in Section 3.7, reclaimed solid wastes will include waste oil, worn gasifier refractory and refractory backup brick, spent sulfur recovery unit catalysts, and spent tail gas treating catalysts; these will be sold to the supply vendors or to other reclaimers. Because these wastes are expected to be reclaimed soon after their removal and replacement, the potential impacts associated with the onsite storage of these materials will be negligible.

Slag by-product is marketable as an abrasive, roofing material, industrial filler, synthetic aggregate for concrete, or road base material. In addition, sulfur and H_2SO_4 by-products are expected to be of marketable-grade quality. Benefits resulting from the sale of these by-products include:

- Increased revenue,
- Reduction in land requirement for onsite by-product storage,
- Reduction in consumption of natural resources where slag is used as a substitute,
- Reduced potential for fugitive dust generation, and
- Reduced potential for aesthetic impacts from by-product storage.

5.4.2 HAZARDOUS WASTES

Hazardous wastes (as defined under RCRA) will be generated primarily as a result of painting, degreasing, and other maintenance activities at the Polk Power Station.

These hazardous wastes will be managed onsite and transported offsite to a permitted waste disposal or recycle facility in accordance with local, state, and federal hazardous waste requirements for generators. The amount of hazardous waste will be minimized through the use of source reduction techniques, such as product substitution, and waste reduction techniques, such as recycling and waste segregation.

Wastes will be collected in designated containers located in satellite storage areas. When a container becomes full, it will be transferred to the central hazardous waste storage facility for temporary storage. Hazardous wastes will not be stored onsite longer than 90 days (or 180 days for small quantities); therefore, the facility will not require a storage facility permit. However, the storage facility will be designed and managed in accordance with applicable emergency prevention and preparedness measures specified in 40 CFR Part 264, Subparts C and D. Such measures include an available fire extinguisher, spill absorbent material, and spill containment features. Hazardous wastes will be stored in a manner to minimize the potential for an incident, and a preliminary RCRA contingency plan has been prepared to provide immediate response in the unlikely event of a fire, spill, or explosion involving hazardous wastes (see Appendix 11.13.2). As a result, any potential impacts associated with the onsite storage of hazardous waste are expected to be minimized through emergency prevention and response.

5.5 SANITARY AND OTHER WASTE DISCHARGES

5.5.1 DISCHARGE REGULATIONS

5.5.1.1 Federal Requirements

Federal regulations primarily address the discharge of pollutants to Waters of the United States through the NPDES permit program. Tampa Electric Company has applied for an NPDES permit for the proposed discharge from the cooling reservoir to Little Payne Creek (see Appendix 11.1.1). The proposed sanitary wastewater treatment system does not discharge directly to jurisdictional waters; however, a monitoring point will be established within the NPDES permit application to demonstrate compliance with applicable BOD, TSS, and other relevant standards.

5.5.1.2 State Requirements

State of Florida requirements include various FDER rules governing the design, operation, and performance of a sanitary wastewater treatment plant, including:

- **Chapter 17-600, Domestic Wastewater Facilities**--This chapter provides general technical guidance and design requirements for new wastewater treatment plants, siting criteria, operation and maintenance requirements, technology- and water quality-based effluent standards, disinfection requirements, and construction and permit requirements;
- **Chapter 17-604, Collection Systems and Transmission Facilities**--This rule provides minimum design, operation, and maintenance standards for domestic wastewater collection/transmission systems;
- **Chapter 17-601, Domestic Wastewater Treatment Plant Monitoring**--This chapter specifies the monitoring/reporting requirements and schedules for flow, carbonaceous BOD, and other parameters connected with the influent and effluent of the treatment plant;
- **Chapter 17-602, Wastewater Plants Operator Certification**--This chapter establishes a system for classification of domestic treatment plants and further specifies classes of certified operator which must serve as lead operators of these plants for minimum specified periods of time;

- Chapter 17-302, Surface Water Quality--The surface water quality standards for BOD, fecal coliform, residual chlorine, and other applicable parameters are specified in this chapter; and
- Chapter 17-701, Solid Waste Management Facilities--This chapter specifies the design and operating standards for landfills which receive solid wastes, including domestic wastewater residuals.

The domestic wastewater treatment plant will comply with these and other relevant state requirements. The effluent monitoring program will include the following parameters: carbonaceous BOD, TSS, pH, fecal coliform, residual chlorine, and flow. No monitoring of nutrients is proposed.

5.5.2 TREATMENT PLANT DISCHARGE

Sanitary wastewaters will be treated and discharged to the cooling reservoir for reuse in the cooling system. As described in Section 3.5, the sanitary wastewater treatment system is an aerobic package system. All effluent from this system will be filtered and chlorinated prior to discharge to the cooling reservoir. Parameter concentrations in the treatment plant effluent, prior to mixing in the reservoir, are expected to be in compliance with the following effluent standards:

- BOD, 20 mg/L;
- TSS, 20 mg/L;
- Total residual chlorine, 0.5 mg/L;
- Fecal coliform, <200 per 100 mL;
- pH, 6.0 to 8.5; and
- Flow rate, 10,400 gpd.

No adverse impacts to the cooling reservoir or offsite water quality are expected from sanitary wastewater discharges. Detectable amounts of residual chlorine and other constituents within the effluent will be rapidly mixed and dissipated upon entering the cooling reservoir.

5.6 AIR QUALITY IMPACTS

5.6.1 IMPACT ASSESSMENT

5.6.1.1 Introduction

Analyses were conducted to project the potential air quality impacts of emissions from Polk Power Station. These analyses are described in detail in the PSD permit application contained in Appendix 11.1.3. This section presents a summary of the approach used and the results obtained. The results demonstrate that the operation of Polk Power Station will not cause or contribute to a violation of any PSD increment or AAQS.

5.6.1.2 Regulatory Applicability and Overview of Impact Analyses

Under federal PSD review requirements, all major new or modified sources of air pollutants regulated under CAA must be reviewed and approved by EPA or by the state agency if PSD review authority has been delegated, as is the case in Florida. A *major stationary source* is defined as any 1 of 28 named source categories that has the potential to emit 100 tpy or more, or any other stationary source that has the potential to emit 250 tpy or more, of any pollutant regulated under CAA. *Potential to emit* means the capability at maximum design capacity to emit a pollutant after the application of control equipment.

Polk Power Station constitutes a major facility since it will have the potential to emit more than 250 tpy of at least one pollutant. Therefore, the facility must undergo PSD review. Furthermore, more than one pollutant is subject to review. Table 5.6.1-1 summarizes the facility's proposed annual emissions and compares the projected totals to the significant emission rate thresholds for PSD review.

PSD review is used to determine whether significant air quality deterioration will result from the new or modified source. PSD review requirements are contained in Chapter 17-2.500, F.A.C., Prevention of Significant Deterioration. Major sources may be required to undergo the following reviews related to PSD for each pollutant emitted in significant amounts:

Table 5.6.1-1. Projected Emissions Compared to PSD Significance Rates

Pollutant	Projected Maximum Annual Emissions (tpy)				Significance Rate (tpy)	Subject to PSD Review?
	IGCC*	+ CCs†	+ CTs**	= Total		
PM (TSP)	411	260	246	917	25	Yes
PM (PM ₁₀)	411	260	246	917	15	Yes
SO ₂	2,543	720	654	3,917	40	Yes
NO _x	2,928	1,308	1,014	5,250	40	Yes
CO	456	1,092	978	2,526	100	Yes
O ₃ /VOC	46	180	168	394	40	Yes
Lead	0.15	0.28	0.17	0.6	0.6	Yes
H ₂ SO ₄	241	80	72	393	7	Yes
Fluorides	0.92	0.17	0.10	1.2	3	No
Mercury	0.12	0.21	0.19	0.5	0.1	Yes
Beryllium	0.011	0.013	0.008	0.03	0.0004	Yes
Total reduced sulfur (including H ₂ S)	7.1	0	0	7.1	10	No
Reduced sulfur compounds (including H ₂ S)	7.1	0	0	7.1	10	No
Vinyl chloride	0	0	0	0	1	No
Asbestos	0	0	0	0	0.007	No

*IGCC emissions include the highest annual emissions estimates from the 7F CT (based on the larger of 100 percent CGCU or 50/50 CGCU/HGCU), plus related combustion emissions (e.g., thermal oxidizer), plus other associated process and fugitive emissions (PM, CO, VOC, and H₂S).

†CC emissions represent the totals for four stand-alone CTs in CC mode.

**CT emissions represent the totals for six stand-alone CTs in simple-cycle mode.

Source: ECT, 1992.

- Control technology review,
- Air quality analysis (monitoring),
- Source impact analysis,
- Source information, and
- Additional impact analyses.

The control technology review includes determination of BACT for each applicable pollutant. BACT emission limits cannot exceed applicable emission standards (e.g., NSPS). The air quality analysis (monitoring) portion of PSD review may require continuous ambient air monitoring data to be collected in the impact area of the proposed source. The source impact analysis requires demonstration of compliance with federal and state AAQS and allowable PSD increment limitations. Projected ambient impacts on designated nonattainment areas and federally promulgated Class I PSD areas must also be addressed, if applicable. Source information, including process design parameters and control equipment information, must be submitted to the reviewing agencies. Additional analyses of the proposed source's impact on soils, vegetation, and visibility, especially pertaining to Class I PSD areas, must be performed, as well as analysis of impacts due to growth in the area associated with the proposed source.

In addition to PSD review requirements, FDER has developed a strategy to control toxic emissions from stationary sources so that these emissions will not endanger public health. The strategy is based on comparing the predicted ambient impact of individual toxic air contaminants with an estimate of each chemical's *no-threat level*. A no-threat level is an ambient exposure level that is not likely to cause appreciable health risks.

Another air toxics assessment involves the estimation of cancer risk due to inhalation of emissions from a proposed facility. The metals arsenic, beryllium, cadmium, and chromium (hexavalent) are of primary interest in such an analysis since these

constituents, which are emitted as a result of the combustion of most fossil fuels, are known or suspected carcinogens.

Polk Power Station will emit small quantities of pollutants addressed in FDER's air toxics review strategy. Therefore, an analysis of the facility's impacts compared to the no-threat levels applies. In addition, a conservative analysis of inhalation cancer risks was considered appropriate since Polk Power Station will emit trace metals that are known or suspected carcinogens. There is no regulatory standard or formal review requirement for this analysis, however.

5.6.1.3 Analytical Approach

Air Quality Models

Three air quality dispersion models were used in the analysis of impacts for Polk Power Station. These models were:

1. SCREEN;
2. ISC2 (both short- and long-term versions, ISCST2 and ISCLT2, respectively); and
3. MESOPUFF-II.

SCREEN is a simple model that calculates 1-hour average concentrations from a single source over a range of meteorological conditions. SCREEN was used to provide conservative estimates of impacts from combustion sources in order to select the worst-case operating configurations for each source.

The Industrial Source Complex (ISC2) models (EPA, 1992) were used for refined analyses. The ISC2 models are steady-state Gaussian plume models that can be used to assess air quality impacts from a wide variety of sources. They are capable of calculating concentrations for averaging times ranging from 1 hour to annual.

The MESOPUFF-II model (EPA, 1984) is a specialized model capable of accounting for several long-range transport and dispersion phenomena that are not addressed

in conventional models such as ISC2. For this study, MESOPUFF-II was used for the specific purpose of estimating SO₂ impacts on the Chassahowitzka National Wilderness Area (NWA), a PSD Class I area.

Meteorological Data

Detailed meteorological data are needed for modeling with the ISC2 models. For this effort, meteorological data for input to these models were selected consistent with EPA (1986) guidance and FDER practice. For ISCST2, surface data from Tampa and mixing height data from Ruskin for the 5-year period 1982 through 1986 were employed. Surface data from the same 5-year period were processed into the format required for ISCLT2.

For MESOPUFF-II, a specialized set of meteorological data was required. Surface data from Tampa, Orlando, and Gainesville, along with upper air data from Ruskin and West Palm Beach for the year 1986 were used.

Emission Source Input Data

Emission parameters for Polk Power Station sources were based primarily on information provided by equipment vendors for the project. Some emission inputs were derived using EPA and other emission factors and facility design data.

For three pollutants (SO₂, NO_x, and PM), it was necessary to evaluate the impacts of other, offsite emission sources. These data were assembled primarily from information provided by FDER.

Background Concentrations

For the same three pollutants (i.e., SO₂, NO_x, and PM), it was also necessary to estimate background concentrations in the vicinity of the Polk Power Station site. For SO₂, the estimates were derived from onsite monitoring (see Section 2.3.7). The following background SO₂ concentrations were estimated based on the monitoring results:

- 5 $\mu\text{g}/\text{m}^3$ (annual average),
- 13 $\mu\text{g}/\text{m}^3$ (24-hour average), and
- 26 $\mu\text{g}/\text{m}^3$ (3-hour average).

For NO_x (actually NO_2), a background concentration of 10 $\mu\text{g}/\text{m}^3$ (annual average) was estimated conservatively based on monitoring data collected at the Archbold research site in 1988 (Hunter/ESE, 1989). The Archbold site is approximately 75 km southeast of the Polk Power Station site. Data from Archbold were used as opposed to data from NO_2 monitors operated by FDER, which are all located in urban areas and whose data would not be representative of rural southwest Polk County.

For PM (actually PM_{10}), background concentrations were estimated from data provided from the onsite monitoring program. For the annual averaging time, background PM_{10} was estimated to be 18.4 $\mu\text{g}/\text{m}^3$. For the 24-hour averaging time, a value of 45.4 $\mu\text{g}/\text{m}^3$ was estimated.

5.6.1.4 Summary of Air Quality Impacts: Criteria Pollutants

Maximum Facility Impacts and Significant Impact Areas

Criteria pollutant emissions from all Polk Power Station sources were modeled using the ISC2 models. ISCLT2 was used for annual and quarterly computations, while ISCST2 and 5 years of hourly meteorological data were used for all short-term computations. For SO_2 , NO_x , CO, and lead, the Polk Power Station source inventory included the 7F CT (IGCC), the stand-alone CTs (both CC and simple-cycle), the auxiliary boiler, the tail gas treating unit thermal oxidizer, and the H_2SO_4 thermal oxidizer; for CO, fugitive sources were also included. For PM, materials handling and process vent sources were added to this list.

Table 5.6.1-2 summarizes the results of the maximum facility impact modeling runs for the criteria pollutants. As appropriate, the maximum impacts are compared to the modeling significance levels. Table 5.6.1-2 shows that SO_2 , NO_x , and PM impacts were found to be significant for all averaging times. CO impacts were found to be

Table 5.6.1-2. Maximum Polk Power Station Criteria Pollutant Impacts

Pollutant	Averaging Time	Maximum Impact ($\mu\text{g}/\text{m}^3$)	Significance Level ($\mu\text{g}/\text{m}^3$)
SO ₂	Annual	2.18	1.0
	24-hour	19.0	5.0
	3-hour	68.6	25.0
NO _x	Annual	2.26	1.0
PM	Annual	1.83	1.0
	24-hour	27.9	5.0
CO	8-hour	67.1	500
	1-hour	169.2	2,000
Lead	Quarterly	0.0014	NA*

*The AAQS for lead is 1.5 $\mu\text{g}/\text{m}^3$.

Source: ECT, 1992.

insignificant for both 1- and 8-hour averaging times. And while no significance level exists for lead, lead impacts were considered insignificant relative to the AAQS.

Illustrations of significant impact areas (SIAs) are provided in Figures 5.6.1-1 through 5.6.1-6. Figures 5.6.1-1, 5.6.1-2, and 5.6.1-3, respectively, present the annual, 24-hour, and 3-hour SIAs for SO₂. The annual SIA was found to have a maximum extent of approximately 8 km. The 24-hour SIA extended out to approximately 25 km, while the 3-hour SIA had a maximum extent of approximately 20 km.

Figure 5.6.1-4 presents the annual NO_x SIA. Its maximum extent was found to be approximately 6 km from the grid origin.

Figures 5.6.1-5 and 5.6.1-6, respectively, show the PM SIAs for annual and 24-hour averages. For the annual average, the maximum extent was only approximately 2 km, while for the 24-hour average it was approximately 11 km. Superimposed on the illustrations of PM SIAs is the portion of Hillsborough County that is classified as an air quality maintenance area for PM. As shown, the SIAs for Polk Power Station PM sources were found to fall well short of the maintenance area. Therefore, new source review with respect to maintenance areas (i.e., including provisions for nonattainment review) was not triggered.

Analyses for Ambient Air Quality Standards

Total potential SO₂, NO_x, and PM (PM₁₀) impacts within the Polk Power Station SIAs were determined for comparison with AAQS. This was accomplished by adding conservative estimates of background concentrations to modeled impacts due to Polk Power Station and other sources in the area. Table 5.6.1-3 summarizes the results of these analyses. As shown, all estimates of predicted total impacts were found to be less than the AAQS. Therefore, it was concluded that the operation of the Polk Power Station facility would not threaten compliance with any AAQS.

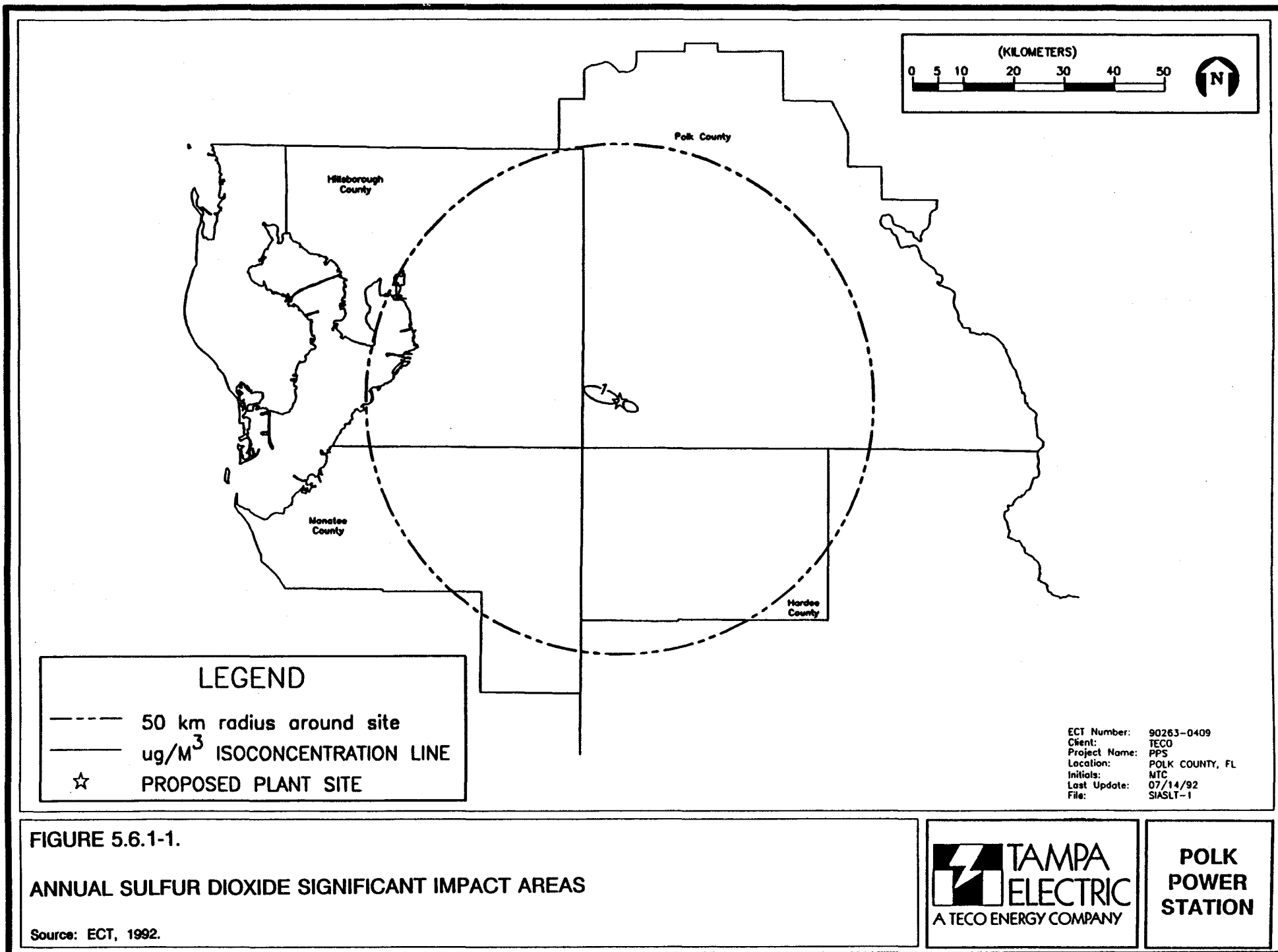


FIGURE 5.6.1-1.

ANNUAL SULFUR DIOXIDE SIGNIFICANT IMPACT AREAS

Source: ECT, 1992.

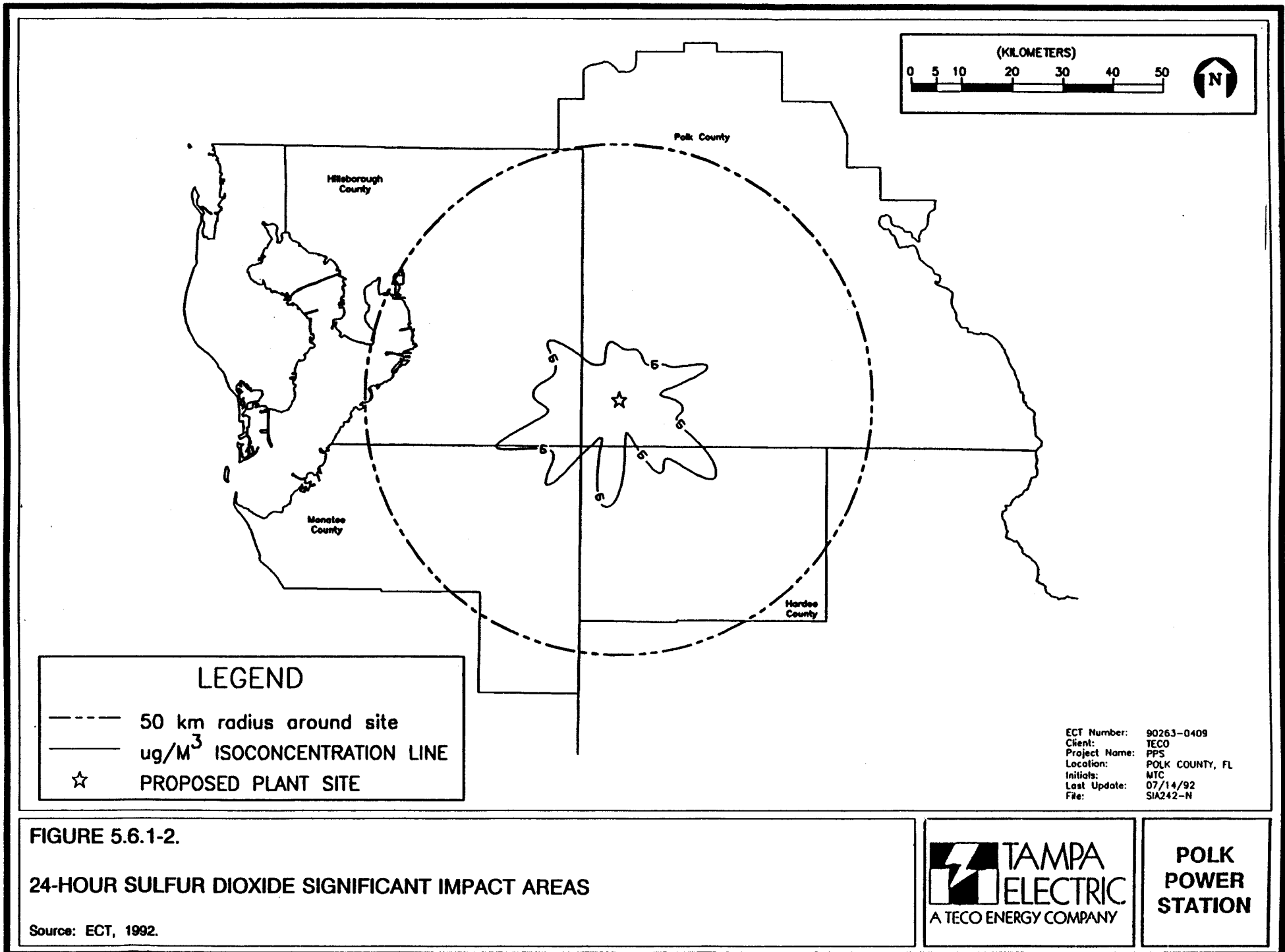


FIGURE 5.6.1-2.

24-HOUR SULFUR DIOXIDE SIGNIFICANT IMPACT AREAS

Source: ECT, 1992.

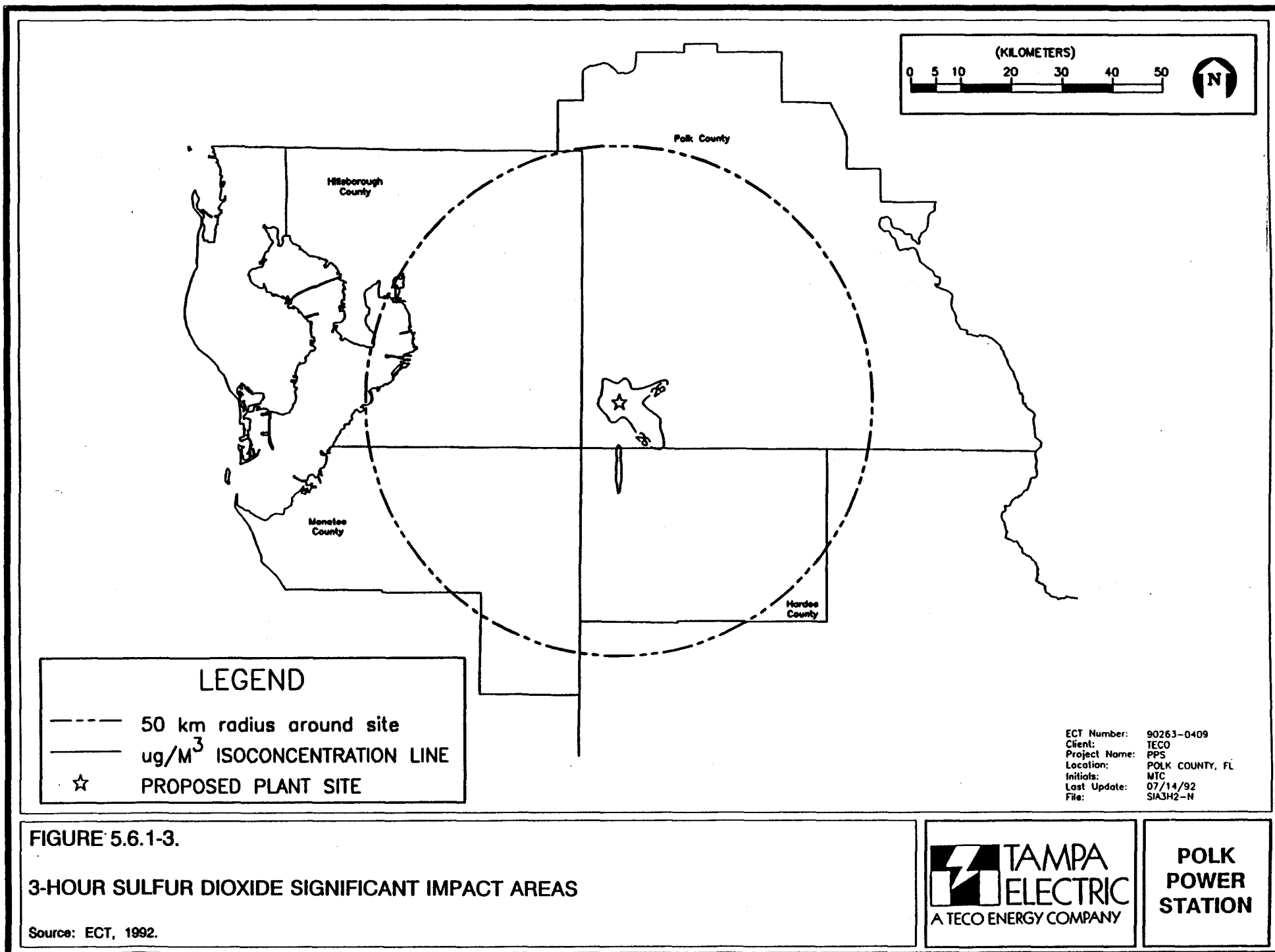


FIGURE 5.6.1-3.

3-HOUR SULFUR DIOXIDE SIGNIFICANT IMPACT AREAS

Source: ECT, 1992.

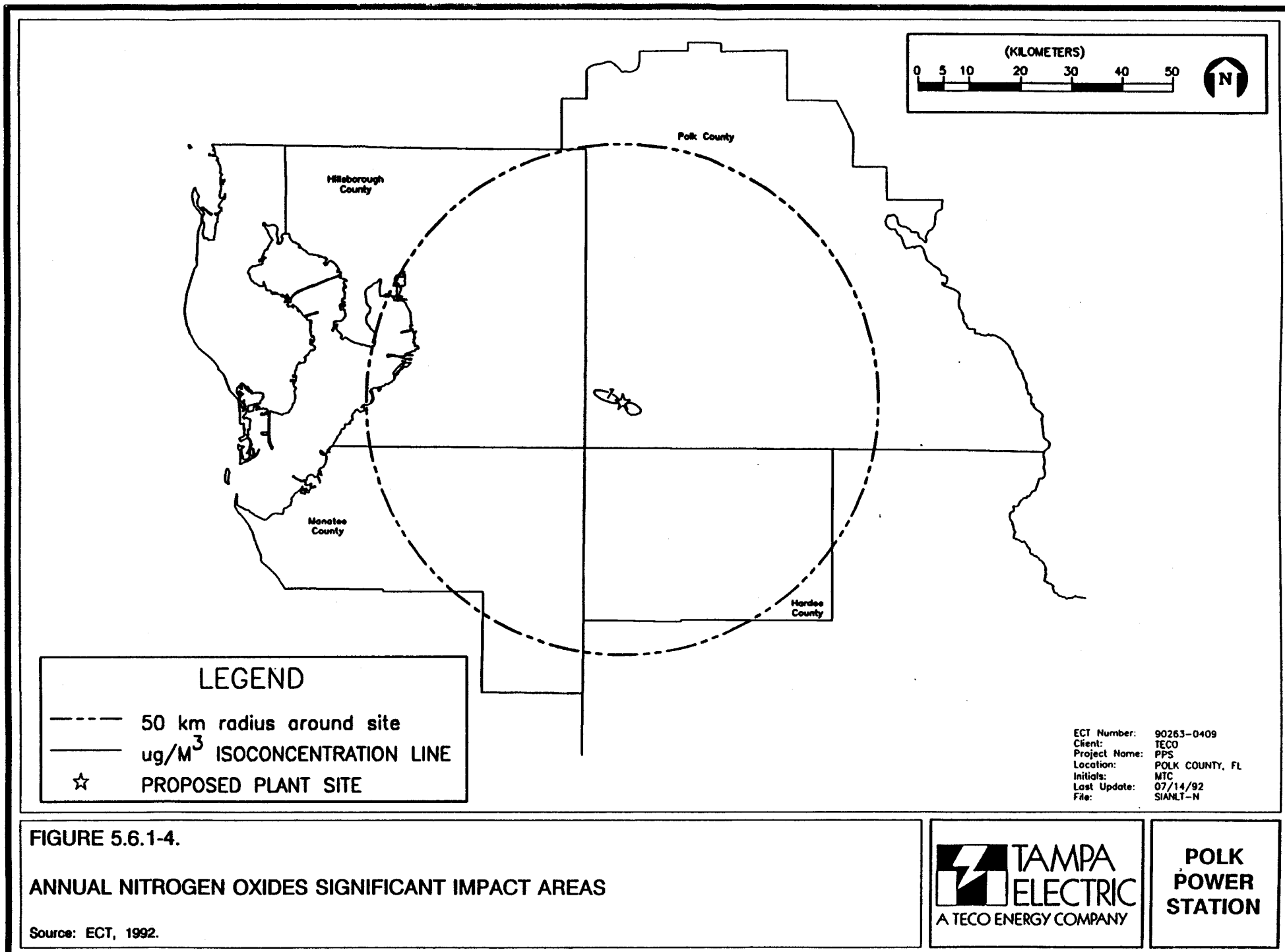
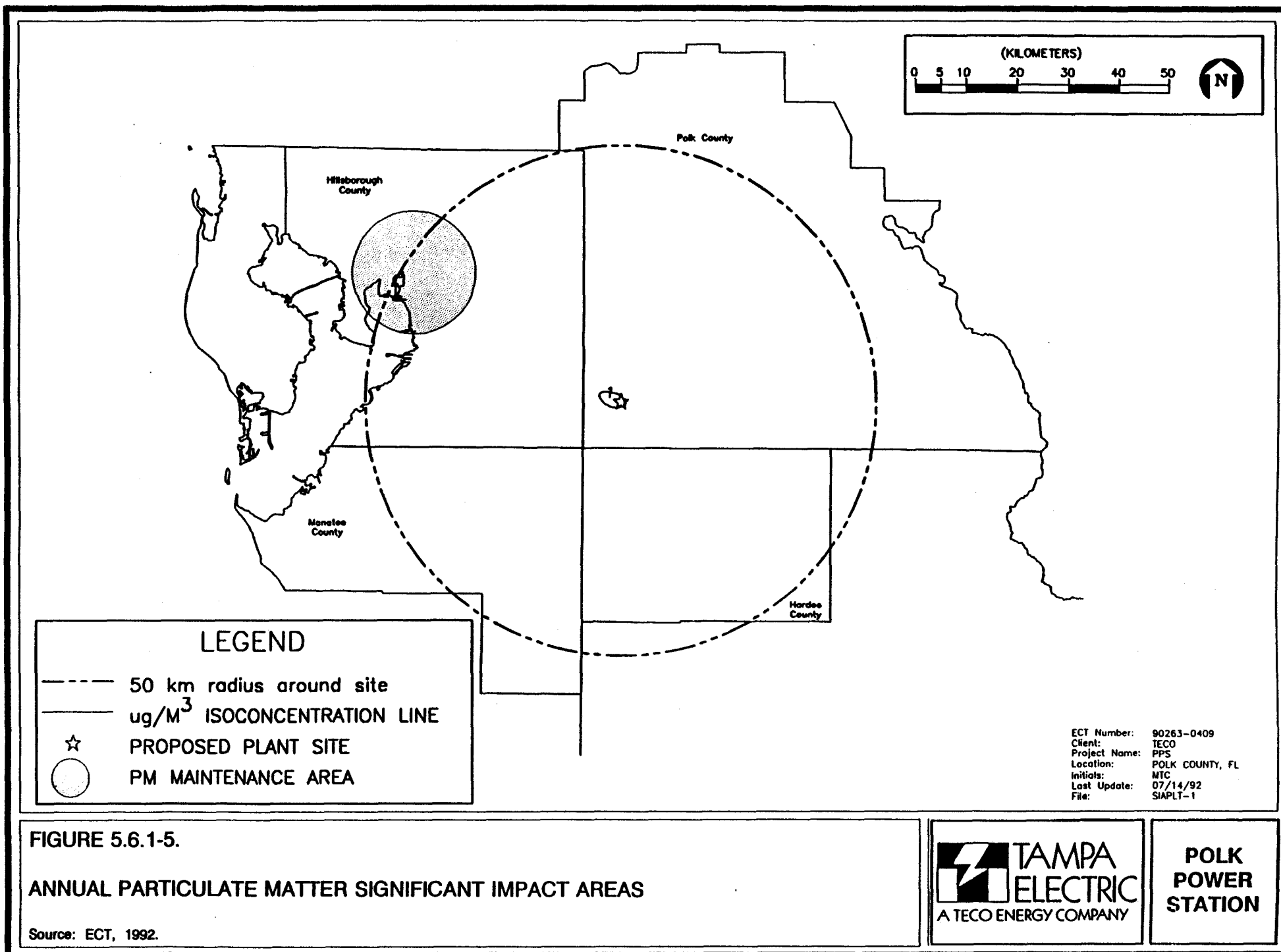


FIGURE 5.6.1-4.

ANNUAL NITROGEN OXIDES SIGNIFICANT IMPACT AREAS

Source: ECT, 1992.



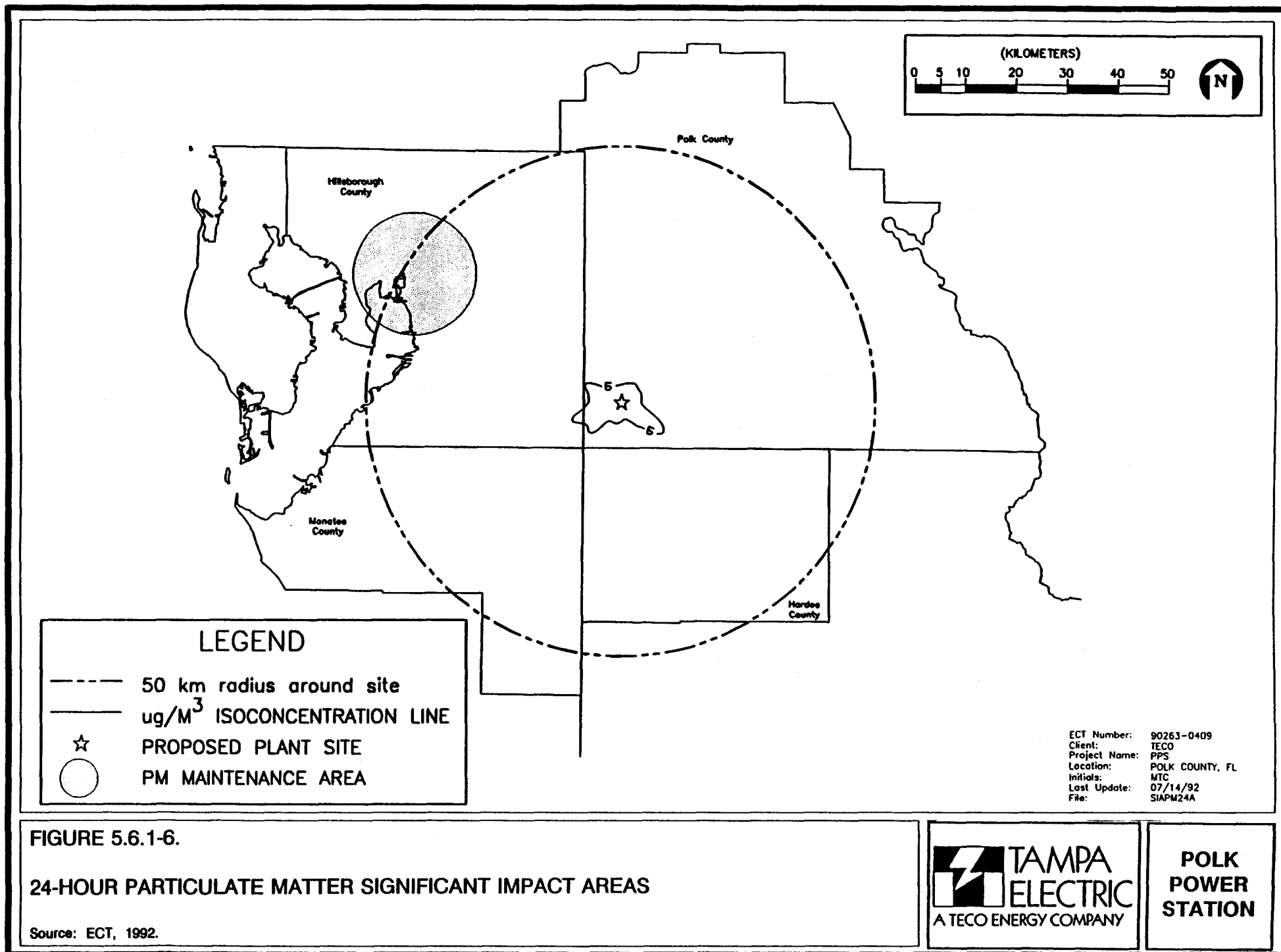


FIGURE 5.6.1-6.

24-HOUR PARTICULATE MATTER SIGNIFICANT IMPACT AREAS

Source: ECT, 1992.

Table 5.6.1-3. Summary of Impact Analyses for AAQS

Pollutant	Averaging Time	Modeled Impact ($\mu\text{g}/\text{m}^3$)	Background Concentration ($\mu\text{g}/\text{m}^3$)	Total Projected Impact ($\mu\text{g}/\text{m}^3$)	AAQS ($\mu\text{g}/\text{m}^3$)
SO ₂	Annual	30.4	5	35	60
	24-hour	162.7*	13	176	260
	3-hour	521.2*	26	547	1,300
NO _x	Annual	5.64	10	16	100
PM (PM ₁₀)	Annual	11.3	18.4	30	50
	24-hour	79.4*	45.4	125	150

*HSH modeled impact.

Source: ECT, 1992.

Analyses for Prevention of Significant Deterioration Class II Increments

Modeling analyses were carried out to determine maximum SO₂, NO_x, and PM (TSP) increment consumption within the Polk Power Station SIAs. Table 5.6.1-4 presents a summary of these analyses. All estimates of predicted impacts were less than the allowable Class II increments. Therefore, the operation of Polk Power Station will not cause significant deterioration of air quality in the project vicinity.

Analyses for Prevention of Significant Deterioration Class I Increments

Using very conservative modeling impacts and assumptions, air quality impacts with respect to PSD Class I increments were projected using the ISC2 and MESOPUFF-II models. Table 5.6.1-5 summarizes the final results of the impact analyses for PSD Class I increments. As shown, no exceedances were predicted. Given the conservative nature of the analyses, it can be concluded that operation of the Polk Power Station facility will not cause significant deterioration of air quality at the Chassahowitzka NWA.

5.6.1.5 Air Toxics Assessment

Maximum impacts due to Polk Power Station emission sources were determined for non-criteria pollutants using the ISC2 models. Table 5.6.1-6 summarizes the results and compares the maximum impacts to the no-threat levels. All maximum impacts were predicted to be below the no-threat levels, indicating that, with an adequate margin of safety, public health in the vicinity of Polk Power Station will not be jeopardized.

In addition to the no-threat level analysis, the potential impacts of the metals arsenic, beryllium, cadmium, and chromium (hexavalent) were of additional interest since they are known or suspected carcinogens and will be emitted in amounts that make them worthy of investigation. To evaluate the potential impacts of these emissions on human health, an inhalation cancer risk assessment was conducted. The assessment was used to estimate maximum individual risk (MIR) and total population risk (TPR). MIR is the estimated increase lifetime risk for an individual exposed to

Table 5.6.1-4. Summary of Impact Analyses for PSD Class II Increments

Pollutant	Averaging Time	Maximum Predicted Impact ($\mu\text{g}/\text{m}^3$)	PSD Class II Increment ($\mu\text{g}/\text{m}^3$)
SO ₂	Annual	0.0*	20
	24-hour	27.8†	91
	3-hour	104.1†	512
NO ₂	Annual	2.5	25
PM (TSP)	Annual	4.8	19
	24-hour	32.3†	37

*Increment consumption was negative over the entire receptor grid.

†HSH modeled impact.

Source: ECT, 1992.

Table 5.6.1-5. Summary of Impact Analyses for PSD Class I Increments

Pollutant	Averaging Time	Maximum Predicted Impact ($\mu\text{g}/\text{m}^3$)	PSD Class I Increment ($\mu\text{g}/\text{m}^3$)
SO ₂	Annual	0.0*	2
	24-hour	5.0	5
	3-hour	11.5†	25
NO ₂	Annual	0.2	2.5
PM (TSP)	Annual	1.3	5
	24-hour	5.9**	10

*Increment consumption was negative over the entire receptor grid.

†Impact due to Polk Power Station was not significant.

**HSH modeled impact.

Source: ECT, 1992.

Table 5.6.1-6. Summary of Worst-Case Estimates of Air Toxics Impacts Compared to FDER No-Threat Levels

Pollutant	Averaging Time	Maximum Impact ($\mu\text{g}/\text{m}^3$)	No-Threat Level ($\mu\text{g}/\text{m}^3$)
H_2SO_4	8-hour	3.76	10
	24-hour	1.64	2.4
Fluorides	1-hour	0.060	25
Mercury	8-hour	0.011	0.1
	24-hour	0.0048	0.024
Beryllium	Annual	0.00006	0.0004
Arsenic	Annual	0.00019	0.0002

Source: ECT, 1992.

the predicted highest annual average concentration. TPR is the estimated annual incidence of excess cancers for the entire affected population.

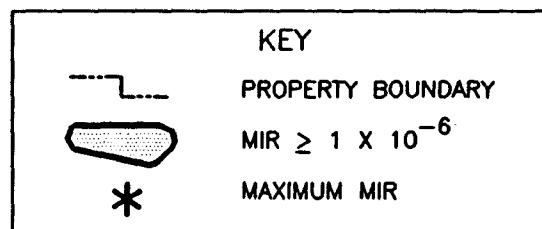
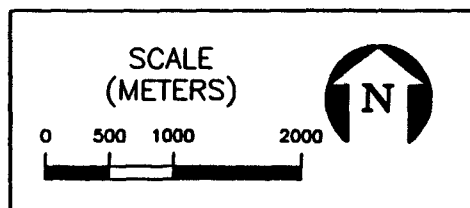
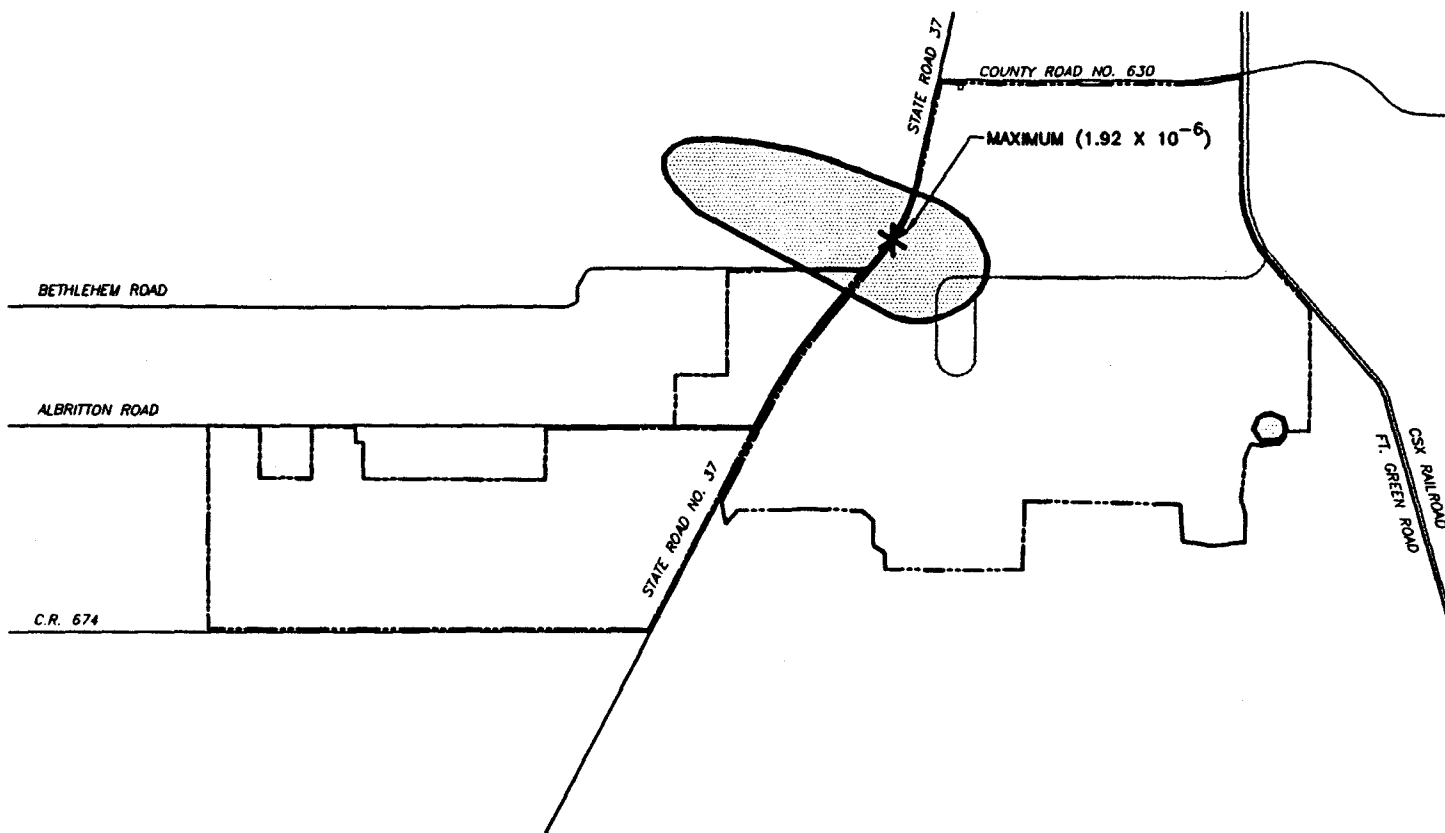
The highest estimate of MIR was calculated to be 1.9×10^{-6} . Figure 5.6.1-7 shows the areal distribution of MIR values of at least 1.0×10^{-6} . These values were predicted to occur primarily to the northwest of the site in areas of little or no population. TPR was conservatively estimated to be only 0.00027, meaning that the plant would theoretically cause an additional case of cancer only every 3,700 years.

5.6.1.6 Other Air Quality-Related Impacts

Impacts Due to Associated Growth

Construction of Polk Power Station will occur in phases. During the initial construction phase, an average of 400 workers will be employed for a 27-month construction period, with a 9-month peak of 600 construction workers. An average of 15 to 40 workers will be employed during other construction phases of the project. It is anticipated that most of these construction personnel will be drawn from Polk County and will commute to the job site from nearby cities, including Bartow, Winter Haven, and Lakeland. A portion of the work force will also commute from the Tampa metropolitan area. While not readily quantifiable, the temporary increase in vehicle-miles-traveled (VMT) in the area would be insignificant, as would any temporary increase in vehicular emissions.

The Polk Power Station will employ a total of 210 operational workers at project build-out. The operational workforce will also include annual contracted maintenance workers to be hired for periodic routine services ranging from 6 persons in 1997 to 100 at build-out in 2010. Again, it is expected that most of these persons will be drawn from the region. In 1990, the population of Lakeland was 70,576, while the population of Polk County was 405,382 persons. The workforce needed to operate the proposed plant therefore represents a small fraction of the population already present in the immediate area. Therefore, while some small increase in area VMT could result, the air quality implications in Polk County would be minimal.



ECT Number: 90263-0409
 Client: TECO
 Project Name: PPS
 Location: POLK COUNTY, FL
 Initials: MTC
 Last Update: 07/16/92
 File: HRISK

FIGURE 5.6.1-7.

AREAL DISTRIBUTION OF PREDICTED MAXIMUM INDIVIDUAL RISK

Source: ECT, 1992.

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Finally, a new industrial facility can sometimes generate growth in other industrial or commercial operations needed to support the new facility. Given the site's proximity to Bartow, Lakeland, and the Tampa metropolitan area, however, the existing commercial infrastructure should be more than adequate to provide any support services that the proposed facility might require. Therefore, no air quality impacts due to associated industrial/commercial growth would be expected. Furthermore, any significant industrial development resulting from the establishment of Polk Power Station would be independently subject to PSD and other environmental review requirements.

Impacts on Visibility and on Soils and Vegetation

No visibility impairment at the local level is expected due to the types and quantities of emissions projected from Polk Power Station sources. The opacity of combustion exhausts from the facility should be low. Emissions of primary particulates and sulfur oxides due to combustion will be low due to the predominant use of low-ash, low-sulfur fuels (syngas, natural gas, and distillate fuel oil) over the lifetime of the facility. While the facility will emit NO_x , the potential to impair visibility at the local level should be relatively low, given the very low expected exhaust opacity. The contribution of emissions of VOC to the potential for haze formation in the area is expected to be minimal. Materials handling and storage operations will be controlled so that fugitive dust potential will be minimized. In addition, the aesthetic character of lands within the boundaries of and adjacent to the Polk Power Station site are largely influenced by present and past mining operations. Because these lands have been previously disturbed by mining operations, the proposed project will not adversely affect aesthetic or visual qualities in the area.

Soil types have been mapped by the U.S. Department of Agriculture (USDA) in cooperation with the Polk County Soil Conservation Services (USDA, 1990). There are 20 different soil types on the Polk Power Station plant site. Most of the onsite or adjacent soils are either hydric soils which have thick organic layers and are slightly alkaline, or highly altered soils associated with mining activities. The Polk

Power Station plant site is situated primarily on Smyrna-Myakka, Arents-Water, and Ona soil types.

Gaseous emissions impacts on soils can cause both acid leaching of nutrients and direct impacts to vegetation. Impacts to vegetation are typically associated with direct uptake of toxins through the root zone. The potential for acid-leaching of nutrients in the alkaline organic soils which exist on the site is low. No impacts to nutrient levels in the highly altered, acidic soils of the mined areas are anticipated.

Sulfates and nitrates caused by SO_2 and NO_2 deposition on soil can have beneficial effects to soil if they are currently lacking. However, they can also increase acidity, affecting nutrient recycling and plant growth. The low emission levels and resulting ambient impacts for this project should not significantly cause increased acidity levels to the already acidic soils.

In summary, based upon the soils onsite, as well as the minimal emissions levels associated with plant operation, no impacts to soils are anticipated.

The majority of the Polk Power Station site has been or is in the process of being mined for phosphate. Consequently, most of the original flora on the site has been drastically altered. As a result of past and ongoing mining activities, only small, portions of relatively undisturbed terrestrial, wetland, and aquatic habitats still remain on the site. Major land uses and vegetation represented on the site consist of mined land, developed land (e.g., transmission lines, a pipeline, and a small industrial site), uplands (e.g., pasture, shrub and brushland, overgrown spoil, old fields, orange grove, mixed oak/pine woods, palmetto rangeland, pine flatwoods, and oak hammock), remaining wetlands (e.g., hardwood swamp and marsh), and open water systems (e.g., ditches, canals, mine ponds, and an intermittent stream). The 4,348-acre Polk Power Station site is a mine site in various stages of activity with relatively small, remnant areas of undisturbed, native vegetation.

Vegetation damage is described as impacts resulting in foliar damage. Less apparent vegetation injury is described as a reduction in growth and/or productivity without visible damage as well as changes in secondary metabolites such as tannin and phenolic compounds. Vegetation damage often results from acute exposure to pollution (i.e., relatively high doses over relatively short time periods). Injury is also associated with prolonged exposures of vegetation to relatively low doses of pollutants (chronic exposure). Acute damages, which have both functional and visible consequences, are usually manifested by internal physical damage to foliar tissues. Chronic injuries are typically more associated with changes in physiological processes.

In light of the previous discussion, the projected air quality impacts due to emission from Polk Power Station were evaluated as to their potential to impact vegetation in the area. The pollutants SO_2 , NO_x , ozone, PM (including trace metals), CO, H_2SO_4 , and fluorides and synergistic effects among gaseous pollutants were evaluated to the extent supported by the literature. Based on this assessment, it was concluded that emission from Polk Power Station will not result in impacts that will cause harm to vegetation.

Other Potential Impacts on the Chassahowitzka National Wilderness Area

The potential for Polk Power Station emissions to affect air quality-related values (AQRVs) at the Chassahowitzka NWA were also evaluated. The AQRVs of interest were visibility, soils, vegetation, and wildlife. Visibility impacts were predicted with the VISCREEN program (EPA, 1988). As a result of the low emissions from Polk Power Station and the distance of the plant from Chassahowitzka, it was predicted that the potential for visibility impairment is negligible.

Similarly, modeling of Polk Power Station emissions showed that the potential impacts at Chassahowitzka would be negligible. Given the ecology of Chassahowitzka and the negligible potential impacts, no detrimental effects on soils, vegetation, or wildlife in the wilderness area are expected.

5.6.2 MONITORING PROGRAMS

5.6.2.1 Post-Construction Ambient Air Quality Monitoring

Tampa Electric Company will provide up to two ambient air quality monitoring stations to collect post-construction ambient air quality monitoring data. The parameters to be monitored, the locations of the monitoring stations, and the operational dates of the stations will be determined at a later date.

5.6.2.2 Continuous Air Emissions Monitoring

The Polk Power Station project will be subject to 40 CFR 60, Subparts Y and GG. An initial performance test for opacity from coal processing, coal storage, and coal transfer and loading systems associated with the coal preparation process will be conducted pursuant to Subpart Y requirements. Continuous monitoring of fuel consumption and ratio of water to fuel being fired in the turbine will be conducted for the Polk Power Station CTs as required by Subpart GG. Monitoring of fuel sulfur and nitrogen content will also be performed pursuant to Subpart GG, §60.334(b). Initial performance testing of the CTs for NO_x and SO₂ emissions will be conducted as stipulated by Subpart GG, §60.335.

Initial and periodic performance testing of pollutants emitted by the Polk Power Station facility will be conducted pursuant to FDER requirements as specified in the SCA Approval Order. FDER test methods are specified in Chapter 17-2.700(6), F.A.C.

5.7 NOISE

Potential operational noise impacts were assessed for the three closest groups of residential receptors around the project site from both continuous and intermittent sources of noise resulting from the Polk Power Station project together with the existing sources. The NOISECALC noise model developed by the New York State Department of Public Service was the primary analytical tool employed in the assessment. Noise level input data were obtained from vendors, constructing engineers, and literature.

Figure 5.7.0-1 shows the locations of residential receptors assessed in the noise modeling. The receptors were located at the three groups of residences closest to the project site. The following list provides the distances in feet between each receptor and the power block center.

<u>Receptor</u>	<u>Distance from Power Block Center (ft)</u>	<u>Number of Residences</u>
1	22,250	53
2	10,125	45
3	8,250	1

Each of the locations will be shielded to some extent from lower elevation noise sources by existing features or features which will be developed as part of the project, including the approximately 200-ft wide vegetative buffer area which will be established along the public roadways (i.e., SR 37, CR 630, and Fort Green Road). In addition to its significant distance (i.e., over 4 miles) from the facilities, Receptor 1, southwest of the power block, will receive some shielding from the wetlands and uplands after reclamation. Currently, there are trees shielding Receptor 2 which is located west of the site. After reclamation, there will be wetlands and uplands which may provide some shielding. Receptor 3 located east of the plant, may receive some shielding from an orange grove between it and the plant. Unless, the vegetation is dense and wide enough, it will not attenuate the noise between the plant and the residences (Federal Highway Administration, 1980).

5.7.0-2

KEY:

- ① RESIDENTIAL AREAS
- ★ NOISE MONITOR LOCATIONS

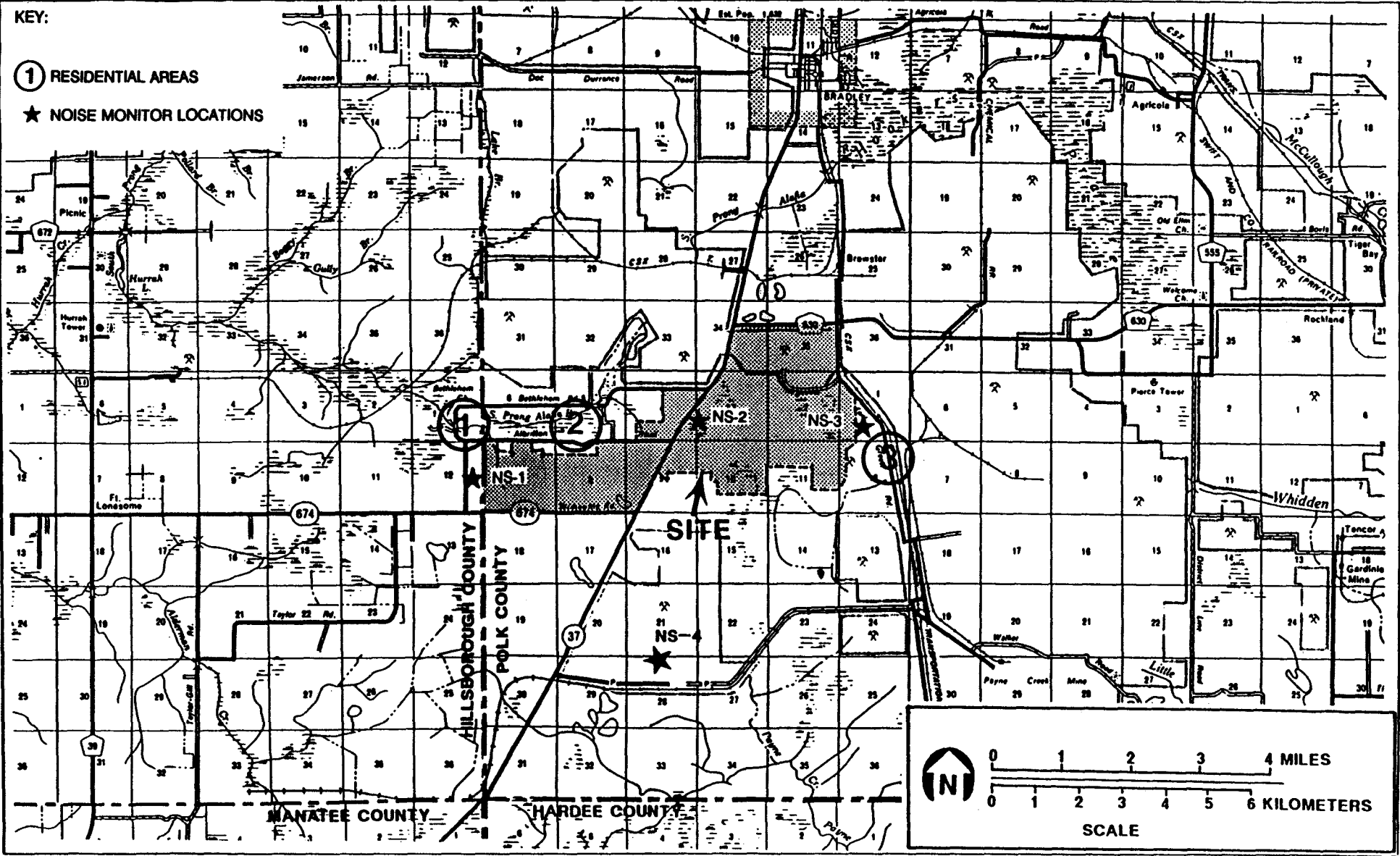


FIGURE 5.7.0-1.
LOCATIONS OF NOISE MODELING RECEPTORS

Source: FDOT Map, FL. ECT, 1992.



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Since the proposed vegetative buffer area surrounding the main plant site boundaries will take some time to mature after development of the project, a conservative approach was used for the noise analysis in that no credit was taken for vegetative noise attenuation in the modeling.

Table 5.7.0-1 presents the results of the noise modeling at each of the three receptor locations for three different timeframes in the overall project development and operation schedule (i.e., IGCC unit only, IGCC and CC units, and full build-out). In the analyses, flare stack and coal delivery train noise sources were modeled separately. For the IGCC unit only, the highest $L_{eq}(24)$ occurred at Receptor 2 west of the site. The highest $L_{eq}(24)$ of 51 dBA for other two development timeframes occurred at Receptor 2 and Receptor 3 located east of the site. Infrequent operation of the flare stack would temporarily increase noise levels to maximum instantaneous levels of 63, 77, and 75 dBA at Receptors 1, 2, and 3, respectively. The flare stack operations for full load trips are not expected to occur more than 24 hours per year. Project-related coal delivery trains on the CSX Railroad should not cause significant increases in the maximum noise levels at the residences but will increase the frequency of trains in the area. At Receptor 3, the residence closest to the railroad, the noise level produced by a train entering the site will be 54 dBA. Two trains per week will not significantly increase noise levels at any residence.

L_{dn} were computed for the plant based on the modeled levels. It was conservatively assumed that all plant activities will take place at any time of the day or night. [Calculation of the L_{dn} requires that a 10-dBA penalty be added to predicted noise levels between the hours of 10 p.m. and 7 a.m. to account for the increased awareness of people to nighttime noise levels. Thus, the L_{dn} is always higher than the 24-hour average level. A L_{dn} is essentially an $L_{eq}(24)$ value plus 10 dBA.]

The L_{dn} associated with plant operations were combined with the existing L_{dn} at the modeled receptor locations to show the total L_{dn} with the plant at full capacity. The existing L_{dn} include train, traffic, agricultural, and dragline noise. Table 5.7.0-2

Table 5.7.0-1. Noise Modeling Results

Receptor	Sound Level (dBA)				
	IGCC Unit Only $L_{eq}(24)$	IGCC and CC Units $L_{eq}(24)$	Full Build-Out $L_{eq}(24)$	Maximum Instantaneous Flare Stack Level	Maximum Instantaneous Coal Train Level
1	39	39	40	63	30
2	51	51	51	77	37
3	50	51	51	75	54

Source: ECT, 1992.

Table 5.7.0-2. Day/Night Noise Levels (dBA)

Receptor	Existing	Predicted Plant Noise	Combined Levels
1	57	46	57
2	61	58	63
3	59	58	62

Source: ECT, 1992.

presents the results of these calculations. The predicted L_{dn} were found to be slightly higher than the existing L_{dn} at Receptors 2 and 3. L_{dn} at Receptor 1 would be unaffected by the plant.

Tampa Electric Company will take into consideration noise mitigation measures as it evaluates equipment and prepares the detailed design of the plant. In addition to the proposed vegetative buffer, mitigative options may include silencers for the CT air intakes and require that vehicles on the plant site travel at slow speeds.

Projected noise levels from power plant operation will not affect wildlife resources. No sensitive wildlife communities (e.g., active eagle nests or wading bird rookeries) exist within 1 mile of the power block area. All wildlife onsite and in the region have been exposed to similar noise levels from phosphate mining for years.

In summary, the plant operation noise levels in the area surrounding the Polk Power Station site are generally not expected to increase significantly due to the project.

5.8 CHANGES TO NON-AQUATIC SPECIES POPULATIONS

5.8.1 IMPACTS

Vegetation and wildlife habitats situated on the Polk Power Station site have or will be modified by either phosphate mining or power plant construction. Habitats occurring onsite during power plant operation will be those left untouched during construction or those created either by mining reclamation or power plant development.

Potential adverse effects to local or regional terrestrial and wetland vegetation due to plant operation are commonly a result of air emissions and cooling system operation. As stated in Chapter 5.6, no significant impacts to either local or regional vegetation patterns are anticipated from the air emissions associated with power plant operation. Since water quality and temperature (after a short mixing zone) meet water quality standards and water levels will not be significantly increased or decreased in any offsite watercourse (i.e., flooding is not expected to occur outside of historic floodplains), no impacts to terrestrial or wetland vegetation are expected outside of the site boundaries.

Onsite, vegetation will become established along the littoral edges of the cooling reservoir and will vary in species composition and abundance depending on the water level fluctuations associated with surface water runoff, groundwater seepage, discharges, and rainfall. None of the remaining terrestrial or wetland communities within the property boundaries will be affected by plant operation. None of the listed plant species discussed in Section 2.3.6 will be impacted by plant operations.

The net effect of the reclamation/development plan will be to increase higher quality wildlife habitats over those that existed prior to mining. Wetland acreage will be increased over pre-mining conditions and, therefore, may result in an increase in wetland-dependent wildlife species onsite. No impacts to wildlife are anticipated as a result of using the cooling reservoir. As previously discussed, no impacts to wildlife

from power plant air emissions are expected either locally or regionally. No listed species discussed in Section 2.3.6 should be affected by power plant operation.

5.8.2 MONITORING

It is not expected that monitoring of the site's non-aquatic species will be necessary. Biological resources of the site were found to be already affected by phosphate mining operations.

Monitoring of the site reclamation/development plan will extend into the operational phase of the project in accordance with FDNR reclamation requirements. This will include creation and restoration of wetlands and documentation of their success.

5.9 TRANSPORTATION AND OTHER PLANT OPERATION EFFECTS

As shown in Table 5.9.0-1 and Figure 5.9.0-1, the operational workforce is anticipated to include 50 persons in 1995 at the initial operation of the plant (i.e., nominal 150 MW) which will increase in 1996 to 130 total employees at the completion of the IGCC unit (i.e., nominal 260 MW), then gradually to a total of 210 (i.e., nominal 1,150 MW) at project build-out in 2010. This employment figure includes plant operators, internal maintenance personnel, and supervisory and administrative staff. The distribution of the operational workforce at build-out by work shift is shown in Table 5.9.0-2, which illustrates that approximately 60 percent of the workforce will be on the site between 7 a.m. and 3 p.m.

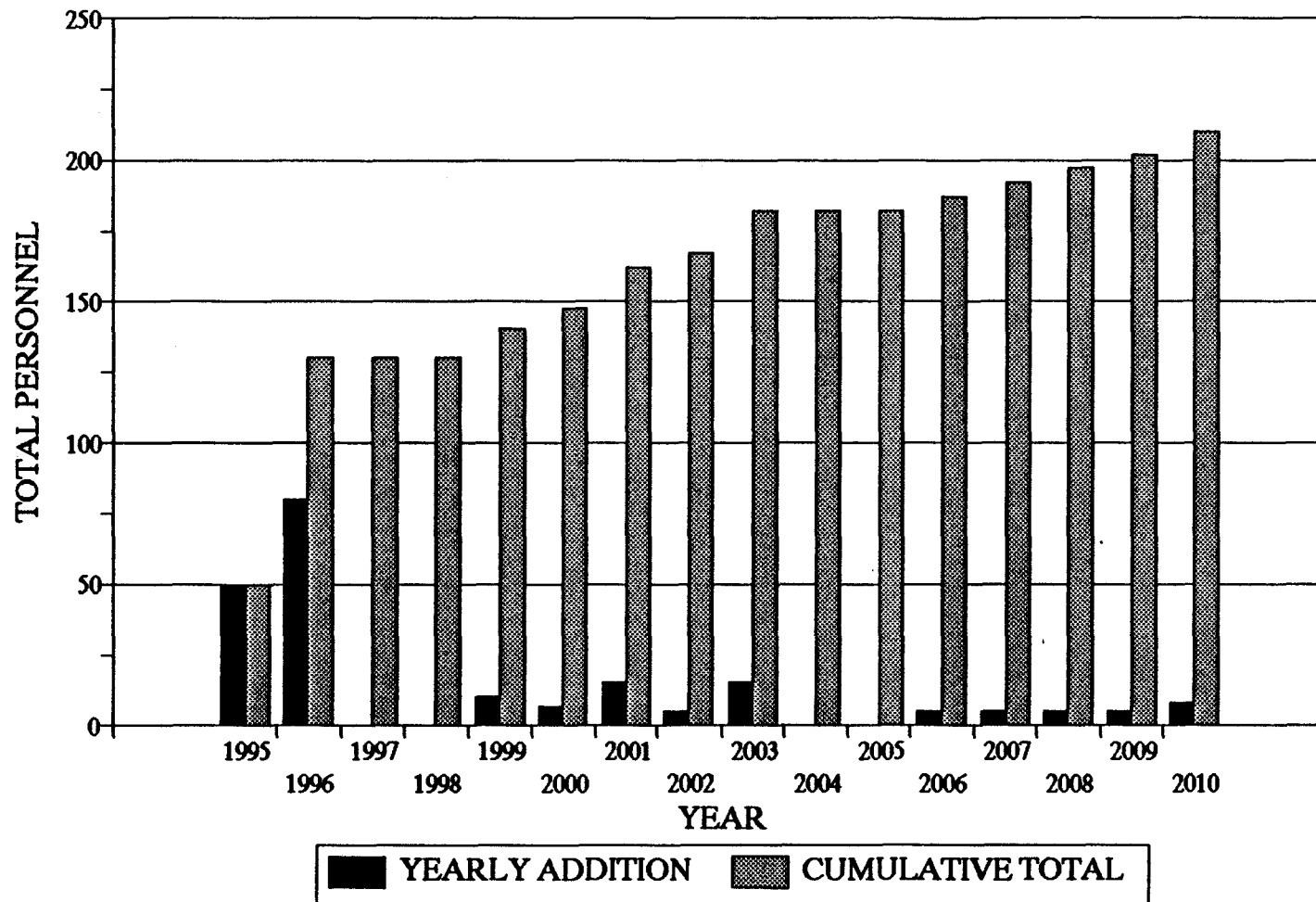
The majority of the operational workforce (e.g., plant workers) is anticipated to be drawn from the local labor pool in Mulberry, Bartow, Lakeland/Winter Haven, Plant City, and Tampa, with most of the senior plant management staff drawn from existing Tampa Electric Company operations in Hillsborough and Polk Counties. The geographic distribution of the operational workforce, as shown in Table 5.9.0-3, is anticipated to consist of the following: 60 percent from Polk County; 25 percent from Hillsborough County; 5 percent from Manatee County; 5 percent from Hardee County; and 5 percent from outside the region or state. Because the major regional population centers are within a 30-mile distance to the Polk Power Station, and based on typical commuting patterns of power plant employees (EPRI, 1982), it is estimated that 95 percent of the total operational workforce will commute from their existing residences. Only those recruited from outside the region or state, or the remaining 5 percent, are expected to permanently relocate to the region. At project build-out in 2010, this 5 percent represents 11 people. This number of potential relocations is not expected to create significant demands on regional housing, transportation facilities, or public services and facilities. In consideration of the relatively small number of relocations, the associated trips to and from the Polk Power Station site are not expected to create significant traffic impacts on the regional road networks.

Table 5.9.0-1. Operational Plant Personnel Requirements*

Year	Unit Additions	Total Nominal Station Capacity (MW)	<u>Personnel Requirement</u>	
			Addition This Year	Cumulative Total
1995	One 150-MW CT	150	50	50
1996	Conversion of CT to 260-MW IGCC	260	80	130
1999	One 75-MW CT	335	10	140
2000	One 75-MW CT	410	7	147
2001	CC conversion of two 75-MW CTs	480	15	162
2002	One 75-MW CT	555	5	167
2003	One 220-MW CC	775	15	182
2006	One 75-MW CT	850	5	187
2007	One 75-MW CT	925	5	192
2008	One 75-MW CT	1,000	5	197
2009	One 75-MW CT	1,075	5	202
2010	One 75-MW CT	1,150	8	210

*The personnel requirements include plant operators, maintenance personnel, and supervisory and administrative staff.

Source: UE&C, 1992.



* The personnel requirements include Plant Operators, Maintenance Personnel, and Supervisory and Administrative Staff.

FIGURE 5.9.0-1.

TAMPA ELECTRIC COMPANY POLK POWER STATION PLANT PERSONNEL REQUIREMENTS

Source: UEC, 1992.



**POLK
POWER
STATION**

Table 5.9.0-2. Estimated Distribution of Operational Workforce

County	1995	2010
Polk (60 percent)*	30	126
Hillsborough (25 percent)*	13	53
Hardee (5 percent)	2	10
Manatee (5 percent)	2	10
Outside region/state (5 percent)	3	11
TOTAL	50	210

*Rounded to the next whole position to establish worst-case relocation scenario.

Sources: UE&C, 1992.
ECT, 1992.

Table 5.9.0-3. Operational Workforce Labor Classifications at Build-Out

Shift	Skilled (Plant Operators)	Supervisory/ Professional	Adminis- trative/ Clerical	Total	Percent
First shift 7 a.m. to 3 p.m.	100	0	0	100	47.6
Second shift 3 p.m. to 11 p.m.	35	0	0	35	16.7
Third shift 11 p.m. to 7 a.m.	25	0	0	25	11.9
Management 7 a.m. to 4 p.m.	0	10	15	25	11.9
Maintenance 7 a.m. to 3 p.m.	20	5	0	25	11.9
TOTAL	180	15	15	210	100.0

Source: UE&C, 1992.

Based on existing operational traffic associated with a similar power plant, the trip generation rate for the Polk Power Station is expected to be approximately 2.35 trips per employee (Kimely-Horn, 1989).

The likely routes for operational employees commuting to the Polk Power Station are listed as follows according to community:

- From Bradley/Mulberry/Lakeland--South on SR 37 to Polk Power Station;
- From Bartow--West on SR 60 to SR 37 south to Polk Power Station, or south on CR 525 to CR 630 west to SR 37 south to Polk Power Station;
- From Fort Meade--West on CR 630 to SR 37 south to Polk Power Station;
- From Wauchula--North on U.S. Highway 17 to SR 62 west to CR 663/Fort Green Road north to CR 630 west to SR 37 south to Polk Power Station;
- From Plant City--South on SR 39 to SR 60 east to SR 37 south to Polk Power Station; and
- From Tampa/Brandon--East on SR 60 to SR 37 south to Polk Power Station, or east on SR 60 to CR 640 southeast to SR 37 south to Polk Power Station.

At the completion of the IGCC unit, a 130-person operational workforce is expected at the Polk Power Station. At project build-out in 2010, a daytime workforce (7 a.m. to 3 p.m.) of 125 persons, or approximately 60 percent of the total 210 operational employees, is anticipated. In consideration of the directional sources of employment, a distribution of 75 percent northbound and 25 percent southbound are assumed at a vehicle occupancy rate of 1.0. The daytime (7 a.m. to 3 p.m.) operational employee traffic volumes are estimated to be 221 daily northbound and 73 southbound daily trips at project build-out in 2010.

The projected operational workforce will also include those employees hired for contract maintenance on an annual basis. All of the contract maintenance workers are expected to commute from their existing residences, with no permanent reloca-

tion anticipated. The projected distribution of these annual contract maintenance workers ranges from 6 to 100 in 1997 to project build-out in 2010 as shown in Table 5.9.0-4. Based on previously stated assumptions regarding trip generation rate, vehicle occupancy rate, and directional distribution, and assuming that 100 percent of this workforce will be employed from 7 a.m. to 4 p.m., the additional traffic from contract maintenance workers ranges from 11 northbound and 3 southbound daily trips in 2001 to 176 northbound and 59 southbound daily trips in 2010.

As previously discussed in Section 3.3.2.1, two different means of delivering coal to the site, by truck or by rail, will be provided for the project. For purposes of identifying a worst-case scenario for vehicular traffic impacts, the following discussion assumes all coal to be delivered by truck.

Under this scenario, coal would be delivered via specially designed covered trucks. These specialized, bottom-dump trucks would operate from a coastal receiving facility at an estimated frequency of 80 to 100 trucks per day. The frequency of coal deliveries by truck is expected to remain constant from the completion of the IGCC unit in 1996 through the operational life of the plant. Based on the results of the detailed transportation analyses for the project, significant impacts on the a.m. and p.m. peak hour traffic volumes caused by the truck delivery of coal are not anticipated.

During the operation of the Polk Power Station, consumables will be delivered to the site, creating minimal additional traffic impacts. Consumable materials to be delivered include acid and caustic materials, boiler chemicals, lime, lubrication oils and greases, and miscellaneous gases. The distribution of these annual deliveries from project initiation in 1995 to build-out in 2010 is shown in Table 5.9.0-5, while the estimated constituent deliveries for the year 2010 and beyond is shown in Table 5.9.0-6. As these deliveries range from approximately four yearly deliveries in 1995 to approximately 50 annual deliveries in 2010, their additional traffic impacts will not be significant.

Table 5.9.0-4. Estimated Annual Contract Maintenance Personnel Requirements

Unit	Special Contract Maintenance Personnel in Year															
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
150-MW CT			6	6		10		6	6	11		6	6		10	
IGCC†				60		60		60		60		60		60		60
75-MW CT						5		7	5	7	5	7	5	7	5	7
75-MW CT							5	7	5	7	5	7	5	7	5	7
CC conversion					Included in preceding CT units											
75-MW CT								5		7			5		7	
220-MW CC										10		14		10		14
75-MW CT													5		7	
75-MW CT														5		7
75-MW CT															5	
75-MW CT																5
75-MW CT																
TOTAL ANNUAL			6	66		75	5	80	21	95	17	94	26	89	39	100

Note: The maintenance of the units could be staggered or combined based on plant operation requirements.

Source: UE&C, 1992.

Table 5.9.0-5. Annual Truck Deliveries for Consumables

Year	Number of Deliveries
1995	4
1996	10
1997	10
1998	10
1999	14
2000	18
2001	18
2002	22
2003	30
2004	30
2005	30
2006	34
2007	38
2008	42
2009	46
2010 and beyond	50

Note: Does not include waste or by-product offsite transfers.

Source: UE&C, 1992.

Table 5.9.0-6. Frequency of Truck Deliveries for Consumables for 2010 and Beyond

Material	Frequency
Acid	1 truck each month
Caustic	1 truck each month
Boiler chemicals	1 truck every 3 months
Lime	1 truck each month
Lube oil and grease	1 truck every 12 months
Miscellaneous gases	1 truck every 2 to 3 months
TOTAL ANNUAL	50

Source: UE&C, 1992.

Minimal traffic impacts to regional road networks are expected to result from fuel oil delivery trucks serving the Polk Power Station. Fuel oil is expected to be used as a backup fuel source for the CC and CT units used to meet peak or immediate demands and for the IGCC when operated in CC mode due to the unavailability of the CG plant. Table 5.9.0-7 provides estimated daily fuel oil truck deliveries based on worst-case fuel demands from project initiation in 1995 to project build-out in 2010. Based on the concurrent unavailability of natural gas and the gasifier, total daily fuel oil truck deliveries range from 7 in 1995 to 111 in 2010. The capability to deliver oil by rail would also significantly reduce the need for truck delivery.

A minimal amount of additional daily traffic will be generated by trucks transporting the by-products of the CG process, sulfur/H₂SO₄ and slag, offsite. Based on a 5-day workweek, approximately six 30-ton trucks will carry sulfur offsite daily, while nine 15-ton trucks will carry slag offsite. This converts to an additional 12 and 18 total daily operational trips, respectively, for sulfur and slag by-products.

The total projected operational daily vehicle trips are summarized on Table 5.9.0-8. These total predicted daily trips range from 322 in 1995 to 1,031 in 2010, and take into account operational and maintenance traffic, coal deliveries, and fuel oil truck and by-product truck deliveries. These total daily trips, when distributed over work shifts and for periodic delivery schedules, are not expected to lower the functional capacity of roadways to an unacceptable LOS or significantly impact a.m. and p.m. peak hour traffic volumes (see Appendix 11.6). Consumable delivery trip information was only available on an annual and not daily basis, and the range of these deliveries from initiation to build-out does not represent significant traffic impacts.

It is possible for vehicles accessing the Polk Power Station site to degrade the paving surfaces (e.g., by pot-holes) of those roadways closest to the Polk Power Station site. Two factors should minimize such potential degradation. First, heavy power plant components will be primarily delivered via rail. Second, access improvements, as appropriate, will be constructed in the initial project phase to facilitate construction

Table 5.9.0-7. Fuel Oil Consumption and Delivery Requirements*

Year	Unit Additions	Total Nominal Station Capacity (MW)	Daily Oil Consumption (gpd)		Number of Daily Truck Deliveries**			
			Maximum	Average	30-Day Replenishment		60-Day Replenishment	
					At Maximum Consumption	At Average Consumption	At Maximum Consumption	At Average Consumption
1995	One 150-MW CT	150	335,520.00	167,760.00	14	7	7	4
1996	CG conversion of one 150-MW CT	260	335,520.00	251,280.00	14	10	7	5
1999	One 75-MW CT	335	582,720.00	380,640.00	24	16	12	8
2000	One 75-MW CT	410	829,920.00	434,400.00	34	18	17	9
2001	CC conversion of two 75-MW CTs	480	819,290.40	591,798.00	33	24	17	12
2002	One 75-MW CT	555	1,066,490.40	721,158.00	43	29	22	15
2003	One 220-MW CT	775	1,550,260.80	1,061,676.00	62	43	31	22
2006	One 75-MW CT	850	1,797,460.80	1,115,436.00	72	45	36	23
2007	One 75-MW CT	925	2,044,660.80	1,191,876.00	82	48	41	24
2008	One 75-MW CT	1,000	2,291,860.80	1,321,236.00	92	53	46	27
2009	One 75-MW CT	1,075	2,539,060.80	1,374,996.00	101	55	51	28
2010	One 75-MW CT	1,150	2,786,260.80	1,451,436.00	111	58	56	29

5.9.0-12

Table 5.9.0-7. Fuel Oil Consumption and Delivery Requirements* (Continued, Page 2 of 2)

*Selective operations are based on shutting down one or more CT units at low loads during simple-cycle operation.

**Number of deliveries are calculated based on the following:

- Truck capacity: 8,000 gallons;
- Outages of natural gas and/or gasifier are 7 days; the plant will have at least 7 days' onsite oil storage;
- The oil trucks will replenish oil consumed over a 30- or 60-day period;
- Five days per week truck delivery; this means 22 days and 44 days delivery, respectively, for 30- and 60-day replenishment; and
- The truck deliveries are rounded off to the next whole number.

Source: UE&C, 1992.

Table 5.9.0-8. Combined Daily and Annual Operational Vehicle Trips

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Operational employment	50	130	130	130	140	147	162	167	182	182	182	187	192	197	202	210
Total daily trips ¹	118	305	305	305	329	346	381	393	428	428	428	440	451	463	475	494
Contract maintenance	0	0	6	66	0	75	5	80	21	95	17	94	26	89	39	100
Total daily trips ¹	0	0	14	155	0	176	12	188	49	223	40	221	61	209	92	235
Coal delivery trucks	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Total daily trips ²	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160
Fuel oil trucks ²	7	7	7	7	12	17	17	22	31	31	31	36	41	46	51	56
Total daily trips ³	14	14	14	14	24	34	34	44	62	62	62	72	82	92	102	112
By-product trucks ⁴																
Sulfur/H ₂ SO ₄	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Total daily trips ³	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Slag	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Total daily trips	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Total combined daily trips	322	509	523	664	543	742	617	815	729	903	720	923	784	954	859	1,031
Total annual consumable truck trips ⁵	8	20	20	20	28	36	36	44	44	44	44	68	76	84	92	100

Note: ¹ = trip generation rate of 2.35, vehicle occupancy rate of 1.0.

² = 60-day replenishment schedule for 7-day outage at maximum consumption.

³ = Trip generation rate of 2.0.

⁴ = by-product transport trips are assumed to remain constant.

⁵ = daily trip information not available.

Sources: UE&C, 1992.
ECT, 1992.

worker and machinery access to the Polk Power Station site. These two factors will minimize such road impacts, especially at the project entrances on SR 37. Tampa Electric Company will repair and maintain these entrances as necessary.

Based on existing traffic volumes, LOS ratings, and functional capacities of roadway networks; the projected number of permanent employees; and expected trip generation rates, traffic associated with the operation of the Polk Power Station will not lower the functional capacity of adjacent road networks below the adopted county standard, or significantly impact a.m. and p.m. peak hour traffic volumes (see transportation analysis in Appendix 11.6).

5.10 ARCHAEOLOGICAL SITES

Based on the results of the Cultural Resources Assessment and a confirmation letter from FDHR (see Appendix 11.5), no significant archaeological sites are expected to be found at the Polk Power Station site. Therefore, no onsite, post-construction monitoring is planned or required. As previously described in Section 4.8, if encountered, the applicant will take appropriate measures to preserve or mitigate potential impacts to archaeological sites after review by a certified archaeologist and consultation with the FDHR.

5.11 RESOURCES COMMITTED

The major irreversible and irretrievable commitments of state and local resources due to operation of the proposed Polk Power Station are the use of land, and the consumption of water, coal, natural gas, and fuel oil.

The majority of the land areas used by the Polk Power Station have been or will be disturbed by phosphate mining activities and would have been reclaimed to pastureland with lakes developed in some mine cut areas.

The Polk Power Station project will use some of these lands for energy production. In addition, significant acreages on the site will be reclaimed to forested and non-forested wetland and upland areas and will develop as wildlife habitat/corridor areas.

Some groundwater and surface water will be consumed (i.e, evaporated) in the operation of the cooling reservoir. The amounts used are negligible compared to the available local supply. Section 5.3 discusses the amounts available and to be consumed. No short- or long-term impacts to local surface and groundwater resources or water users are anticipated from the proposed water use by the Polk Power Station.

Coal, natural gas, and fuel oil will be consumed as fuel for the proposed electric generating units. The amounts are described in Chapter 3.0. This is an irreversible and irretrievable commitment of energy resources for the production of energy for the State of Florida.

5.12 VARIANCES

A thermal mixing zone will be required for the discharge of water from the proposed cooling reservoir. The size of this mixing zone is described in Section 5.1.1.

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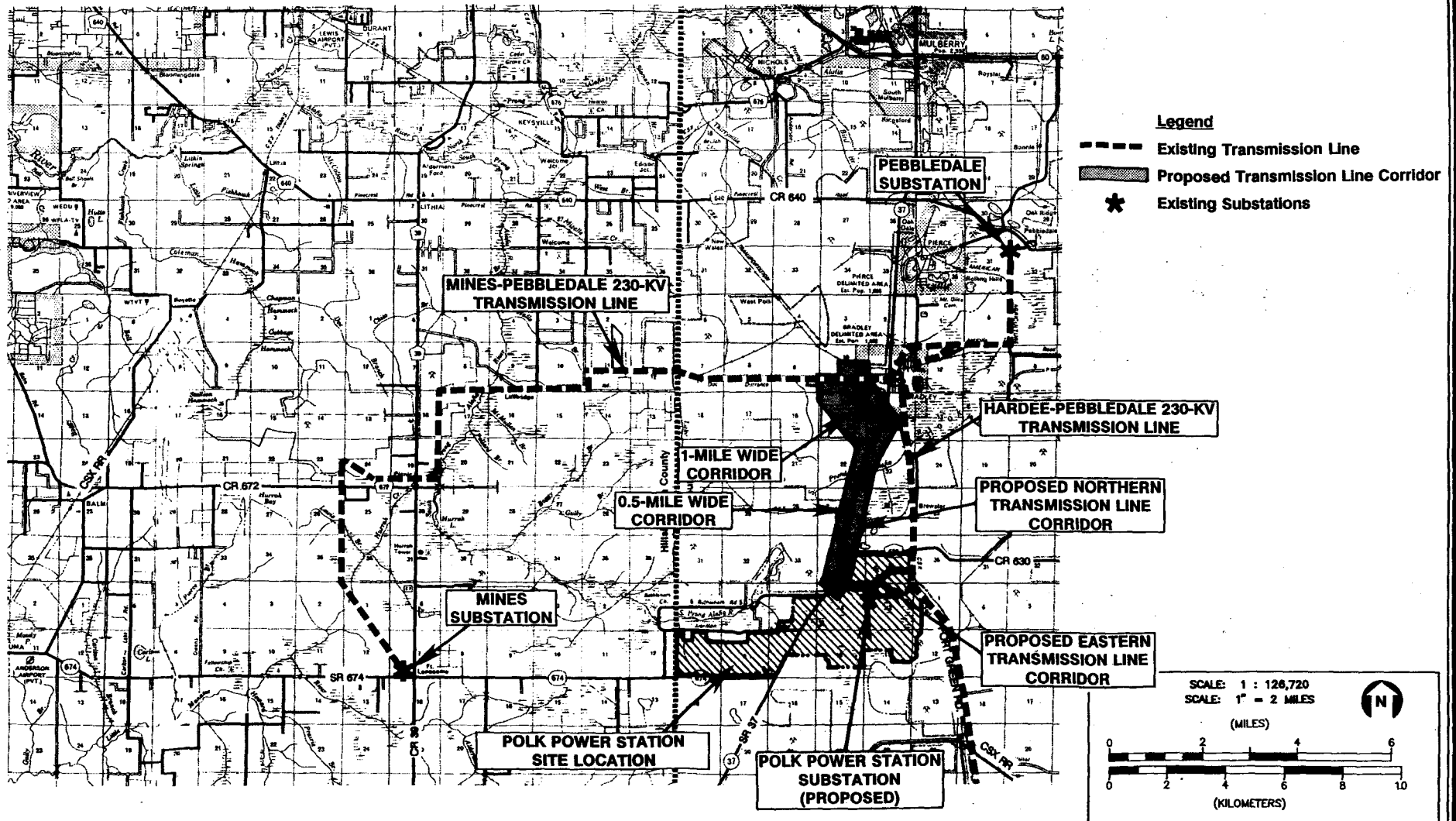


FIGURE 6.1.1-1.

EXISTING AND PROPOSED ELECTRIC TRANSMISSION LINES

Source: ECT, 1992.



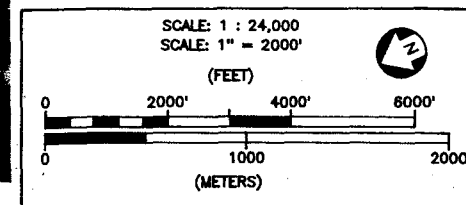
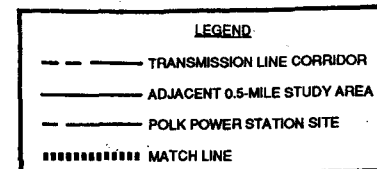
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proposed transmission line corridors in the following sections primarily focus on the portion of the northern corridor which is located outside of the Polk Power Station site boundaries. Descriptions of the existing environment for the eastern corridor and onsite northern corridor segment were provided previously in Chapter 2.0 of this SCA. In addition to evaluating socio-political and bio-physical characteristics for the proposed corridor, FDER application guidelines [FDER Form 17-1.211(1), F.A.C.] also require analysis of an area extending 0.5 mile from the edge of the corridor. This additional area will be referred to as the adjacent 0.5-mile wide study area.

6.1.2 CORRIDOR LOCATION AND LAYOUT

The proposed northern transmission corridor connecting Polk Power Station to the existing Mines-Pebbledale 230-kV transmission line will run west from the onsite substation to SR 37 (see Figure 6.1.2-1). This portion of the corridor will be 400 ft wide and is located entirely within the Polk Power Station site boundaries (see Figure 2.1.0-1). The proposed centerline of the corridor will turn north at SR 37 at a point approximately 1,500 ft north of Bethlehem Road. The proposed corridor will traverse north along SR 37, and then turn northwest at a point south of Bradley Junction in order to connect to the existing circuit while avoiding this community. The corridor width along SR 37 is 0.5 mile and is increased to 1 mile southwest of Bradley Junction to allow flexibility in routing the line around mined areas and phosphate clay settling ponds, and to avoid the existing community. The total length of this transmission line corridor is approximately 5.2 miles, including approximately 0.75 mile on the Polk Power Station site.

The proposed eastern corridor connecting the Polk Power Station site to the existing Hardee-Pebbledale 230-kV transmission line will be 400 ft wide and is completely contained within the Polk Power Station site boundaries (see Figure 2.1.0-1). This corridor proceeds in a general northeastern direction from the onsite substation across old mined, unreclaimed lands to the existing transmission line. The proposed centerline of this corridor will interconnect with the existing Hardee-Pebbledale 230-kV transmission line at a point approximately 1,400 ft south of the intersection of CR 630 and Fort Green Road. The existing Hardee-Pebbledale 230-kV circuit traverses along the west side of Fort Green Road at this point within the Polk Power Station site boundaries. This eastern corridor is approximately 1 mile long.



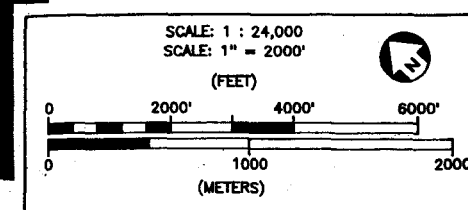
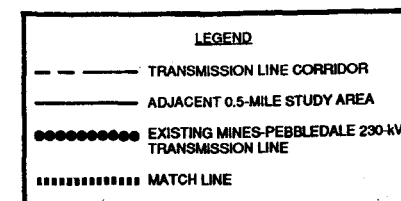


FIGURE 6.1.2-1.

NORTHERN TRANSMISSION LINE CORRIDOR AND ADJACENT STUDY AREA (PAGE 2 OF 2)

Sources: SRMC, 1992; ECT, 1992.

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6.1.3 TRANSMISSION LINE AND ROAD DESIGN CHARACTERISTICS

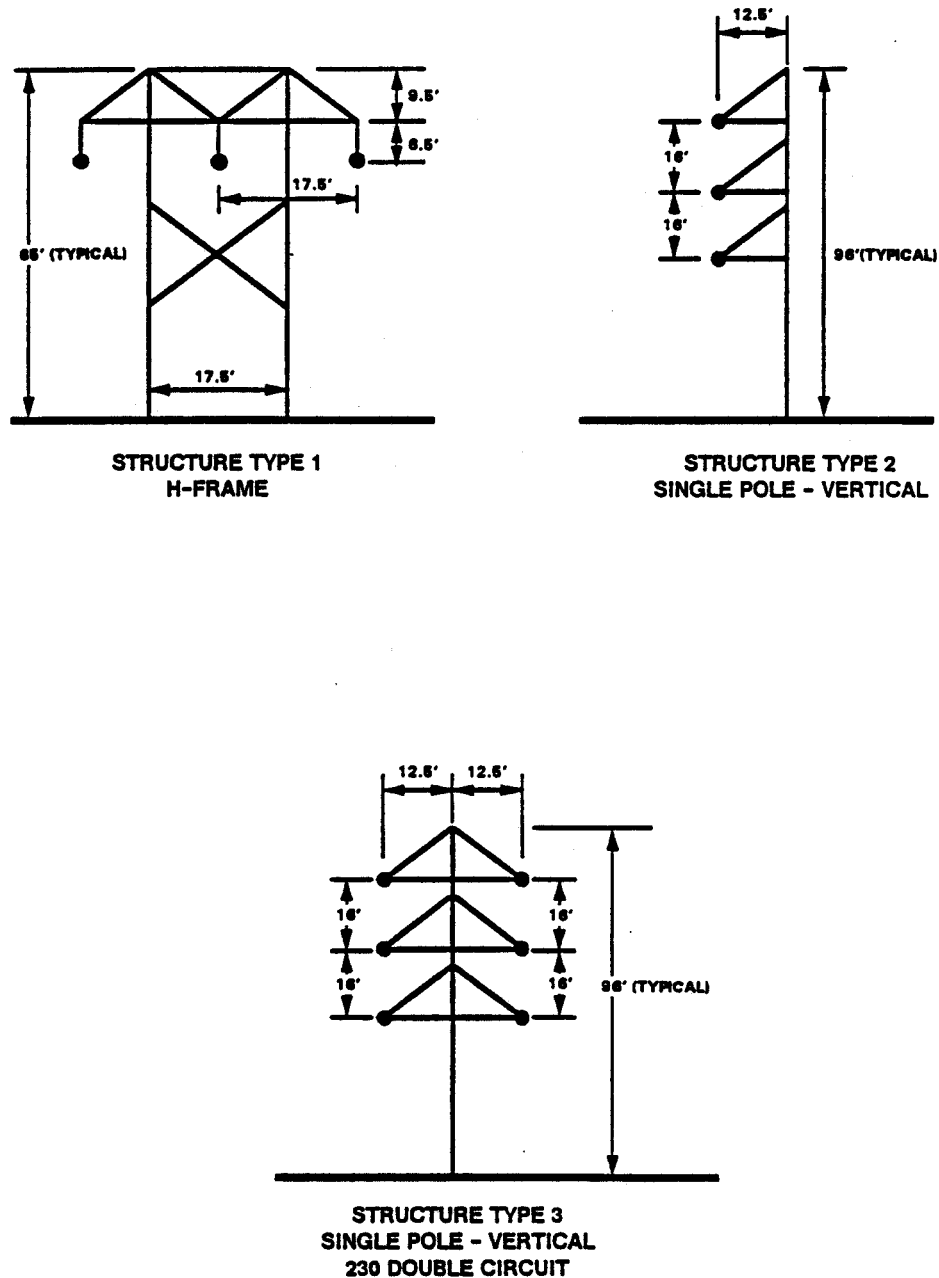
The transmission circuits will undergo a transmission line design process that includes considerations for the cost of construction and future maintenance and aesthetic compatibility. The transmission lines may be constructed using H-frame or single-pole structures. The poles may be of wood, steel, or concrete. Typical configurations to be used on H-frame and single-pole structures are shown on Figure 6.1.3-1. Unguyed structures will be used where the lines turn shallow angles. Guys and anchors will be used where the lines turn sharp angles. Depending on structure type used, the right-of-way will generally be a maximum of 150 ft wide for the northern corridor. The right-of-way for the onsite eastern corridor is generally considered to be 400 ft wide.

The design voltage of the proposed lines will be nominally 230 kV with a maximum current rating (MCR) of 1,880 amperes and a maximum continuous capacity of 749 megavolt-amperes (MVA). The MCR is the nominal capacity that would be expected to result in the conductor reaching its design temperature limit of 100°C (212°F).

Final conductor selection has not been completed. The optimum conductor will be determined based on an analysis of economics and performance considerations. A typical conductor for this type of construction is a 1,590 aluminum conductor steel reinforced (ACSR) unit with a nominal operating voltage of 230,000 volts. The overhead ground wire may contain fiber optic communications circuits or may be a stranded steel or aluminum cable.

Conductor profiles for H-frame and single-pole configurations are presented in Figures 6.1.3-2 and 6.1.3-3, respectively.

Span lengths between structures will average between 500 to 700 ft. Individual span lengths will be determined by the topography of the route and width of the right-of-way. The entire line will meet National Electrical Safety Code (NESC) standards for



NOT TO SCALE

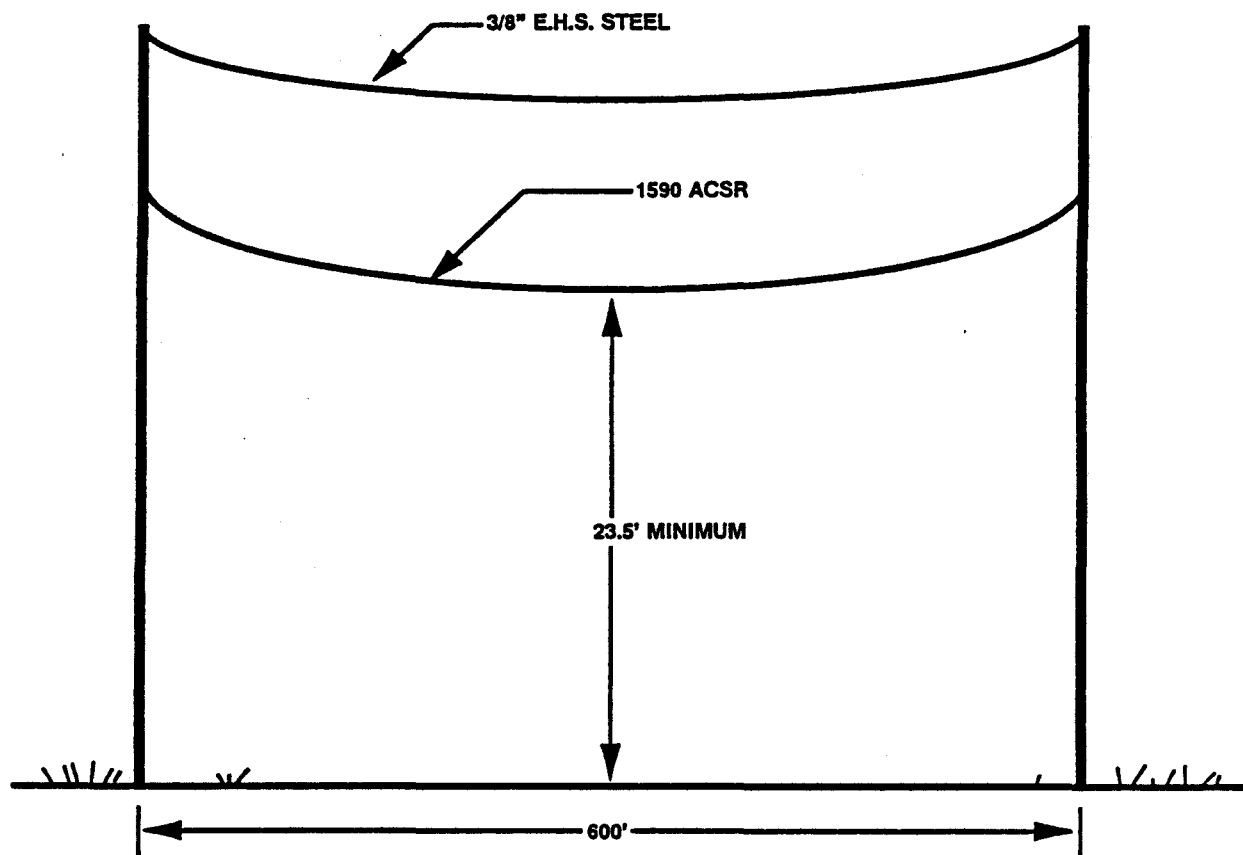
FIGURE 6.1.3-1.

POLK POWER STATION
TRANSMISSION STRUCTURES

Source: Tampa Electric Company, 1992.



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1590 ACSR (LAPWING)
600' RULING SPAN

NOT TO SCALE

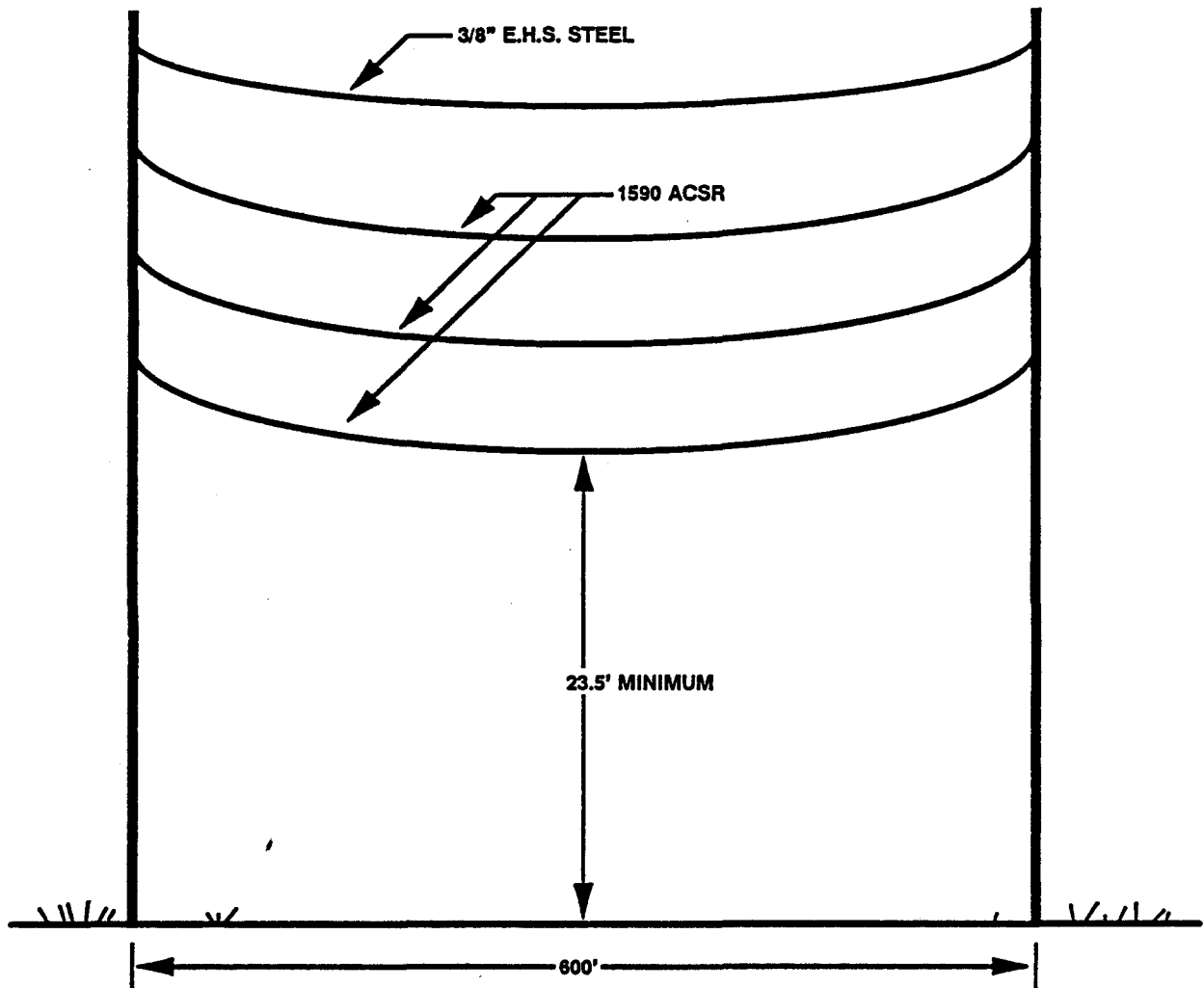
FIGURE 6.1.3-2.

CONDUCTOR PROFILE FOR H-FRAME
CONSTRUCTION

Source: Tampa Electric Company, 1992.



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1590 ACSR (LAPWING)
600' RULING SPAN

NOT TO SCALE

FIGURE 6.1.3-3.

CONDUCTOR PROFILE FOR SINGLE POLE
CONSTRUCTION

Source: Tampa Electric Company, 1992.



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clearance to ground and obstructions. Additionally, the minimum clearance from any energized conductor to ground will be 23.5 ft, which exceeds NESC standards by 1 ft.

Existing roadways (i.e., SR 37) will be used for access to the offsite portions of the northern transmission line wherever possible. If adequate road access does not exist for the onsite or offsite corridors, new roads will be constructed which will typically be unpaved and have a prepared driving area width of 16 to 20 ft.

Structure pads will typically be constructed adjacent to the access roads. The pads may be up to approximately 150 ft in width with the length varying as a function of the distance between the structure and the access road.

6.1.4 COST PROJECTIONS

Approximate costs for the transmission lines are presented in Table 6.1.4-1. The actual cost of the transmission lines may vary depending on the final right-of-way and structure location, structure configuration, cost of right-of-way acquisition, and other site-specific conditions.

Table 6.1.4-1. Cost Projections for the Transmission Lines for the Polk Power Station Project in 1992 Dollars

Corridor	Approximate Length (miles)	Estimated Right-of-Way Cost* (\$)	Total Right-of-Way Preparation Cost (\$)	Line Construction Cost (\$)	Total Cost (\$)
Northern	5.2	500,000	300,000	2,088,000	2,888,000
Eastern	1.0	0	20,000	633,000	653,000

*Right-of-way costs include only the offsite segment of the northern corridor.

Source: Tampa Electric Company, 1992.

6.1.5 CORRIDOR SELECTION

Corridor selection was dictated on the basis of selecting corridors that could connect the Polk Power Station to the existing transmission grid while minimizing land use and environmental impacts. In this case, the Polk Power Station is situated where long transmission lines were not necessary to interconnect with the existing grid. The station will be linked to the existing Tampa Electric Company Hardee-Pebbledale 230-kV line which traverses the east edge of the property. Therefore, this eastern corridor consists of a link across the northeastern portion of the plant site property to this existing line. Criteria used for its location included avoiding onsite physical and ecological constraints (e.g., old sand tailings mounds and lakes), while at the same time, complementing the proposed site layout.

The other transmission link is to the existing Tampa Electric Company Mines-Pebbledale 230-kV line to the north of the Polk Power Station, approximately 5 miles away. Corridor selection for this short link was based on avoiding the physical constraints (i.e., mining and phosphate clay settling ponds) and the populated area of Bradley Junction. Since SR 37 offered an obvious route through the phosphate mining-related activities to the Bradley Junction area, it was selected as the centerline for the northern corridor. Flexibility on right-of-way location was provided by making the corridor 0.5-mile wide. To avoid developed areas around the southwest portion of Bradley Junction and a large, reclaimed lake in the area, the corridor was widened to 1 mile as it turns northwest from SR 37. Immediately west of Bradley Junction, the corridor connects to the Mines-Pebbledale line, which runs east to west in this area.

6.1.6 SOCIO-POLITICAL ENVIRONMENT OF THE CORRIDOR AREA

6.1.6.1 Governmental Jurisdictions

Both proposed transmission line corridors, onsite and offsite, are completely contained within unincorporated Polk County and do not cross any incorporated municipal boundaries. Neither proposed transmission line corridor crosses any federal, state, regional, or local lands utilized for recreation or conservation.

6.1.6.2 Zoning and Land Use Plans

The proposed northern transmission line corridor primarily crosses disturbed lands currently or previously utilized for phosphate mining. Approximately 13 homes are located within the northern corridor along its length off the Polk Power Station site. An abandoned commercial structure is located approximately 0.5 mile north of CR 630 east of SR 37. No schools or other sensitive institutional uses or structures are contained within this corridor. Since this corridor will be collocated along existing linear facilities, will avoid populated areas, and will traverse existing mined lands, the proposed transmission line is not expected to have significant impacts on adjacent areas and land uses.

The proposed onsite eastern transmission line corridor traverses primarily lands that were previously mined for phosphate ore. Therefore, no residential, commercial, or institutional structures are located within this corridor. Again, this onsite corridor will have no impact on land uses in the area.

The development of the transmission lines associated with the Polk Power Station are currently permitted uses according to the Polk County Comprehensive Plan and Zoning Ordinance. According to Policy 2.125-D1(b) of the Comprehensive Plan, electric transmission lines are permitted as specialized uses in all future land use categories, in conjunction with the county approval of the CUP for the Certified Electric-Power Generating Facilities. Electric transmission lines are defined as Class I Essential Services according to the Polk County Zoning Ordinance. Class I Essential Services are permitted uses in all zoning districts.

As shown in Figure 6.1.6-1, the proposed northern transmission line corridor mainly crosses lands within the PM future land use category, with a small area of Agricultural/Residential Rural (A/RR) located approximately 1 mile south of Bradley Junction. Within the 0.5-mile of the corridor, the Rural-Cluster Center (RCC) future land use category is also encountered, corresponding to the unincorporated community of Bradley Junction. Permitted uses within these future land use categories are shown in Table 6.1.6-1.

As shown in Figure 6.1.6-2, the vast majority of lands within the northern transmission line corridor are zoned Rural Conservation (RC). The RC district was established to provide for low density residential development, agricultural and open space, and recreational uses. At the corridor's widest point (1 mile) southwest of Bradley Junction, the corridor crosses lands zoned Residence (R-1). This district was established to allow for the exclusive development of large homes or large lots, more commonly known as the ranchette concept of residential development. The northern transmission line corridor also crosses a small triangular tract of land zoned Single Family-Mixed (SF-1M) along the western edge of SR 37 approximately 1.5 miles south of Bradley Junction. The SF-1M district was established to provide for a mix of mobile homes and conventionally constructed homes in a low density setting.

The proposed northern transmission line corridor also crosses a small tract of commercially zoned land. A commercial tract within the proposed northern transmission line corridor located along the eastern edge of SR 37 and situated slightly more than 0.5 mile north of CR 630 is zoned C-3. The C-3 district allows for commercial development. The parcel zoned as C-3 located within the corridor corresponds to an abandoned gasoline service station.

Within the adjacent 0.5-mile wide study area, the following zoning districts are encountered: RC, R-1, R-3, SF-1M, and C-3. Of these districts, the only one not previously discussed relative to the transmission line corridor is the R-3 district. Located in portions of unincorporated Bradley Junction, this R-3 district is similar

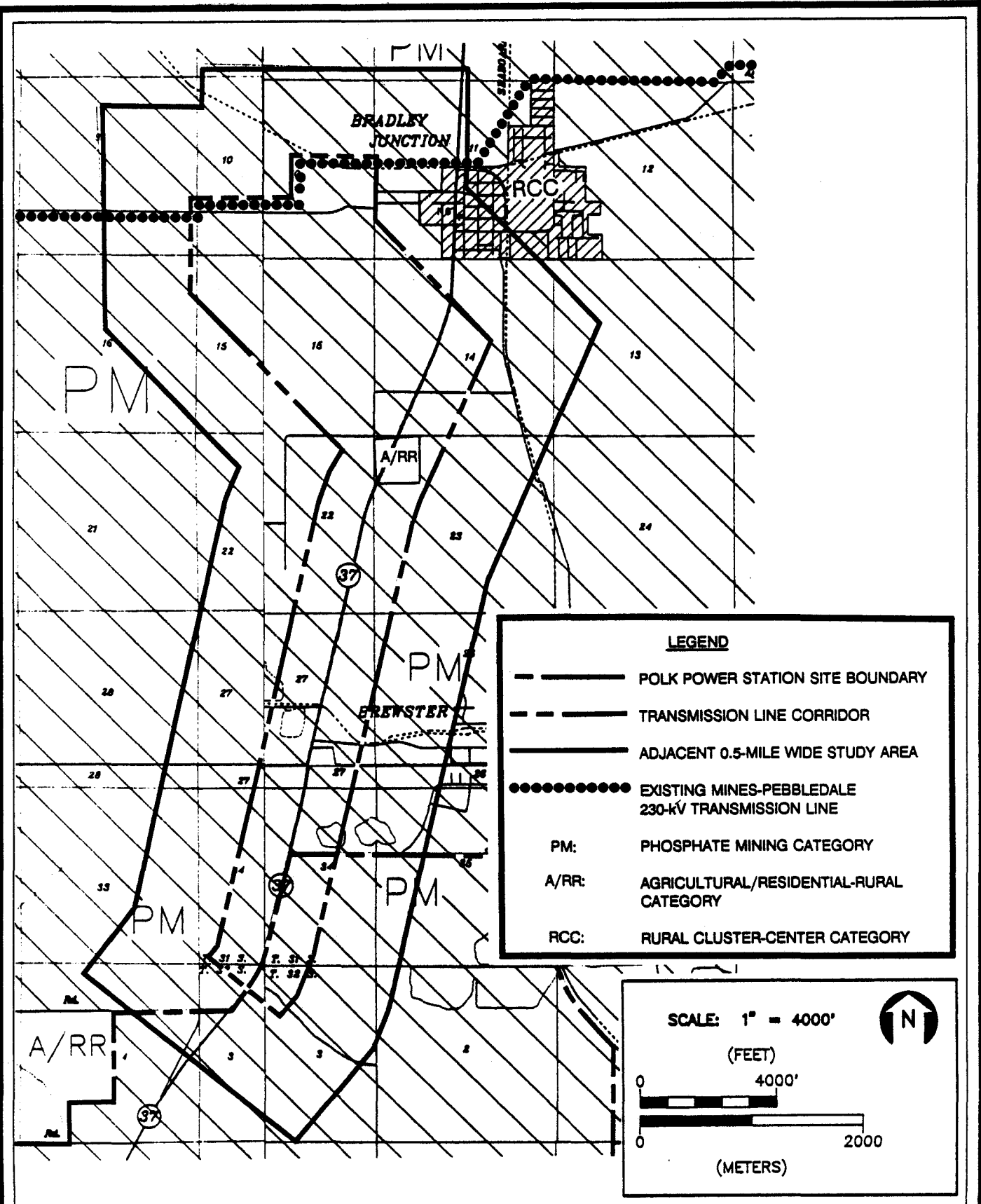


FIGURE 6.1.6-1.
FUTURE LAND USE CATEGORIES WITHIN 0.5 MILE
OF THE PROPOSED NORTHERN TRANSMISSION
LINE CORRIDOR

Sources: Polk County, 1991; ECT, 1992.



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Table 6.1.6-1. Future Land Use Categories and Zoning Districts within 0.5 Mile of the Proposed Transmission Line Corridor

Designation	Permitted Uses
<u>Future Land Use Categories</u>	
PM	PHOSPHATE MINING--Phosphate mining and allied industries, land reclamation, agriculture, Certified Electric-Power Generating Facilities and ancillary facilities, Non-certified Electric-Power Generating Facilities and ancillary facilities, commercial hazardous waste treatment facilities, and other land uses with conditional approval that are compatible with phosphate extraction and processing
A/RR	AGRICULTURAL/RURAL RESIDENTIAL--Single-family homes at a density of one dwelling unit per 5 acres, associated farm labor residential uses, utility structures, and permitted uses within Rural Residential Development (RRD) and Rural Mixed-Use Development (RMD) categories
RCC	RURAL-CLUSTER CENTER--Single-family homes at or less than a density of two dwelling units per acre, commercial uses compatible with rural population needs for retail and personal services, non-residential uses concentrated at the center of the cluster (i.e., grocery, pharmacy, medical offices) based on location and minimum population support criteria
<u>Zoning Districts</u>	
RC	RURAL CONSERVATION--Class III Agricultural Uses, parks and open space, nature preserves and wildlife refuges, single-family detached dwellings, foster homes, home occupations, Class I and II Essential Services, off-premises signs, other uses similar to or customarily accessory to those described
R-3	RESIDENCE--Residential dwellings not to exceed two stories, foster homes, customary accessory structures, parks and playgrounds, Class I and II Agricultural Uses, Class I and II Essential Services, home occupation

Table 6.1.6-1. Future Land Use Categories and Zoning Districts within 0.5 Mile of the Proposed Transmission Line Corridor (Continued, Page 2 of 2)

Designation	Permitted Uses
R-1	RESIDENCE--Single-family detached dwellings, foster homes, customary accessory structures, public parks and playgrounds, Class I and II Agricultural Services, Class I and II Essential Services
SF-1M	SINGLE FAMILY-MIXED--Single-family detached dwellings, foster homes, customary accessory structures, parks and playgrounds, Class I Agricultural Uses, Class I and II Essential Services
C-3	REGIONAL COMMERCIAL--Retail establishments, personal service establishments, offices, clinics, Class I and II Agricultural Uses, Class I and II Essential Services, financial institutions, light repair services, daycare centers, multi-family structures, restaurants, transient lodging places, business services, enclosed storage and warehousing, health and service establishments, amusement and recreational services, cultural activities, radio and television stations, kennels, off-premises signs

Note: Permitted uses are summarized. Some uses require conformance with other applicable regulations.

Sources: Polk County, 1991, 1983.
ECT, 1992.

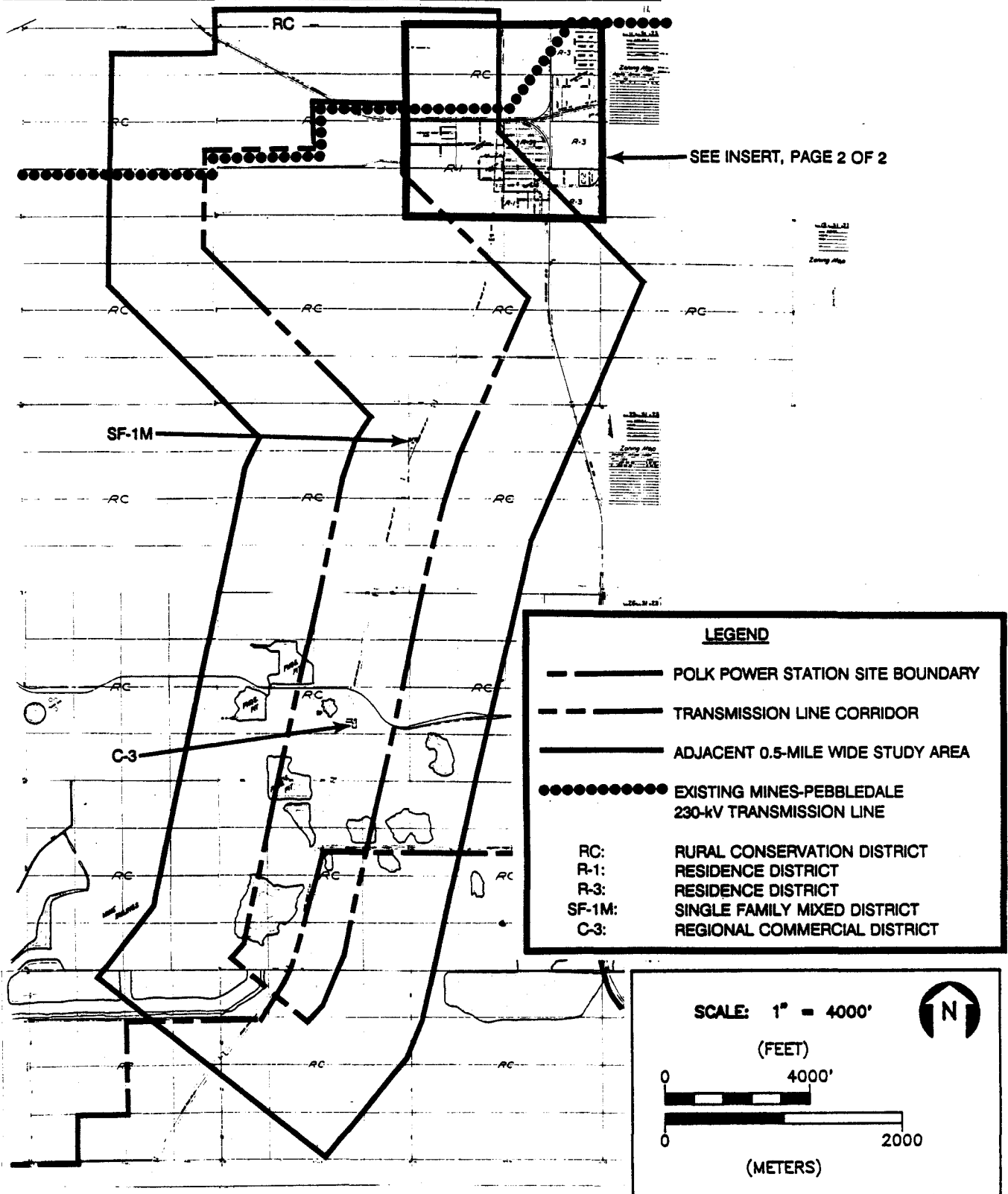
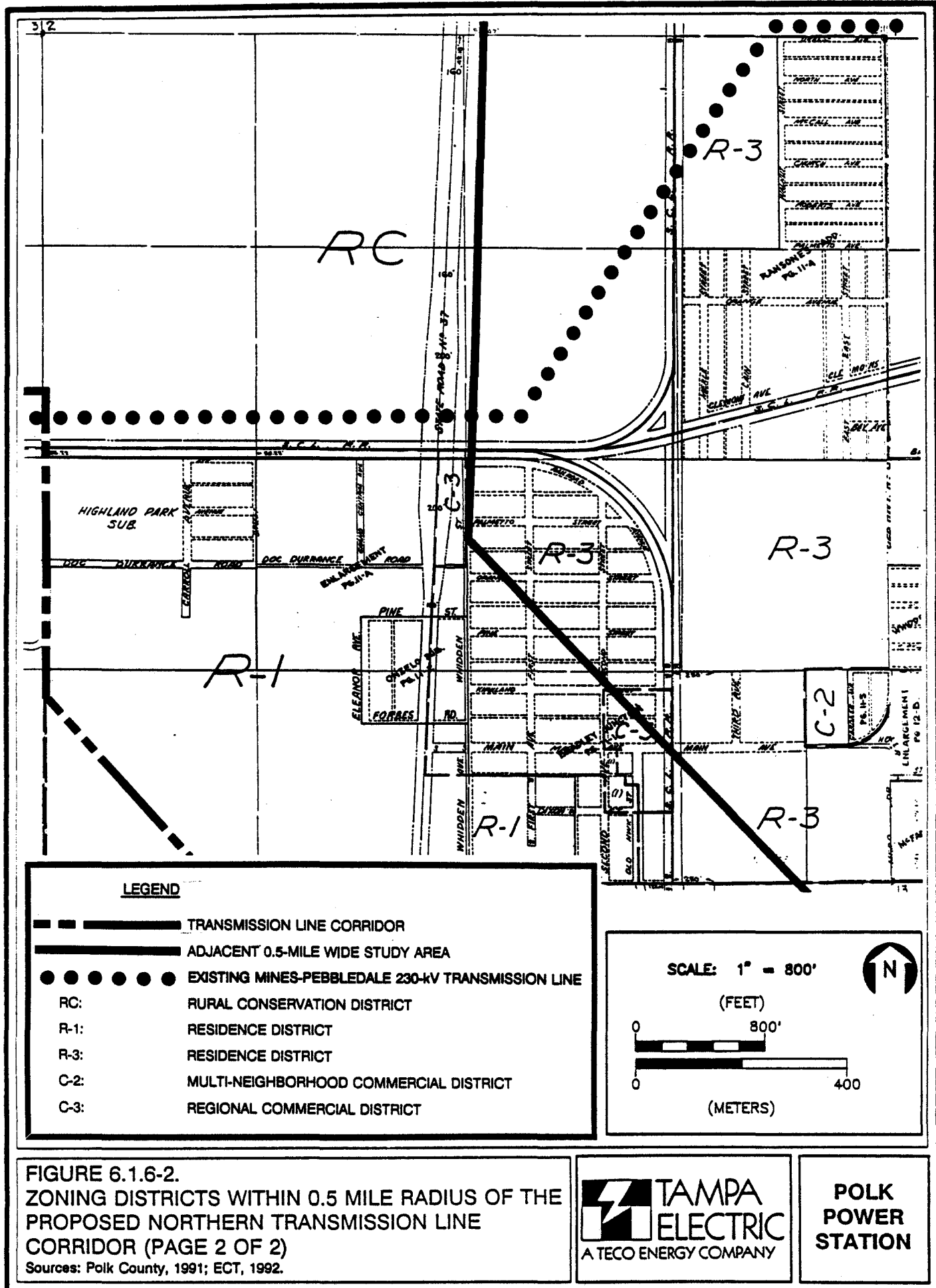


FIGURE 6.1.6-2.
ZONING DISTRICTS WITHIN 0.5 MILE OF THE
PROPOSED NORTHERN TRANSMISSION LINE
CORRIDOR (PAGE 1 OF 2)

Sources: Polk County, 1991; ECT, 1992.

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to the R-1 district except that it also allows residences of all building types (i.e., mobile homes and single-family) of up to two stories in height, and also allows home occupations. A description of permitted uses in all of these zoning districts is shown in Table 6.1.6-1.

The proposed onsite eastern transmission line corridor and segment of the northern corridor within the Polk Power Station site boundaries have a PM future land use designation and are zoned RC. Future land use and zoning district designations within the Polk Power Station site were previously discussed in Section 2.2.2.

6.1.6.3 Easements, Titles, and Agency Works

Easements and approvals are normally required for crossing agency-owned lands, easements, or Works of the District (i.e., SWFWMD). Table 6.1.6-2 lists those approvals which may normally be required for the northern corridor.

6.1.6.4 Vicinity Scenic, Cultural, and Natural Landmarks

The two proposed transmission line corridors do not contain areas with scenic and cultural resources or natural landmarks.

6.1.6.5 Archaeological and Historic Sites

A cultural resource assessment has not been conducted at this time for the portion of the proposed northern transmission line corridor outside of the Polk Power Station site. However, once the alignment is finalized, a centerline right-of-way survey will be conducted prior to right-of-way preparation, clearing, and transmission line construction. Based on the previous use of most of these lands for phosphate mining, significant archaeological finds are not expected to be encountered.

A cultural resource assessment for the proposed onsite eastern transmission line corridor and onsite portion of the northern corridor was conducted as part of the assessment for the entire Polk Power Station site. This assessment found no significant sites or resources eligible for listing on the National Register of Historic

Table 6.1.6-2. Easement, Title, and/or Crossing Approval Normally Required for Transmission Line Construction

Facility	Corridor	Agency	Approval
SR 37	Northern	FDOT	Utility permit
CR 630	Northern	Polk County	Utility permit
Doc Durrance Road	Northern	Polk County	Utility permit
South Prong Alafia River	Northern	SWFWMD	Work of the District permit

Source: ECT, 1992.

Places, and a low probability exists of discovering any unrecorded sites. The findings of this assessment were reviewed and approved by the FDHR (see Appendix 11.5).

6.1.7 BIOPHYSICAL ENVIRONMENT OF THE CORRIDOR AREA

6.1.7.1 Land Use/Vegetation

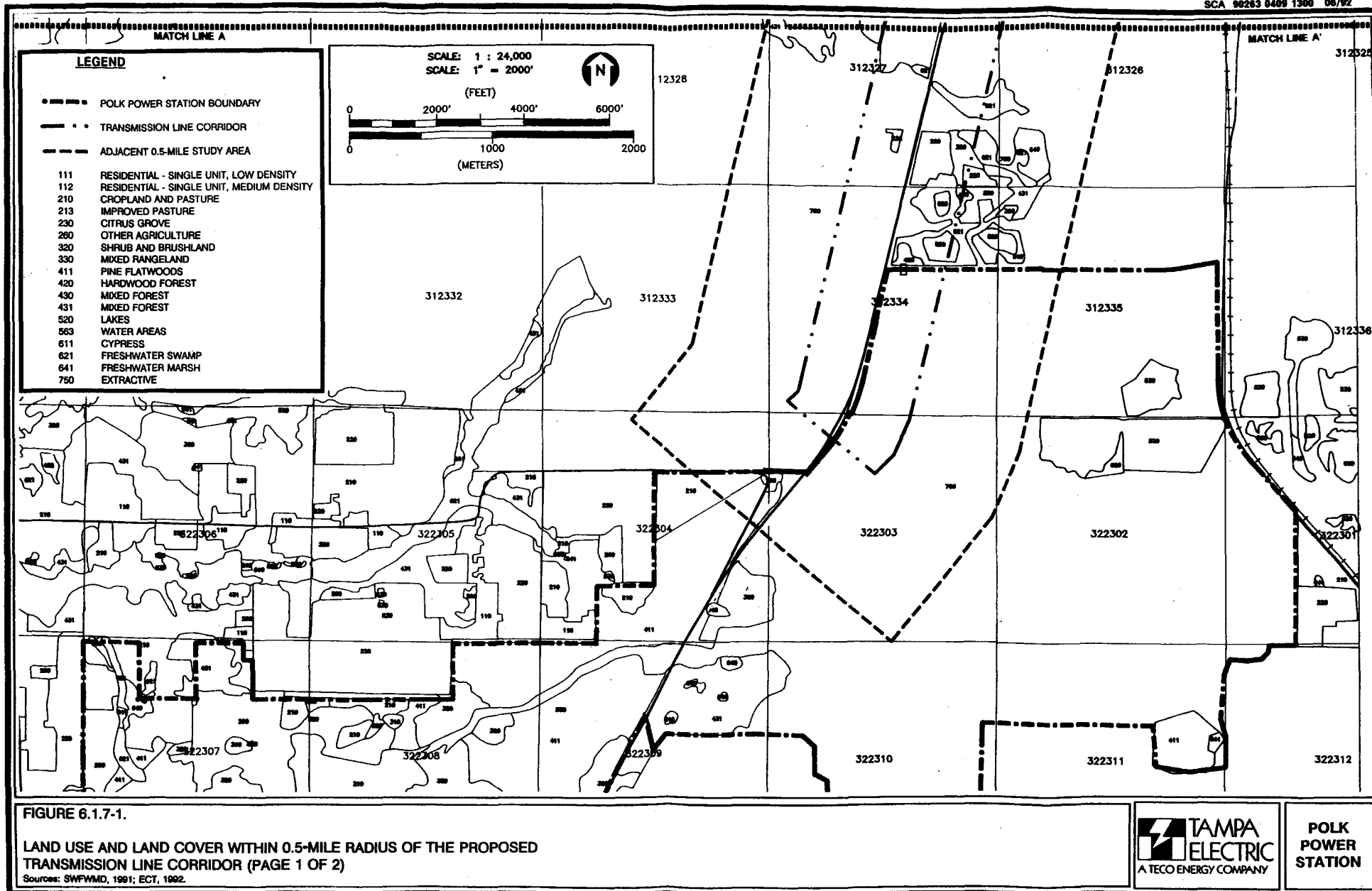
The existing land use (FLUCCS Category II) and vegetation cover (FLUCCS Category III) for the offsite portions of the northern corridor and within 0.5 mile of the edges of the corridor were identified and mapped using information from USGS 1:24,000 topographic quadrangle maps, 1992 Land Use and Land Cover Maps prepared by SWFWMD, and 1-inch = 400-ft prints of aerial photographs taken in March 1992. Information gathered from these sources was substantiated through field studies and helicopter flyovers. Land use and vegetation are shown in Figure 6.1.7-1. Current aerial photographs (March 1992) of the northern corridor area at a scale of 1:24,000 are shown in Figure 6.1.2-1. A current aerial photograph for the onsite eastern corridor area is shown in Figure 2.1.0-1 and at a more detailed scale (i.e., 1 inch equals 1,000 ft) in Appendix 11.16.

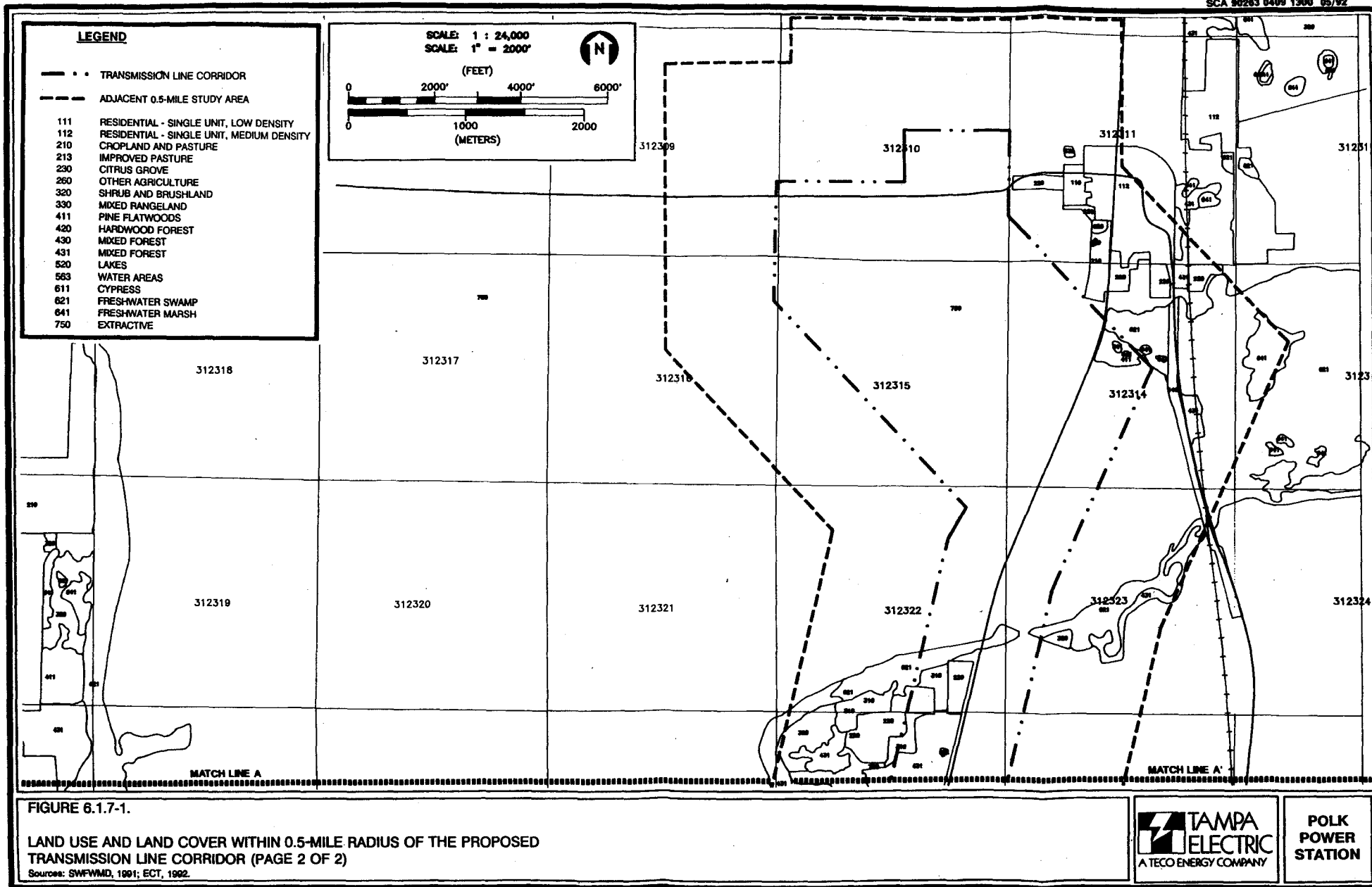
Since a portion of the northern and all of the eastern transmission line corridors fall entirely within the boundaries of the Polk Power Station site proper, existing land use and cover characteristics mapped according to FLUCCS for these onsite areas were previously discussed in Sections 2.2.3.2 and 2.3.5.

Land Use

As shown on Figure 6.1.7-1 and as previously described, the majority of the lands within the proposed offsite transmission line corridor and 0.5-mile wide adjacent study area fall within the extractive (750) designation, associated with phosphate mining. These extractive areas include mined areas, spoil banks, sand tailing areas, clay settling ponds, and reclaimed areas. Some of the reclaimed areas designated as 750 by SWFWMD in actuality are currently improved pasture.

The SWFWMD data show no residential or commercial development within the proposed transmission line corridor. However, it is known that 13 residences are contained in the approximately 5.2-mile corridor, as based on review of aerial photographs and field evaluations. These residences are found in scattered locations





along SR 37 and include single-family homes and mobile homes. Many of these homes appear to be associated with agricultural uses along SR 37. An abandoned commercial use, an old gas station, is not indicated on SWFWMD maps, but is located within the corridor, slightly more than 0.5 mile north of CR 630 on the eastern edge of SR 37. No schools or sensitive uses are contained within the proposed northern transmission line corridor.

Within the 0.5-mile wide adjacent study area, the only areas of urban (i.e., residential, commercial, and institutional) development are located in Bradley Junction. SWFWMD data identified the general Bradley Junction area as 111, low-density residential (less than two dwelling units per acre) and 112, medium-density residential (two to six dwelling units per acre). However, while Bradley Junction is predominantly a residential area, a few scattered commercial uses (i.e., convenience stores and gas stations), a few institutional uses (i.e., churches and a post office), and a park (Bradley Junction Recreational Park), which are not indicated on SWFWMD maps are also located within this unincorporated community. No schools or sensitive uses are contained within the 0.5-mile wide adjacent study area.

Agricultural lands are also found in scattered locations within the proposed transmission line corridor and the 0.5-mile wide adjacent study area. These areas are mapped as 230, citrus groves; 210/213, cropland and pastureland/improved pasture; and 260, other agriculture. As previously discussed, more areas of improved pasture are located within the corridor and adjacent study area than indicated on SWFWMD maps, which correspond to reclaimed phosphate mining lands. It is likely that these reclaimed areas were not separately mapped by SWFWMD because they were considered an extractive (750) land use.

Land cover types within the proposed transmission line corridor and 0.5-mile wide adjacent study area include the following: 320, shrub and brushland; 330, mixed rangeland; 411, pine flatwoods; 430/431, mixed forest; 520, lakes; 563, other water areas; 611, cypress; 621, freshwater swamp; and 641, freshwater marsh.

The vegetation associated with these land cover types and agricultural/mining uses are described in the following paragraphs.

Vegetation

Since the eastern corridor and a portion of the northern corridor lie completely within the boundaries of the Polk Power Station site, the vegetation types traversed by this corridor area were described in Section 2.3.5.

The northern corridor connects the Polk Power Station to the existing Mines-Pebble-dale 230-kV transmission line via a 5.2-mile long corridor situated primarily north of the Polk Power Station along SR 37, to a location south of Bradley Junction at which point it turns northwest and intersects the existing transmission line. The vegetation encompassed within the offsite portion of this corridor and in the area extending 0.5 mile from either edge of the corridor is primarily ruderal vegetation typical of areas altered by mining. Small areas of remnant, relatively natural communities are included within and adjacent to the northern corridor. For convenience, the plant communities encountered within and adjacent to the northern corridor are grouped under the broad characterization of uplands and wetlands. Within each are several distinct community types (designated using FLUCCS, 1976) which are described in the following paragraphs. Scientific names are provided in Appendix 11.10. The location and extent of these plant communities are illustrated on Figure 6.1.7-1.

Uplands--Upland communities within and along the northern corridor include pine flatwoods (411), mixed forest (430/431), hardwood forest (420), shrub and brushland (320), mixed rangeland (330), cropland and pastureland/improved pasture (210/213), citrus groves (230), and upland vegetation on phosphate mined lands (750).

Pine flatwoods is the dominant plant community type within Florida. These open woodlands occupy flat terrain overlying sandy soils which often exhibit a hardpan layer. Within the study area, the flatwoods are dominated by slash pine in the over-story (less commonly, longleaf pine) and a shrub-dominated stratum consisting pri-

marily of saw palmetto, gallberry, and small oaks. Herbs are present in open spaces between clumps of saw palmetto. Conspicuous herbs include wiregrass, dichanthelium grass, bushy goldenrod, wild sensitive plant, elephant's foot, and rabbit's tobacco.

Mixed forest includes forest areas with a significant conifer and hardwood component. These communities often represent a late seral stage from pine flatwoods to oak hammock; floristically, mixed forests contain elements typical of both pine flatwoods and oak hammocks.

The hardwood forest type is often referred to as *oak hammock*. Structurally, this community usually exhibits three strata with a dense canopy, a sparse shrub stratum, and a mosaic herb layer. The canopy is usually dense and dominated by live oak, laurel oak, cabbage palm, and occasionally slash pine. Shrubs typically include saw palmetto, wax myrtle, groundsel bush, and beautyberry. Herbs include dichanthelium grass, coinwort, marsh pennywort, dayflower, and galingales.

After a native forest has been cleared and subsequent land uses abandoned (especially improved pasture), a community type dominated by shrubs and a variety of weedy forbs develops. Depending upon the percentage of land area covered by shrub/brush and/or open grassland, the community can be designated as either shrub and brushland or mixed rangeland. Common species include wax myrtle, shiny sumac, laurel oak, beardgrass, goldenrod, blackberries, bracken fern, Caesar's weed, dog fennel, smutgrass, bahia grass, and beggar's-ticks.

Improved pasture exists on areas formerly supporting pine flatwoods, mixed forest, or hardwood forest, or on reclaimed and mined land. These areas have been cleared of native vegetation and planted with introduced grasses, especially bahia grass. In the absence of maintenance or cattle grazing, these areas become dominated by old field vegetation such as dog fennel, beardgrass, and various legumes.

Citrus groves are cultivated on lands cleared of native upland vegetation or on reclaimed mined lands. Most groves are planted for orange (231) or grapefruit production (232).

The upland vegetation-mineral extraction designation encompasses ruderal vegetation characteristic of phosphate mine spoil piles, clay settling ponds, perimeter dikes, etc. The vegetation is usually dominated by shrubs and herbs except on older unreclaimed lands where trees dominate. Tree species include laurel oak, live oak, black cherry, sweet gum, slash pine, and water oak. Common shrubs and herbs include Brazilian pepper, groundsel bush, wax myrtle, beggar's-ticks, beardgrass, smutgrass, Bermuda grass, musky mint, dog fennel, goldenrod, natal grass, rattleboxes, Vasey grass, marsh fleabane, and milkpea.

Wetlands--Wetland communities associated with the northern transmission corridor include freshwater marsh (641), freshwater swamp (621), cypress (611), lakes (520), and other water areas (563) such as mine pit lakes, cattle ponds, and other created water bodies.

The freshwater marsh designation encompasses all treeless wetlands dominated by emergent herbaceous vegetation that flood seasonally. The marshes within and adjacent to the corridor are located in basically circular depressions within upland habitats. Zonation is often apparent, and distinct vegetation zones form in response to elevation, degree of inundation, and organic content of the soil. In some areas, shrubs have become established possibly due to drainage alterations or lack of fire.

Typical marsh species are St. John's wort, sand cordgrass, maidencane, beak rushes, beardgrasses, galingales, rushes, yellow-eyed grasses, milkworts, meadow-beauties, bog-buttons, pickerelweed, and arrowhead.

Freshwater swamps, dominated by a mixture of hardwood trees, occur along the South Prong Alafia River intersecting the corridor north of the power plant site. In

addition, shrub swamp associations occur at edges of mine pit lakes, within clay settling areas, and within marsh areas which have been altered or which have not experienced periodic fires.

Typically within the mixed hardwood swamp, the canopy is dense and dominated by water-tolerant hardwoods with some cypress. The tree species composition varies according to hydroperiod, soil characteristics, and the nature of the drainage basin. The following tree species are representative of the floodplain swamps traversed by the corridor: red maple, laurel oak, pop ash, blackgum, sweetgum, and bald cypress. When the canopy is dominated by either bald or pond cypress, the wetland can be characterized as a cypress strand or dome depending upon the forest profile, canopy dominance, hydroperiod, and other factors. Often a sub-canopy composed of dahoon holly, swamp redbay, pop ash, loblolly bay, and sweet bay is discernible. Common shrubs include buttonbush, highbush blueberry, wax myrtle, elderberry, and primrose willow. Common herbs observed are beak rushes, galingales, dichanthelium grasses, cinnamon fern, royal fern, thelypteris, Virginia chain fern, coinwort, water hoarhound, panic grasses, maidencane, and pickerelweed. Vines are a conspicuous element of the flora. Southern fox grape, catbriers, peppervine, Virginia creeper, and poison ivy are common vines.

Shrub swamps are usually typified by the predominance of willow and/or red maple in the canopy. Shrubs, herbs, and vines are similar to those described for the floodplain of the South Prong Alafia River.

The lakes and other water areas category encompasses all open water bodies created through activities associated with phosphate mining or agriculture (cattle ponds). The littoral vegetation zone is comprised of emergent freshwater marsh or swamp species as listed previously. In addition, floating-leaved or submerged aquatic plants are typical. These include water hyacinth, water lettuce, hydrilla, fragrant white water lily, spatterdock, and Scirpus cubensis.

6.1.7.2 Affected Waters and Wetlands

Affected waters and wetlands crossed by the northern corridor include phosphate reclaimed lakes, clay settling ponds, small ditches and canals (primarily along SR 37), and a crossing of the South Prong Alafia River. The South Prong Alafia River crossing is unavoidable; however, depending on final right-of-way location, the other water crossings may be avoided. Since the eastern corridor occurs on the Polk Power Station, those affected waters are discussed in Section 2.3.4 of this application.

6.1.7.3 Ecology

An area that included the northern and eastern corridor and 0.5 mile beyond either edge of the corridors was evaluated for the potential presence of plant and animal species that are officially designated as endangered, threatened, species of special concern, rare, commercially exploited, or under review for listing by one or more of the following agencies/organizations: USFWS, FGFWFC, FDACS, FCREPA, and FNAI, and may reasonably be expected to occur in the corridor study areas.

The selection criteria which determined the specific species to be discussed in this section of the application included their known or expected occurrence in the corridor study area as inhabitants or residents, migrants, or transients; potential for impacts due to right-of-way clearing, construction, and maintenance of the transmission line; or other agency concerns such as the presence of ecologically unique or valuable habitats.

Table 2.3.6-6 in Section 2.3.6 of this application lists important plant and animal species known to occur or for which appropriate habitat exists in the study area or immediate environs.

The probability for occurrence for these organisms in the corridor was based on known locations for such species (e.g., eagle nests, wading bird colonies, etc.), direct field observations, recent and historical reports of occurrence in the literature, and

the presence of suitable habitat as shown on land use and land cover maps and recent aerial photographs.

Plant Species

Of the 18 species of plants listed in Table 2.3.6-6, 10 are known to occur on the plant site which encompasses the onsite eastern corridor and a segment of the northern corridor. Several of the plant species listed in Table 2.3.6-6 undoubtedly occur within or 0.5 mile on either side of the offsite portions of the northern corridor, especially within the floodplain of the South Prong Alafia River north of the plant site. These plants are dahoon holly, cinnamon fern, royal fern, golden polypody, wild azalea, bluestem, *Aspidium* fern, red-needle leaf, shoestring fern, and netted chain fern. Two other species, prickly pear and wild coco, are often common on reclaimed mined lands or improved pasture, both abundant vegetation types within the northern corridor study area.

In addition to the plants listed on Table 2.3.6-6, one additional species was evaluated as having the potential to occur within or adjacent to the northern corridor; namely, needle palm (*Rhapidophyllum hystrix*). This unique palm is spottily distributed in central and northern Florida and is currently listed as commercially exploited by FDACS. Although rare in the State of Florida, this palm is locally abundant within suitable habitat areas. Though known to occur within the South Prong Alafia River system in Polk County, it has not been recorded or found within the northern corridor study area.

Animal Species

Any of the wildlife species depicted in Table 2.3.6-6 have the same potential for occurrence in the corridors as previously described in Section 2.3.6 of this application. No individual nesting or unique habitats for any of these species were observed in the northern corridor. It is unlikely that the northern corridor contains any habitat solely depended upon by one of these species.

6.1.7.4 Other Environmental Features

Relevant environmental information regarding the biological and water resources within and near the transmission line corridors is presented in the preceding subsections. No other significant environmental features have been identified within or adjacent to these corridors.

6.1.8 EFFECTS OF RIGHT-OF-WAY PREPARATION AND TRANSMISSION LINE CONSTRUCTION

6.1.8.1 Construction Techniques

Right-of-Way Clearing

All trees, stumps, and brush in the right-of-way will be cleared. Trees beyond the boundary of the right-of-way may be trimmed or cut with the owner's consent if it is determined that the trees present a hazard. Equipment used may include bulldozers, shearing machines, chainsaws, or other heavy or light equipment. Burning may be used to eliminate slash from the right-of-way. All burning will be conducted in accordance with local burning ordinances.

If forested wetlands are crossed, clearing will be done by hand or low pressure ground shear machines to reduce damage to ground cover and hydrology.

Road and Pad Construction

Access roads will be required in areas where the final transmission line rights-of-way do not follow or are not adjacent to existing roads. The overall objective of the access roads will be to provide efficient and safe ingress and egress to the transmission line structures while minimizing environmental impact and cost. These access roads will be required for construction and maintenance of the transmission line facilities.

The use of fill will be minimized in the construction of access roads, and wherever possible, roads will be constructed by blading natural soil from both sides of the intended road. Where fill is required, it will be trucked in and spread, compacted, and shaped to the desired elevation. Access roads will be constructed to have a maximum surface width of 16 to 20 ft. Dump trucks may be used for hauling, and bulldozers and graders may be used for spreading and compacting. A typical cross section for the access road is presented in Figure 6.1.8-1.

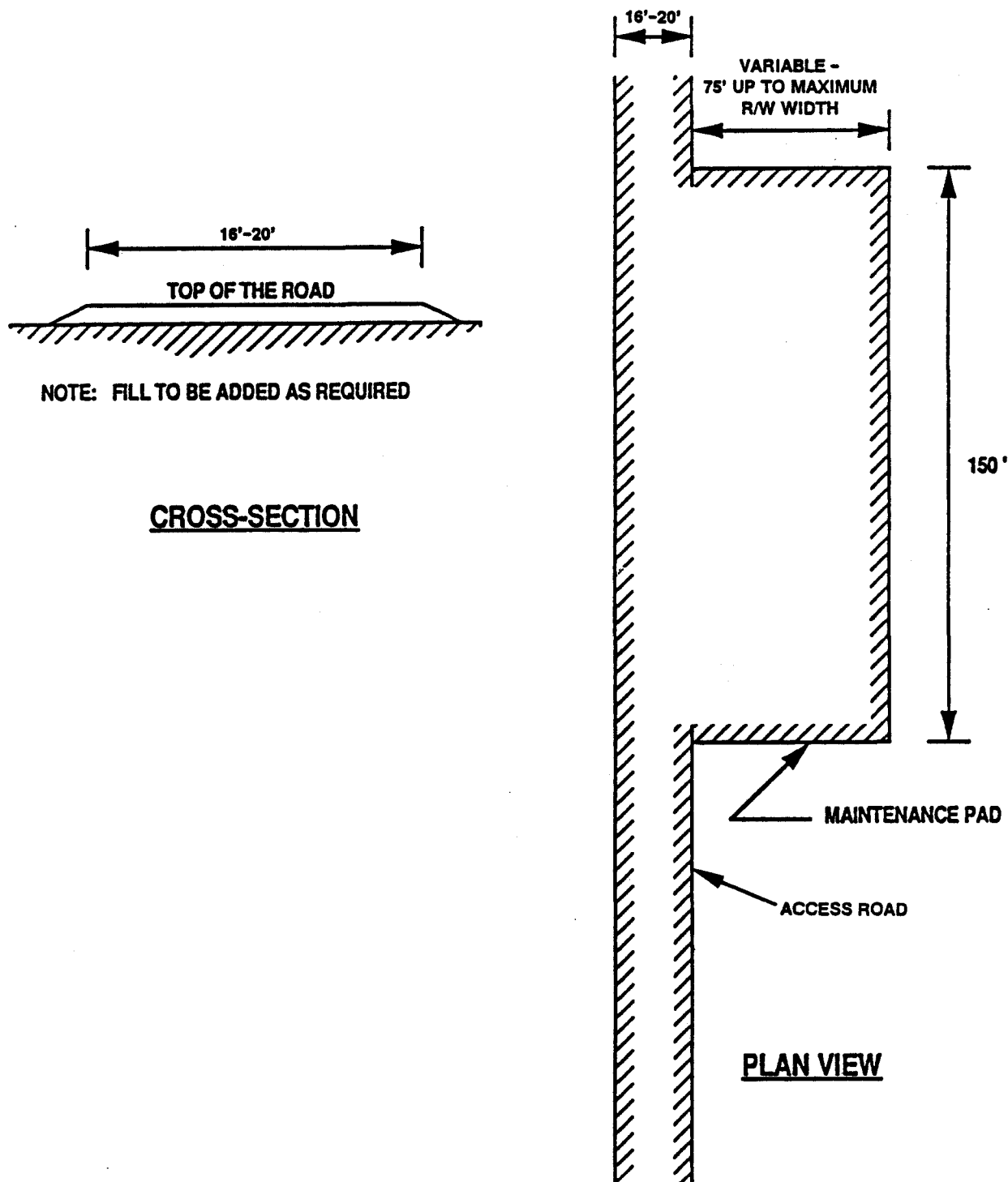


FIGURE 6.1.8-1.

POLK POWER STATION TYPICAL ACCESS ROAD
PLAN AND CROSS-SECTION FOR ASSOCIATED
TRANSMISSION LINES

Source: Tampa Electric Company, 1992.



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Line Construction

Multiple structure configurations and construction materials will be used throughout the length of the transmission lines from the Polk Power Station to the end points. The type of structure used in any particular area will be a function of the characteristics of the right-of-way and surrounding areas. Proposed structures that may be used for this project are depicted in Figure 6.1.3-1.

Currently, seven different scenarios are being considered for the two proposed corridors. On the northern corridor, a 69-kV transmission line is located along SR 37. Scenario 1 for the northern corridor involves placing the 230-kV line adjacent to the existing 69-kV line. Scenario 2 would involve locating the 230-kV line across SR 37 from the 69-kV line. Since there are two possible combinations of circuit phasing on the 69-kV line, Scenario 2A represents one phase combination and Scenario 2B represents the other. Scenario 3 would involve placing the 230-kV line completely away from SR 37 and the 69-kV line. All four scenarios currently involve use of single-pole structures.

For the eastern corridor, Scenario 1 would involve two H-frame structures on a 400-ft wide right-of-way. Scenario 2 would use two single-pole structures, and Scenario 3 would involve one single-pole structure, all on a 400-ft wide right-of-way.

H-frame construction involves directly imbedding the poles into native soil and attaching cross bracing after imbedment. Suspension insulators are then attached to the cross bracing to support the phase conductors to be pulled. H-frame construction is typically used for tangent (straight line) construction.

Where the right-of-way allows, three pole structures will be used for line angle construction. This type of construction involves directly imbedding the structures and guying to meet strength requirements. Once the poles and guy wires are installed, suspension insulators are attached to the structures to support the phase conductors.

Single-pole construction will be used where right-of-way or other constraints limit the use of H-frame construction. Single-pole structures are anticipated to be used in areas where the width of the right-of-way prohibits the use of an H-frame structure, and in areas where visual impacts are significant. Single-pole structures may be directly imbedded with native soil, crushed rock, or concrete backfill. Single-pole structures can be used for line angles and can be designed to be self-supporting, but may also use guys to support angle loads.

Structures will be framed and erected using cranes and other support vehicles. Overhead ground wires and conductors will be installed by various wire-pulling equipment. Vehicles used to support line construction may include bulldozers, tractors, and other heavy or light vehicles.

Foundations for structures may be either native soil, crushed rock, or concrete backfill. In addition, poured concrete foundations may be used where an extra strong foundation is required. With native soil or crushed rock backfill, a hole is augered and the pole is inserted into the hole. The backfill material is then compacted around the pole up to the surrounding ground level. In the case of poured concrete foundations, the required concrete foundation is poured and the pole is set into the concrete.

Erosion Control

Disturbance to natural vegetation will be kept to a minimum to reduce the potential for erosion. Where necessary, erosion control measures such as staked hay bales or fabric fences will be used to eliminate erosion during construction. After construction, areas susceptible to high erosion potential may be reseeded. Routine maintenance of the right-of-way will be designed to minimize ground cover disturbance, and therefore reduce the potential for erosion.

6.1.8.2 Impacts on Water Bodies and Uses

Tampa Electric Company will provide detailed information to the regulatory agencies on any dredging or filling that may be required after the plant and associated transmission corridors are certified and the final right-of-way and structure locations have been determined. If water bodies are impacted, culverts will be installed as needed to maintain flow. It is anticipated that the possible use of SR 37 for access will minimize need for new access road construction and fill.

The crossing of the South Prong Alafia River is unavoidable, but the potential impacts can be minimized by crossing along-side the existing SR 37 crossing. The wetland is only about 200 ft wide here and has been cleared for SR 37. No structures or fill will be placed in the water.

If fill is required in any water crossings, use of filtration devices such as fabric fences or staked straw bales will be used to maintain water quality.

No bridges will be required for any water crossings so no restrictions to navigation will occur. Adequate clearances will be provided in the transmission design so as not to impede any boat traffic at any water crossings.

6.1.8.3 Solid Wastes

Solid waste generated from right-of-way preparation and line construction typically consists of trash and cleared vegetation. Any combustible trash and cleared vegetation will be burned onsite in accordance with any applicable burning ordinances. If or when burning is not allowed, material will be hauled off and disposed of in a locally approved landfill.

6.1.8.4 Changes to Vegetation, Wildlife, and Aquatic Life

Impacts on terrestrial and aquatic systems and species associated with transmission line right-of-way preparation and construction depend primarily on the location of the selected right-of-way within the designated corridors and, to a lesser degree, on

clearing and construction techniques. Right-of-way preparation and line construction will result in no significant changes to terrestrial and aquatic communities or to components thereof, because the corridor is centered along SR 37 and its existing right-of-way for much of its 5.2-mile length. The only significant area crossed by the corridor within this segment is the South Prong Alafia River. However, the floodplain has already been altered due to road construction, as well as by mining activities north and south of the river.

For the remainder of its length, the corridor turns northwest from SR 37 south of Bradley Junction in order to connect to the existing Mines-Pebbledale 230-kV transmission line. Along this segment, virtually all natural communities have been altered by phosphate mining activities.

Since the majority of the natural communities which occurred within the corridor and the immediate adjacent areas have been altered by mining or road construction, it is not anticipated that transmission line construction or maintenance will have any significant impact on vegetation, wildlife or aquatic life. An evaluation of potential impacts on terrestrial and aquatic vegetation and wildlife components is presented in the following paragraphs.

Vegetation

As discussed, the majority of the proposed northern 230-kV transmission line corridor will traverse existing road right-of-way or lands altered by mining. Because the existing rights-of-way are already cleared and maintained, other areas cleared by construction associated with the 230-kV transmission line should not pose any additional adverse changes to vegetation, except for the permanent alterations associated with structure installation.

A permanent alteration of limited areas of upland and wetland communities will result from right-of-way clearing and access road (where needed) and structure pad construction. Such alterations to the vegetation occur principally along the sections

of proposed right-of-way which are forested. In areas where the proposed right-of-way traverses forested communities such as pine flatwoods and mixed hardwood swamp, right-of-way preparation and line construction will require the cutting of trees and the subsequent maintenance of the right-of-way to a low-growing, early successional system. Adjoining tracts of woodlands will remain intact and provide habitat for forest species. In addition, adjacent communities should not be affected by structure pad and road construction since erosion control measures and proper culverting will be used.

Construction practices in wetlands will retain the vegetative root mat in the right-of-way, thereby minimizing impacts to wetland areas which are not filled for road or structure pad construction. Impacts to wetlands will vary depending on the wetland system through which the transmission line is routed. The shift in wetland composition will vary with the type of the original overstory, and soil and drainage alterations resulting from construction activities. Outside of areas where filling is necessary for roads or structure pads, small freshwater marsh/wet prairie systems crossed by the transmission line will not be affected by construction activities since no clearing will be required, and proper culverting will maintain the existing hydroperiod.

Wildlife

Specific impacts to terrestrial and aquatic animals due to transmission line construction vary by species and depend primarily on the extent of habitat alteration and continued availability of such habitat after construction. No federally-designated Critical Habitat is crossed by the corridor, and no terrestrial or aquatic habitats critical to the continued regional presence of important species will be affected.

Individual small burrowing mammals (e.g., rodents) or amphibians and reptiles may be lost during right-of-way clearing. Such individual losses, however, will not affect local or regional populations. No losses of medium-sized or large mammals, birds, or other mobile species (e.g., indigo snakes) due to direct impacts or habitat alterations are expected because of the mobility of these animals. Therefore, it is not

expected that local or regional populations of game species, species of commercial importance, or threatened or endangered species occurring or potentially occurring within the right-of-way area will be adversely impacted.

No significant impacts to the resident birds or migratory species are expected since the preferred corridor does not include major staging, breeding, or wintering areas for migratory species (e.g., waterfowl, shorebirds, passerines). Local disturbance or displacement of wildlife due to construction noise will be minor and short term since construction activities in any one location will be intermittent and are not expected to last more than a few weeks. Also, the location of the preferred corridor along SR 37 and through land transformed by mining and associated activities will further limit the potential for wildlife disturbance since individuals in local areas will already be habituated to traffic noise.

Aquatic Life

Impacts on aquatic systems and species are expected to be minor or insignificant since the proposed transmission line structures will avoid or span potential ecologically valuable aquatic habitats such as lakes, rivers, and streams. Although the construction of the transmission line may involve installation of culverts and placement of fill resulting in temporary increases in turbidity and silt deposition, such impacts will be local and temporary and are not expected to adversely affect aquatic resources. Appropriate mitigative measures such as staked hay bales and silt curtains will minimize or eliminate siltation resulting from stormwater runoff. Transmission line and access road construction in wetland areas will use methods such as proper culverting and erosion control as necessary to minimize any significant disruption to the aquatic ecosystem or resultant changes in species composition. The only major aquatic system is the South Prong Alafia River. As previously discussed, this crossing is already impacted by SR 37 and if possible, this line will be located alongside the road to minimize impacts to the system.

6.1.8.5 Impact on Human Populations

The corridor route was selected based in part on the ability to minimize potential impacts to human populations. For the most part, the corridor avoids residences and the populated areas of Bradley Junction.

For those residents near the actual right-of-way, construction impacts should be minor and temporary. Typically transmission construction is a phased activity, consisting of such phases as right-of-way preparation, foundation placement, pole erection, conductor stringing, and right-of-way restoration. Each of these activities is short in duration.

Minor inconveniences such as noise, dust, and increased traffic will be short-term and localized. Activities will typically be scheduled for daylight hours to further minimize potential impacts to residents.

6.1.8.6 Impact on Regional Scenic, Cultural, and Natural Landmarks

Since there are no regional scenic, cultural, and natural landmarks located within or adjacent to the proposed corridor, the construction of the transmission line will have no impact on such resources.

6.1.8.7 Impact on Archaeological/Historic Sites

A cultural resource assessment for the Polk Power Station site was conducted and yielded no known sites listed or eligible for listing on the National Register of Historic Places. A low probability exists for finding any such sites along the transmission corridor.

Since the corridor area is highly disturbed due to phosphate mining activity, the potential for adverse impacts to historic and archaeological resources is expected to be minimal due to right-of-way clearing and transmission construction. A cultural resource assessment will be conducted once a final right-of-way has been selected.

If potential sites are identified or if such sites are discovered during construction activities, FDHR will be notified regarding appropriate mitigation measures.

6.1.9 POST-CONSTRUCTION IMPACTS AND EFFECTS OF TRANSMISSION LINE MAINTENANCE

6.1.9.1 Maintenance Techniques

Transmission Line Maintenance

The transmission line rights-of-way will be patrolled and inspected regularly to identify structures in need of repair. Occasional maintenance will be required on the transmission structures. Insulators will be replaced when damaged, as will supporting clamps and braces. Wood transmission poles are expected to be replaced on the average of every 15 years. Where steel or concrete poles are used, there will be minimum pole maintenance needed. The expected life of these poles is in excess of 30 years. The maintenance of the transmission line is expected to have a minimum impact on the surrounding area.

Right-of-Way Maintenance

Mechanical mowing and herbicides will be used to keep the right-of-way clear of unwanted vegetation. Herbicide chemicals will be used only as needed for maintenance purposes. All herbicide application will be conducted in a manner consistent with applicable federal, state, and local regulations and will be carried out by licensed personnel.

No burning is anticipated to be needed for the maintenance of the right-of-way.

6.1.9.2 Multiple Uses

Various activities including citrus farming, grazing, and agriculture are typically allowed within the right-of-way as long as these activities do not interfere with the full use of the right-of-way as required to operate and maintain a transmission line. Specific uses within the right-of-way will be addressed individually with affected parties. Multiple use of the right-of-way may be restricted in certain areas, but in general, compatible multiple uses will be allowed.

6.1.9.3 Changes in Species Populations

The status and potential occurrence of important species in and along the corridors was discussed in Section 6.1.7.3. The absence of significant impacts to important species is not coincidental as efforts were made during the corridor selection to avoid potentially sensitive habitats as much as possible. The avoidance of ecologically unique or valuable habitats was achieved primarily through collocation with SR 37 and/or crossing of lands which have been previously altered in conjunction with mining.

Changes in local species populations are not expected as a result of transmission line presence and maintenance. Displacement of individuals from the immediate right-of-way areas which may occur during construction activities are temporary. These displaced species are expected to re-inhabit the right-of-way areas. Habitat use will decline during actual construction due to noise and physical activity. Such avoidance behavior will enable wildlife to escape direct impacts from construction activities, although some losses of individual vertebrates (e.g., rodents, amphibians) may occur during right-of-way clearing. No animal or plant species populations are expected to be permanently displaced out of the project area from either construction or maintenance of the transmission line.

Due to necessary maintenance practices in the right-of-way within forested areas, a decrease in structural diversity will occur in areas formerly forested (i.e., permanent loss of a tree canopy layer). Concomitantly, an increase in species diversity is probable as additional shrubs and herbs will colonize the right-of-way in response to increased sunlight and decreased competition due to canopy removal. Since much of the corridor areas are either collocated with SR 37 or traverse previously disturbed lands (mined areas), clearing of canopy vegetation will be minimal. In those portions of the corridors where clearing is necessary, only a relatively narrow strip of canopy will be lost. In these areas, clearing of overstory vegetation and subsequent maintenance requirements will not result in the loss of entire tracts or significant portions of regional wildlife habitat types. In nonforested systems, such

as marshes and shrub swamps, clearing or alteration may not be necessary. In many instances, these community types can be spanned, thereby eliminating the need to affect structural characteristics.

6.1.9.4 Effects of Public Access

It is Tampa Electric Company's policy to install locked gates at all points where the transmission line access road intersects previously fenced property. Therefore, with the exception of Tampa Electric Company's personnel performing routine maintenance, no increased vehicle access is anticipated. Since no significant increase in human traffic into formerly inaccessible habitats will result, there will be no subsequent increased disturbance to wildlife.

6.1.10 ELECTRIC AND MAGNETIC FIELDS AND OTHER POST-CONSTRUCTION EFFECTS

6.1.10.1 Electric and Magnetic Field Values

Electric fields associated with transmission lines are a function of voltage on the line and conductor height. Magnetic fields are a function of the current carried by the line and conductor height. Electric and magnetic fields (EMF), therefore, vary along a transmission right-of-way.

The proposed transmission lines will comply with Florida's EMF rule (Chapter 17-274, F.A.C.), which basically requires 230 kV lines to not exceed 2.0 kilovolts per meter (kV/m) for electric fields and 150 milligauss (mG) for magnetic fields at the edge of the right-of-way. The electric field will also not exceed 8 kV/m anywhere on the right-of-way. The calculated maximum EMF values for the proposed lines are shown in Table 6.1.10-1. The estimates are based on a model (Bonneville Power Administration Corona and Field Effects Program) and show calculated estimates for the MCR. Figures 6.1.10-1 through 6.1.10-14 depict the horizontal profile for EMF for the seven potential configurations.

6.1.10.2 Corona Effects

The intense electric field at the surface of transmission line conductors can under some conditions result in localized ionization of the air near the conductors. This phenomena is called corona. Corona activity at the surface of transmission line conductors produces low levels of acoustic and radio-frequency electric energy which under some conditions can result in audible noise and radio or television interference.

Audible Noise

The primary cause of audible noise on high voltage transmission lines is corona resulting from water droplets on the conductors. As a result, rainy weather conditions produce the highest noise level. The background noise of the falling rain tends to mask the transmission line noise to some extent. Gap-type discharges on hardware or scintillations on dirty or salt-contaminated insulators can also lead to audible noise in certain situations but are not anticipated to be significant noise sources on the

Table 6.1.10-1. Calculated Maximum EMF for the Polk Power Station 230-kV Transmission Lines

Configuration*	Electric Field (kV/m) [†]		Magnetic Field (mG) ^{**}	
	On Right-of- Way	Edge of Right-of- Way	On Right-of- Way	Edge of Right-of- Way
<u>Northern Corridor††</u>				
Single-pole, vertical (1)	5.59	0.24	428.15	61.28
Single-pole, vertical (2A)	5.59	0.28	439.21	65.87
Single-pole, vertical (2B)	5.59	0.26	438.85	67.27
Single-pole, vertical (3)	5.59	0.26	437.78	104.08
<u>Eastern Corridor</u>				
H-frame, horizontal (1)	4.42	1.36	561.85	141.00
Two single-poles, vertical (2)	4.32	0.21	355.72	129.68
Single-pole, vertical (3)	3.62	0.33	411.90	74.25

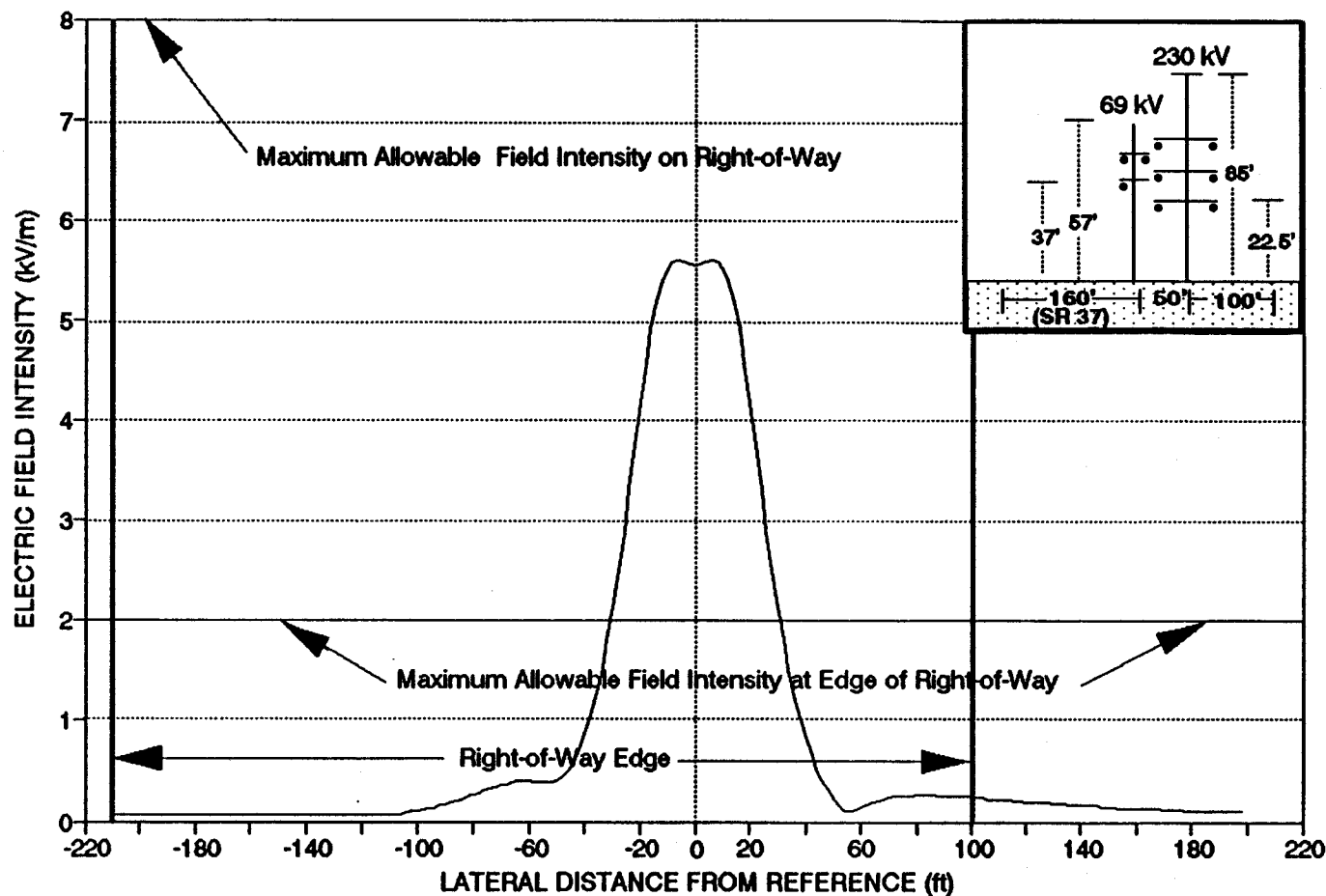
*Northern or eastern corridor scenarios described in Section 6.1.8.1 and illustrated in Figures 6.1.10-1 through 6.1.10-14.

†Electric field values based on 242-kV operating voltage.

**Magnetic field values based on MCR for the line (1,880 amperes, 749 MVA).

††The onsite east-west portion of the northern corridor will use configurations described for the eastern corridor.

Sources: Tampa Electric Company, 1992.
ECT, 1992.



NOTE: MODELED VALUES; ACTUAL VALUES ARE LIKELY TO BE LOWER

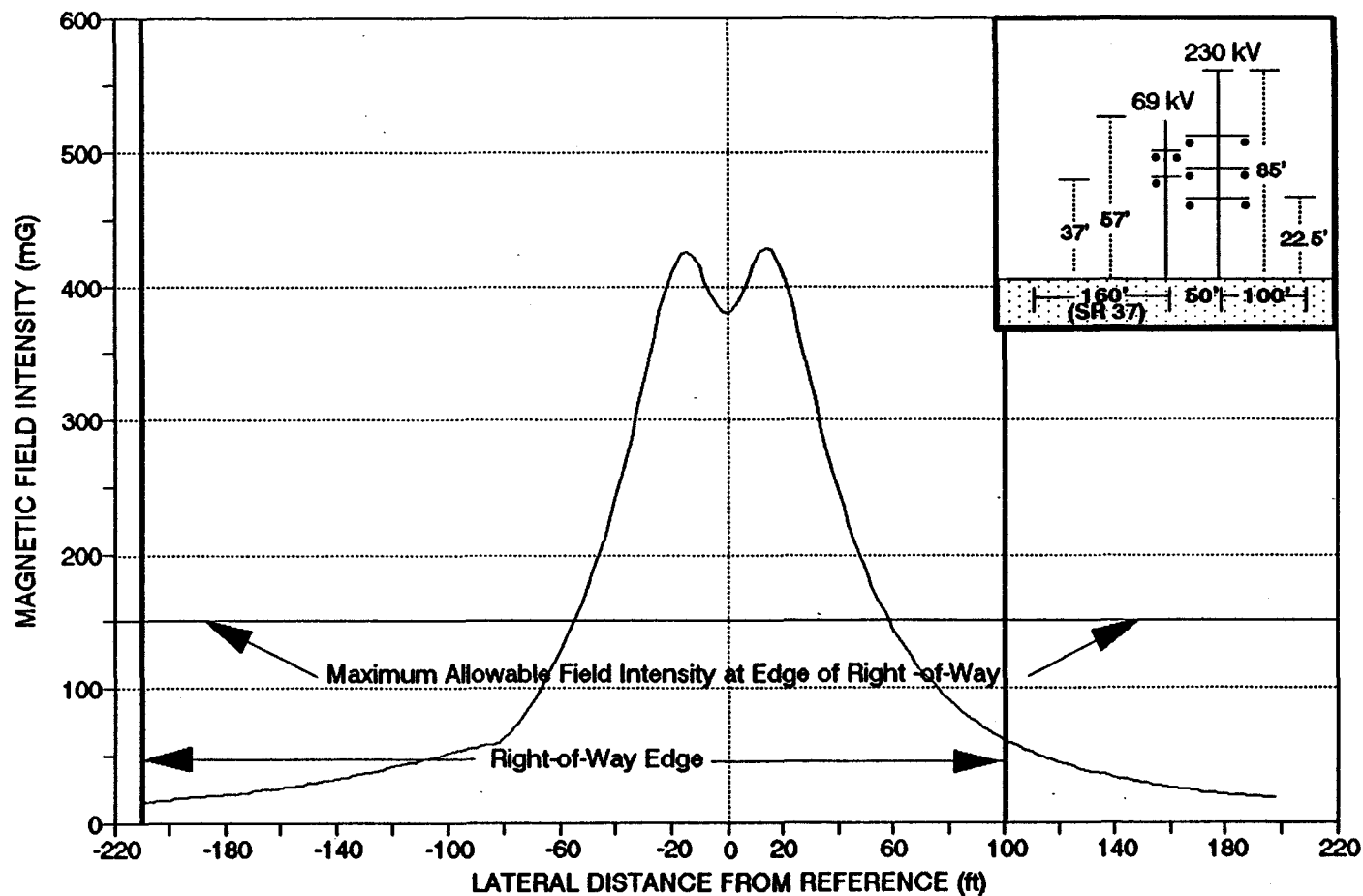
FIGURE 6.1.10-1.

LATERAL (MID-SPAN) PROFILE OF ELECTRIC FIELD AT MAXIMUM OPERATING VOLTAGE--
NORTHERN CORRIDOR, SCENARIO 1

Sources: Tampa Electric Company, 1992. ECT, 1992.



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NOTE: MODELED VALUES; ACTUAL VALUES ARE LIKELY TO BE LOWER

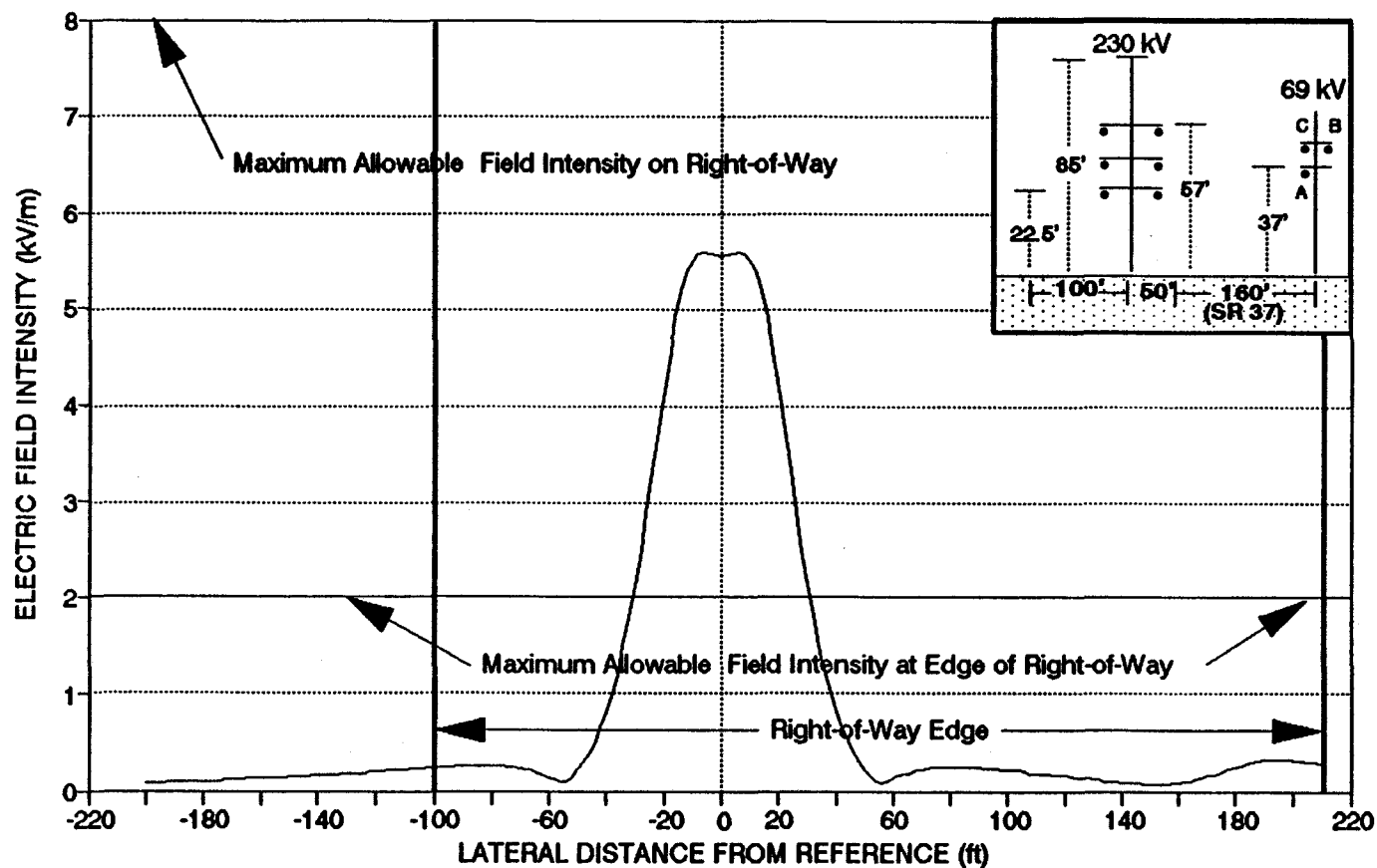
FIGURE 6.1.10-2.

LATERAL (MID-SPAN) PROFILE OF MAGNETIC FIELD AT MAXIMUM CURRENT RATING--
NORTHERN CORRIDOR, SCENARIO 1

Sources: Tampa Electric Company, 1992. ECT, 1992.



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NOTE: MODELED VALUES; ACTUAL VALUES ARE LIKELY TO BE LOWER

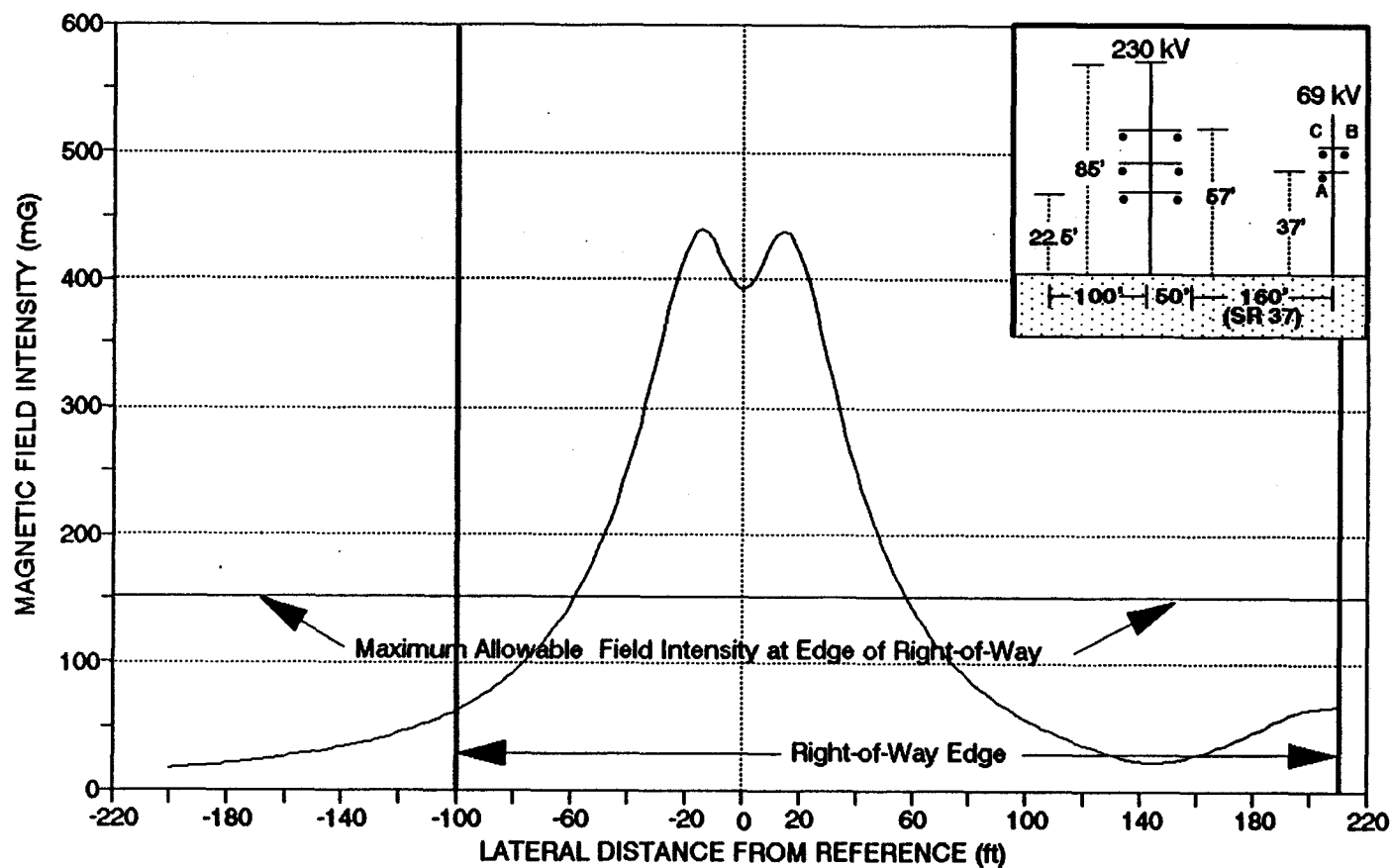
FIGURE 6.1.10-3.

LATERAL (MID-SPAN) PROFILE OF ELECTRIC FIELD AT MAXIMUM OPERATING VOLTAGE--
NORTHERN CORRIDOR, SCENARIO 2A

Sources: Tampa Electric Company, 1992. ECT, 1992.



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NOTE: MODELED VALUES; ACTUAL VALUES ARE LIKELY TO BE LOWER

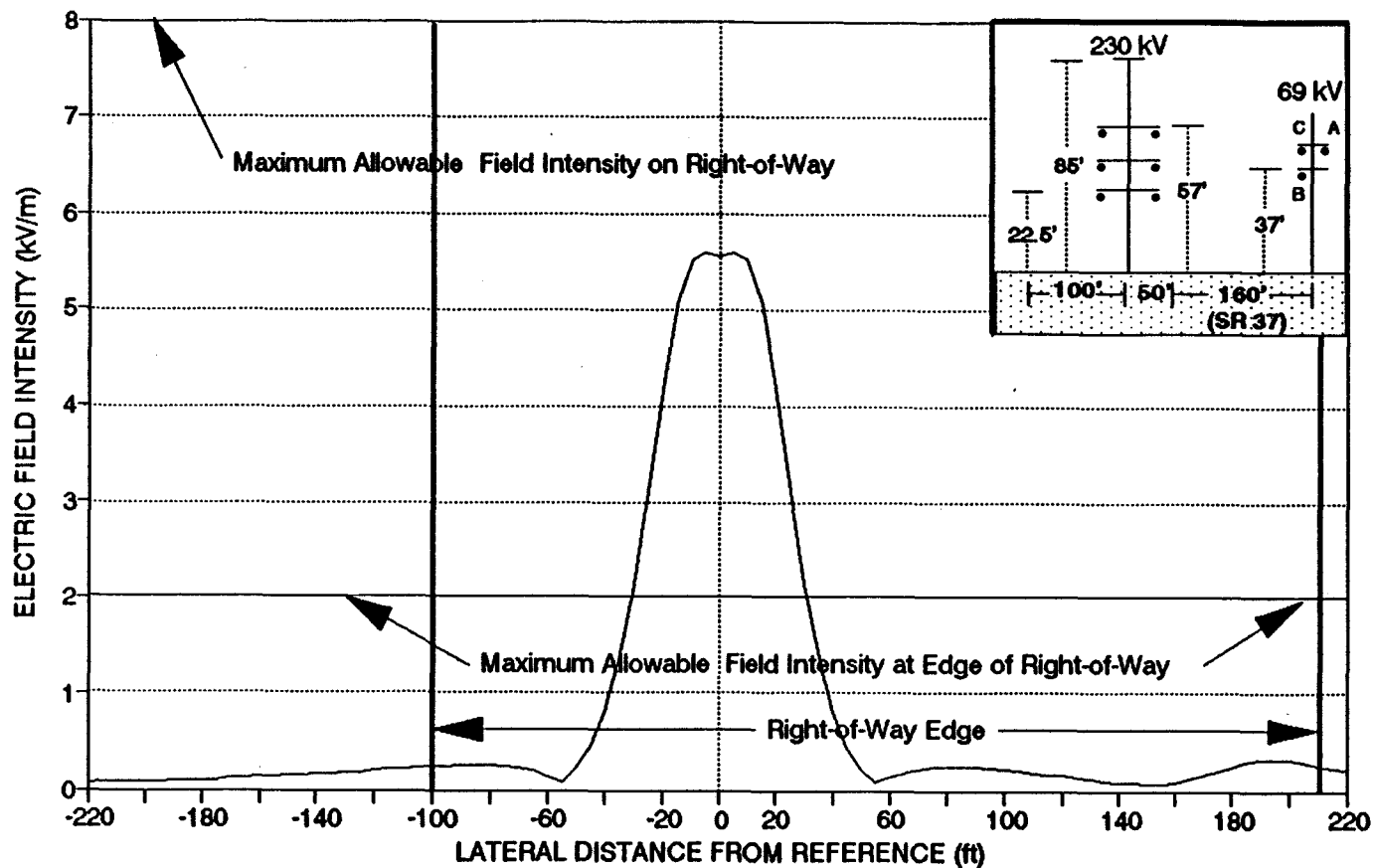
FIGURE 6.1.10-4.

LATERAL (MID-SPAN) PROFILE OF MAGNETIC FIELD AT MAXIMUM CURRENT RATING--
NORTHERN CORRIDOR, SCENARIO 2A

Sources: Tampa Electric Company, 1992. ECT, 1992.



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NOTE: MODELED VALUES; ACTUAL VALUES ARE LIKELY TO BE LOWER

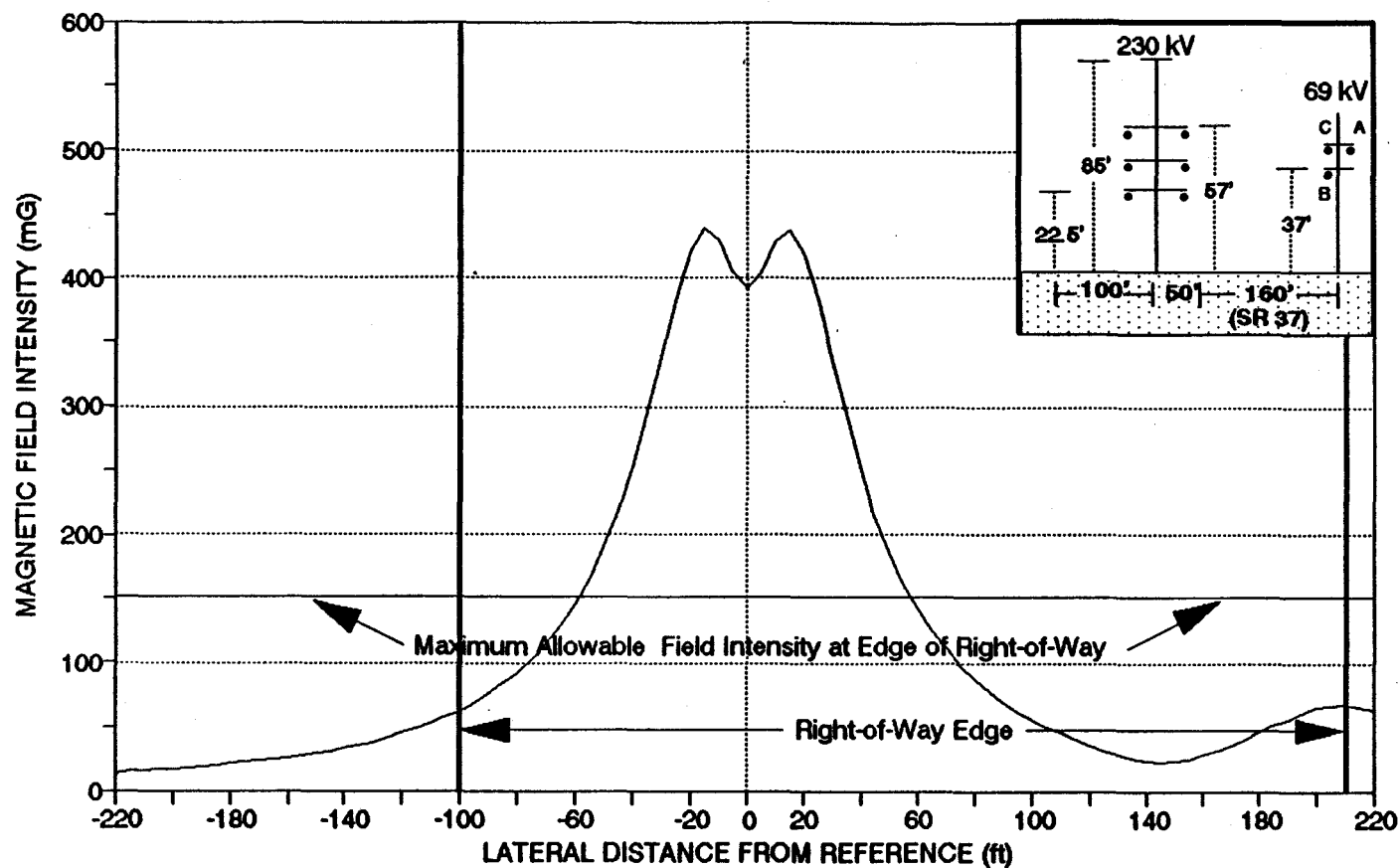
FIGURE 6.1.10-5.

LATERAL (MID-SPAN) PROFILE OF ELECTRIC FIELD AT MAXIMUM OPERATING VOLTAGE--
NORTHERN CORRIDOR, SCENARIO 2B

Sources: Tampa Electric Company, 1992. ECT, 1992.



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STATION



NOTE: MODELED VALUES; ACTUAL VALUES ARE LIKELY TO BE LOWER

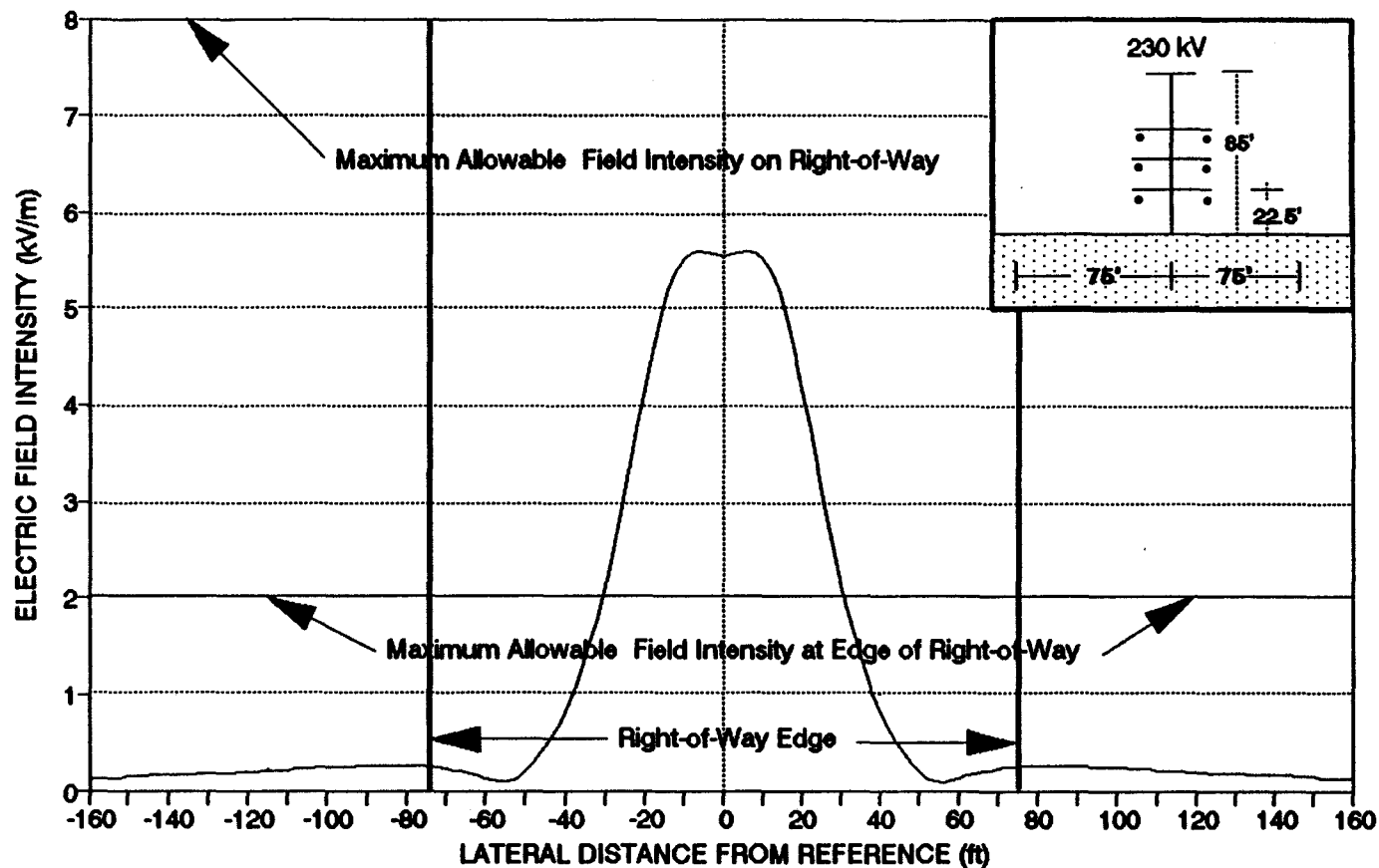
FIGURE 6.1.10-6.

LATERAL (MID-SPAN) PROFILE OF ELECTRIC FIELD AT MAXIMUM CURRENT RATING--
NORTHERN CORRIDOR, SCENARIO 2B

Sources: Tampa Electric Company, 1992. ECT, 1992.



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NOTE: MODELED VALUES; ACTUAL VALUES ARE LIKELY TO BE LOWER

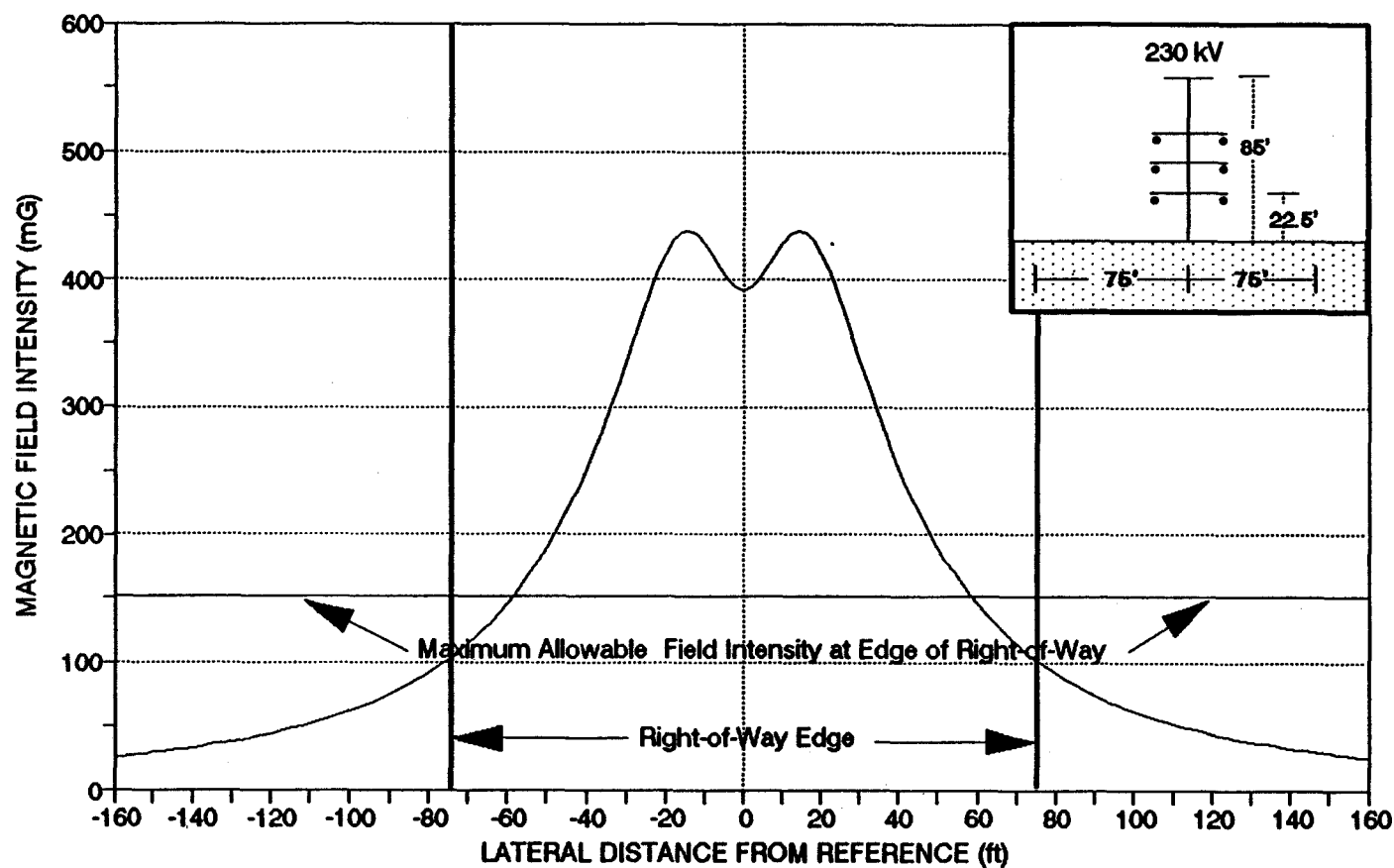
FIGURE 6.1.10-7.

LATERAL (MID-SPAN) PROFILE OF ELECTRIC FIELD AT MAXIMUM OPERATING VOLTAGE--
NORTHERN CORRIDOR, SCENARIO 3

Sources: Tampa Electric Company, 1992. ECT, 1992.



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NOTE: MODELED VALUES; ACTUAL VALUES ARE LIKELY TO BE LOWER

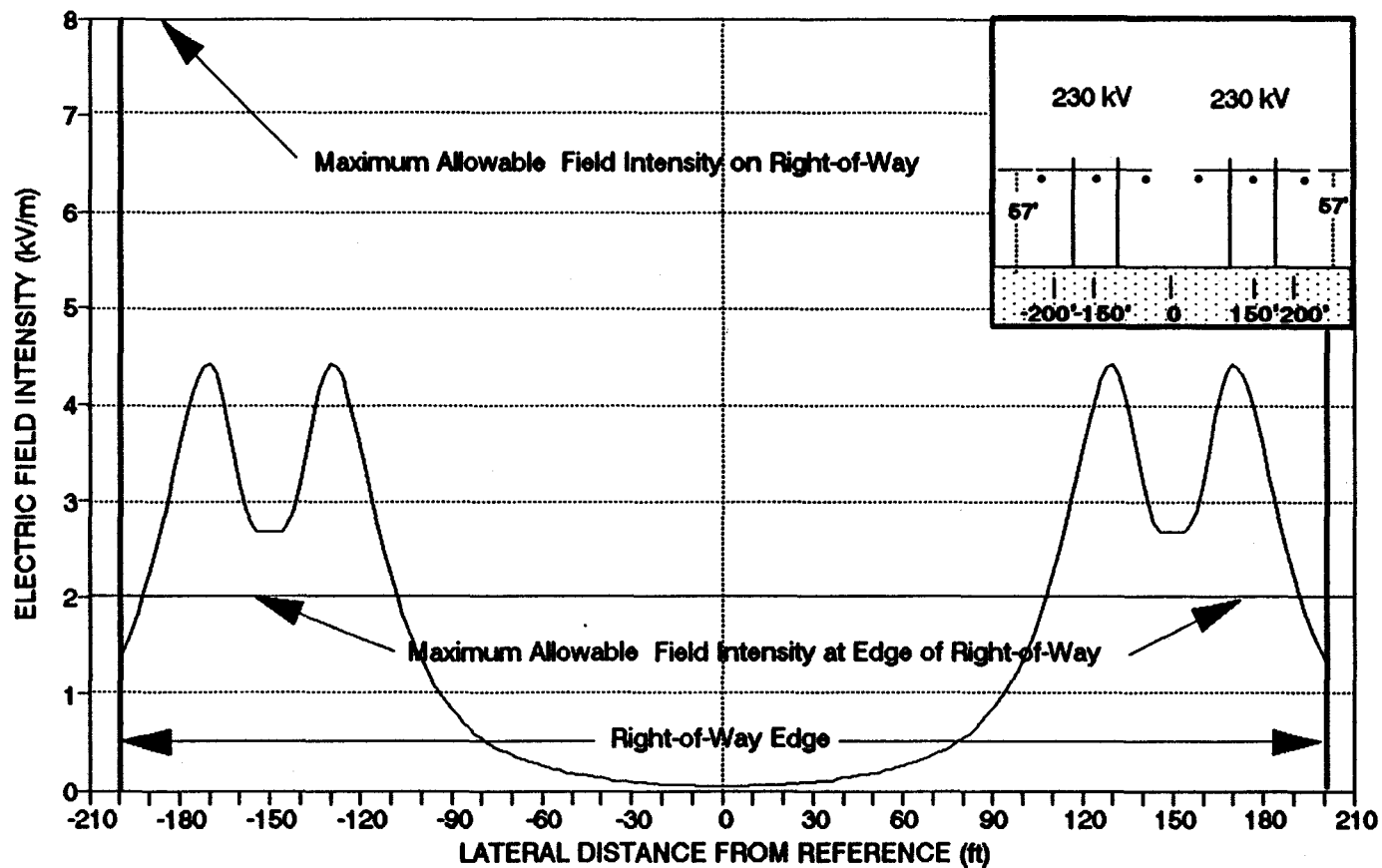
FIGURE 6.1.10-8.

LATERAL (MID-SPAN) PROFILE OF MAGNETIC FIELD AT MAXIMUM CURRENT RATING--
NORTHERN CORRIDOR, SCENARIO 3

Sources: Tampa Electric Company, 1992. ECT, 1992.



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NOTE: MODELED VALUES; ACTUAL VALUES ARE LIKELY TO BE LOWER

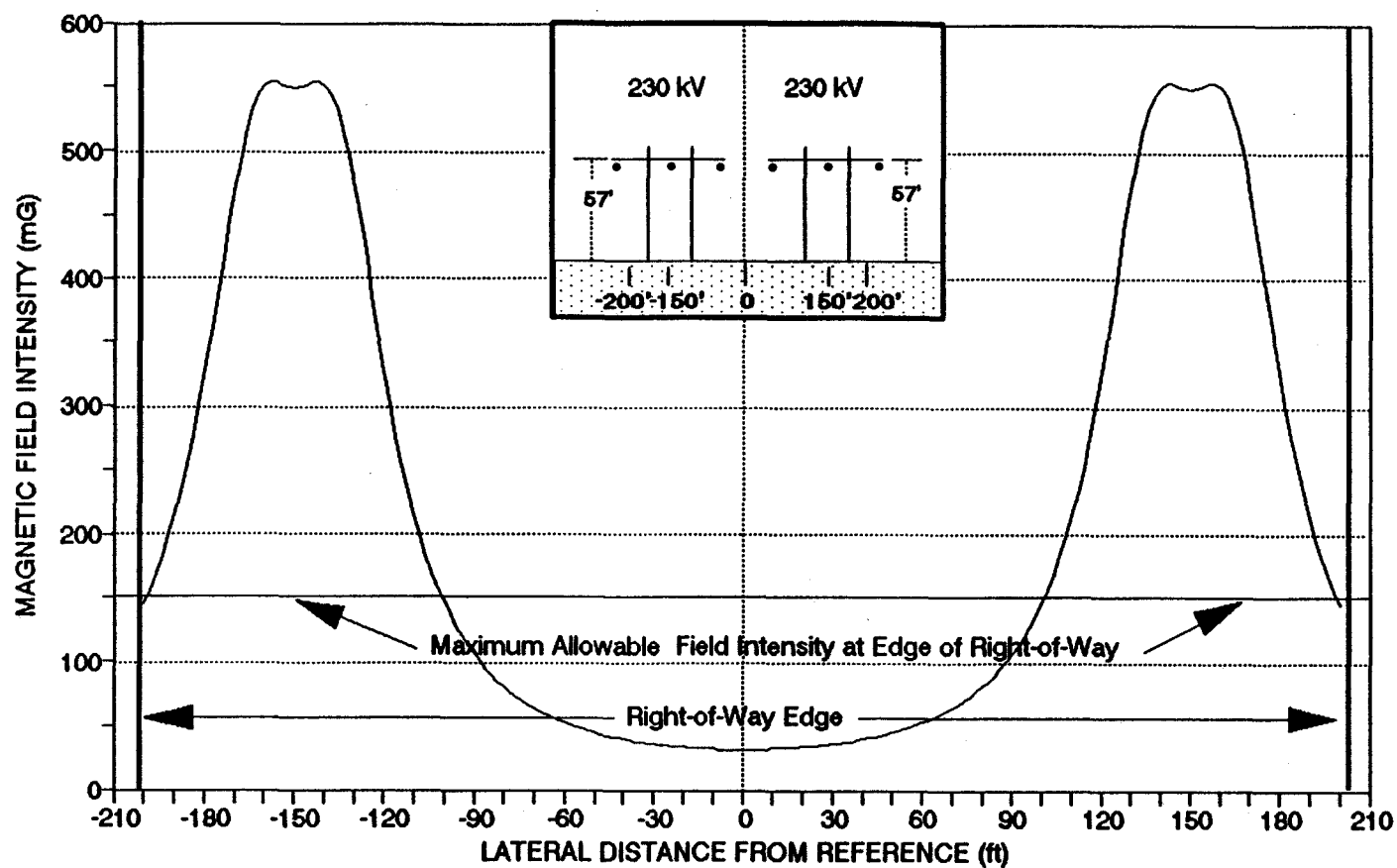
FIGURE 6.1.10-9.

LATERAL (MID-SPAN) PROFILE OF ELECTRIC FIELD AT MAXIMUM OPERATING VOLTAGE--
EASTERN CORRIDOR, SCENARIO 1

Sources: Tampa Electric Company, 1992. ECT, 1992.



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NOTE: MODELED VALUES; ACTUAL VALUES ARE LIKELY TO BE LOWER

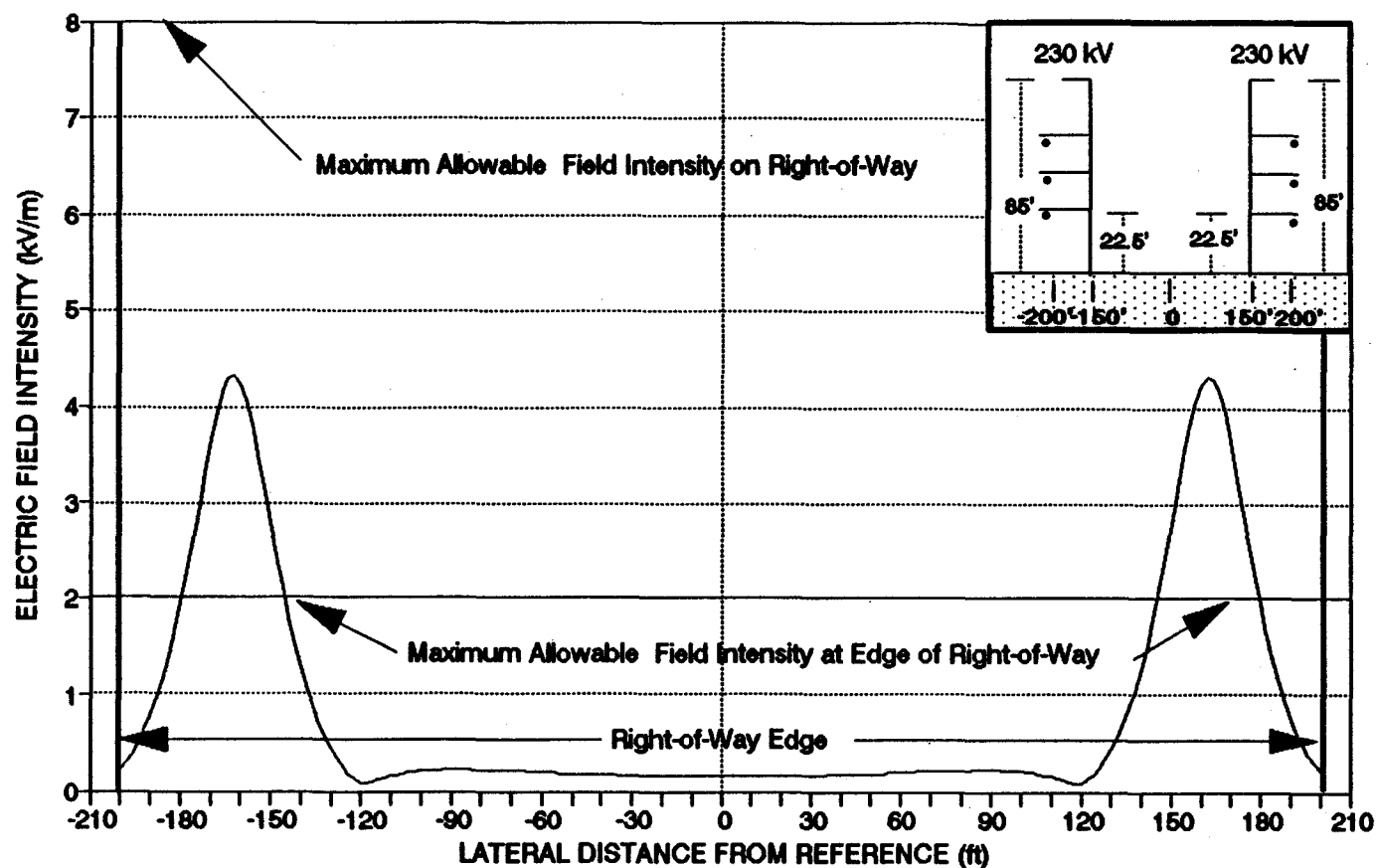
FIGURE 6.1.10-10.

LATERAL (MID-SPAN) PROFILE OF MAGNETIC FIELD AT MAXIMUM CURRENT RATING--
EASTERN CORRIDOR, SCENARIO 1

Sources: Tampa Electric Company, 1992. ECT, 1992.



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NOTE: MODELED VALUES; ACTUAL VALUES ARE LIKELY TO BE LOWER

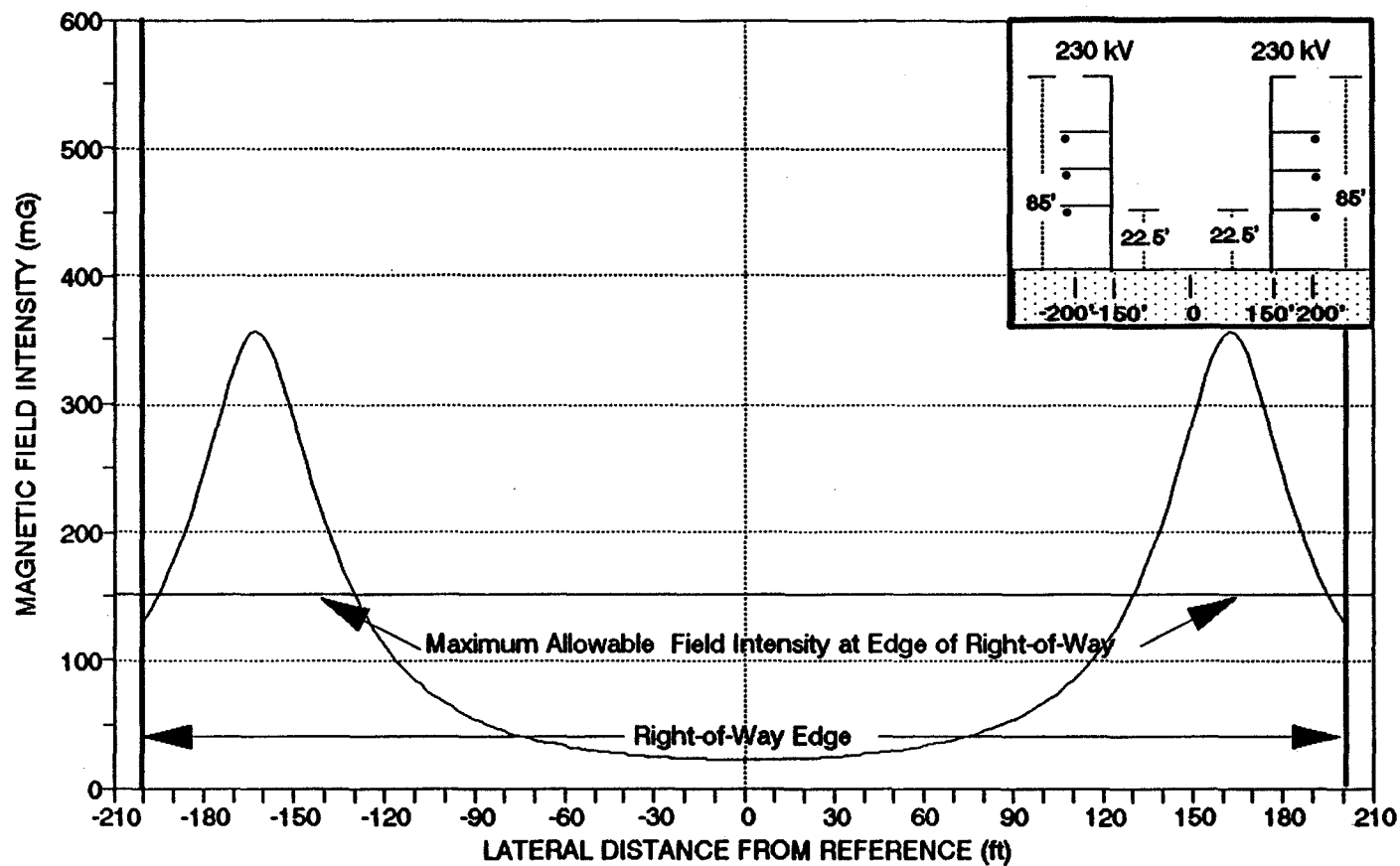
FIGURE 6.1.10-11.

LATERAL (MID-SPAN) PROFILE OF ELECTRIC FIELD AT MAXIMUM OPERATING VOLTAGE--
EASTERN CORRIDOR, SCENARIO 2

Sources: Tampa Electric Company, 1992. ECT, 1992.



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NOTE: MODELED VALUES; ACTUAL VALUES ARE LIKELY TO BE LOWER

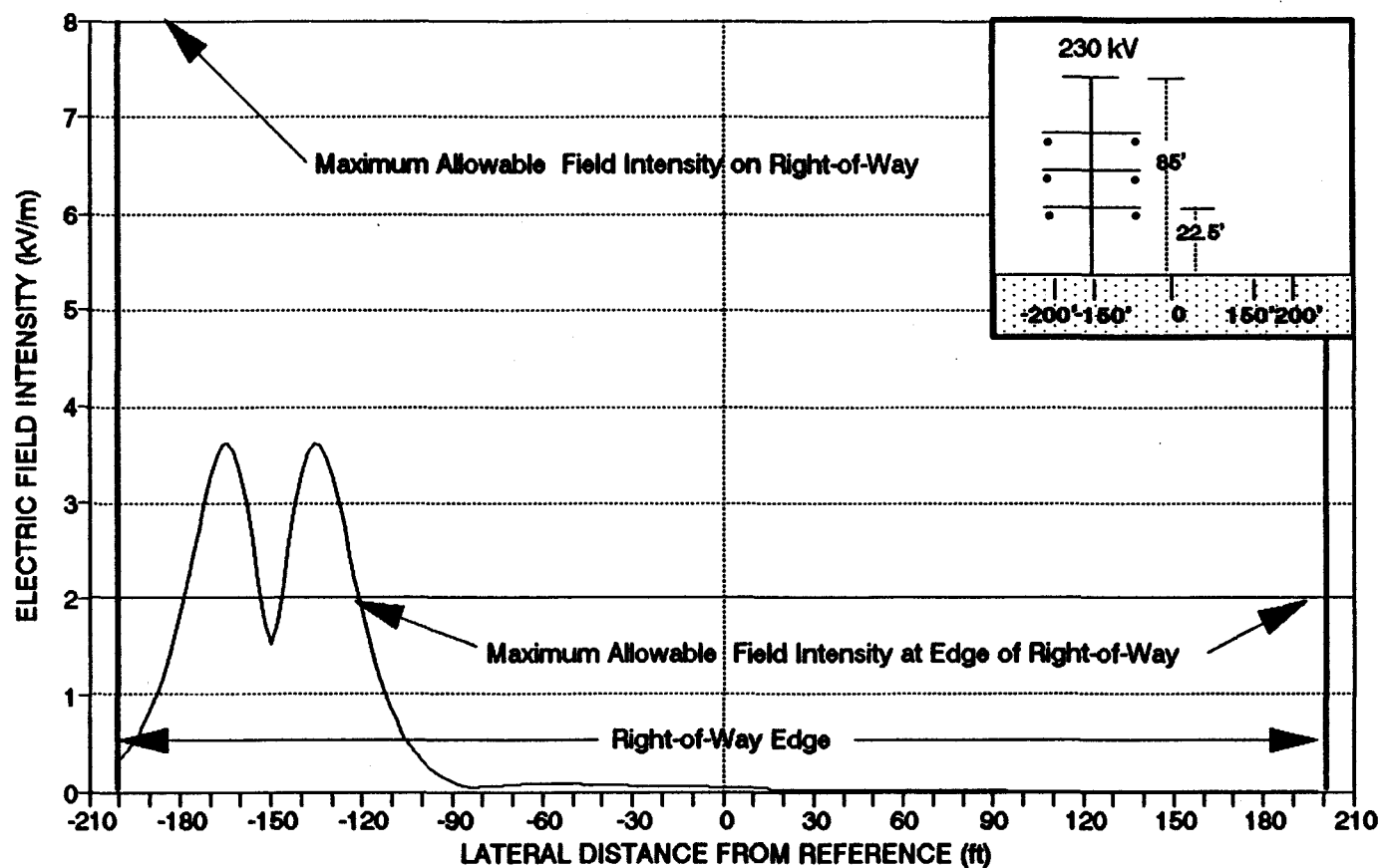
FIGURE 6.1.10-12.

LATERAL (MID-SPAN) PROFILE OF MAGNETIC FIELD AT MAXIMUM CURRENT RATING--
EASTERN CORRIDOR, SCENARIO 2

Sources: Tampa Electric Company, 1992. ECT, 1992.



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NOTE: MODELED VALUES; ACTUAL VALUES ARE LIKELY TO BE LOWER

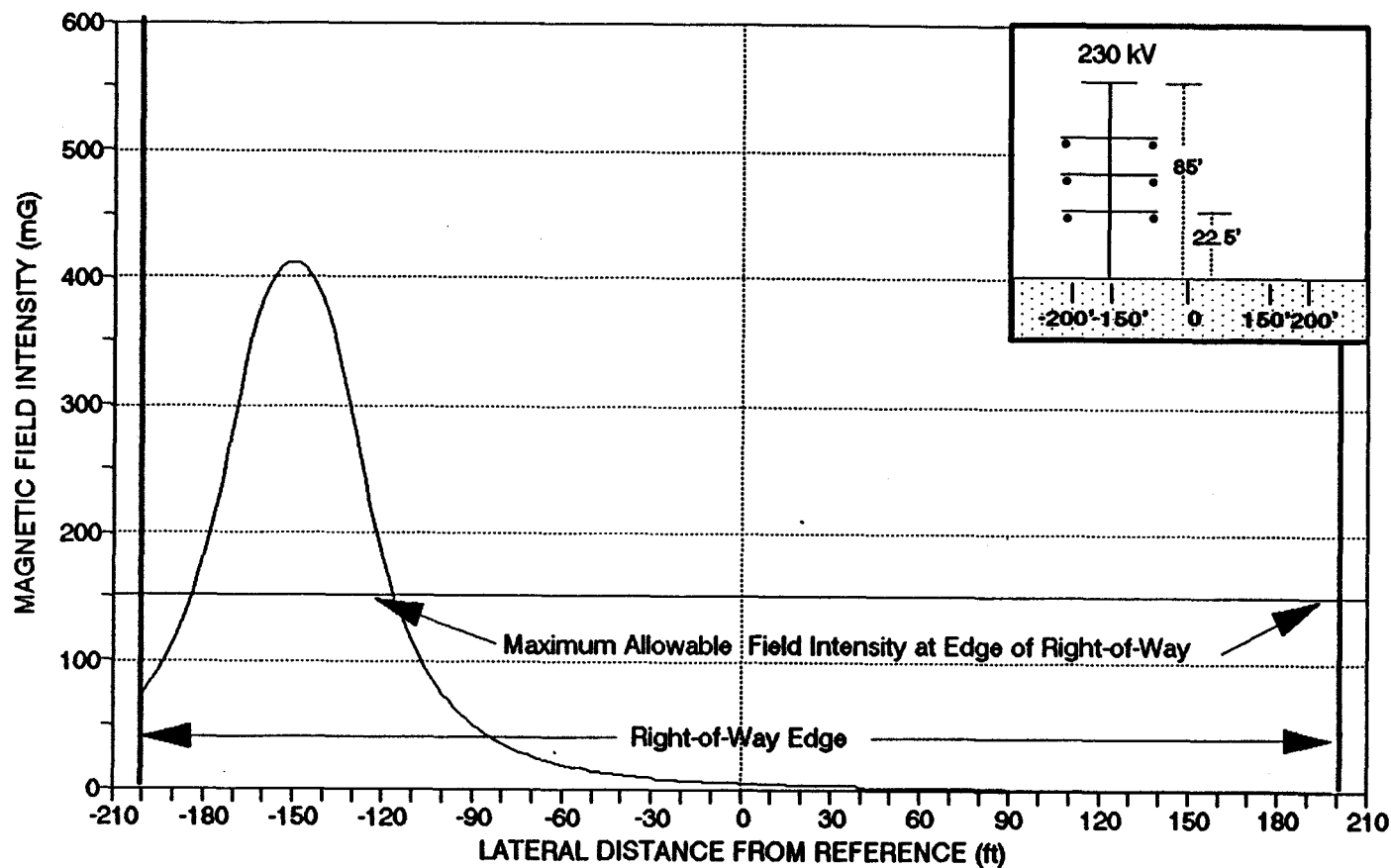
FIGURE 6.1.10-13.

LATERAL (MID-SPAN) PROFILE OF ELECTRIC FIELD AT MAXIMUM OPERATING VOLTAGE--
EASTERN CORRIDOR, SCENARIO 3

Sources: Tampa Electric Company, 1992. ECT, 1992.



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NOTE: MODELED VALUES; ACTUAL VALUES ARE LIKELY TO BE LOWER

FIGURE 6.1.10-14.

LATERAL (MID-SPAN) PROFILE OF MAGNETIC FIELD AT MAXIMUM CURRENT RATING--
EASTERN CORRIDOR, SCENARIO 3

Sources: Tampa Electric Company, 1992. ECT, 1992.



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230-kV transmission lines associated with the Polk Power Station. This is because the proposed lines will use noise-free hardware and the frequent heavy rain in central Florida will keep the insulators free of dirt and salt contamination.

During fair weather conditions, when the conductors are dry, the audible noise levels produced by the 230-kV transmission lines associated with the Polk Power Station will be less than normal outdoor ambient noise levels. Dry conditions occur more than 90 percent of the time in the central Florida area.

Transmission line audible noise will increase when rain or very dense fog deposits water droplets on the transmission line conductors. This will occur less than 10 percent of the time. During these wet conditions, the median A-weighted sound pressure level of the line proposed for the offsite northern corridor will be 41.3 dBA or less at the edge of the right-of-way. The median wet-weather A-weighted sound pressure level for the transmission line proposed for the onsite eastern corridor will be 44.9 dBA or less at the edge of the right-of-way. The primary reason for the higher sound level at the edge of the right-of-way in the eastern corridor is the shorter distance from the transmission line to the right-of-way edge in the eastern corridor compared to that proposed for the northern corridor. These noise levels are comparable to the median sound pressure level of rainfall in open fields and on trees and shrubs (42 and 46 dBA, respectively) and are below the levels identified by the EPA as requisite to protect public health and welfare (EPA, 1974). There are no local noise ordinances in effect within the area traversed by the proposed corridors with which the proposed transmission lines must comply.

Radio and Television Interference

Electrical noise in the radio-frequency range can be produced by corona on transmission line conductors or by gap discharges on transmission line hardware. Corona noise is most significant in the lower frequencies such as those used for amplitude modulation (AM) radio broadcast. Noise from gap discharges, on the other hand, extends to very high frequencies and is often a source of interference

with television broadcast reception. Since the 230-kV transmission lines associated with the Polk Power Station will be constructed with noise-free hardware, gap discharges are not anticipated to occur. Should a gap discharge develop on a damaged, defective, or improperly installed piece of hardware and lead to interference, it will be located and repaired or replaced. Therefore, the following analysis focuses on interference from corona on the transmission line conductors.

Communications systems making use of frequency modulation (FM) such as FM radio broadcast and business and public service communications are not affected by transmission line noise. Systems using AM such as AM radio and the video (picture) portion of the television broadcasts are sometimes affected if the broadcast signal strength is weak, the noise level is high, or both.

AM radio stations providing broadcast signals sufficiently strong to be free of naturally occurring atmospheric interference (static) at least 90 percent of the time are classified as providing Type A signal service by the Federal Communications Commission (FCC). Stations with Type A signal service will not experience objectionable interference from the proposed Polk Power Station transmission lines during fair weather if the radio receiver is outside the right-of-way.

Weaker AM radio stations which are likely to experience naturally occurring atmospheric interference 10 to 50 percent of the time are defined as Type B signal service. Weak stations minimally meeting the Type B criterion could experience noticeable interference from transmission line corona during fair weather at locations on private land within approximately 13 ft of the right-of-way or on the portion of the SR 37 right-of-way within 38 ft of the boundary adjoining the transmission line right-of-way for the transmission line proposed for the northern corridor. For the transmission lines proposed for the eastern corridor, fair weather interference with weak Type B AM radio signals is possible within 48 ft of the right-of-way, but since the adjoining property is entirely power station property, there will be no opportunities for interference.

During rainy weather, naturally occurring radio interference from atmospheric electricity (static) increases significantly causing interference with all but the stronger local AM radio stations. Consequently, interference from transmission line corona during rain is not a significant concern.

Grade A television signal strengths have been defined by the FCC as those capable of providing acceptable reception at 70 percent of the receiver locations more than 90 percent of the time. The proposed transmission line will not cause interference with any Grade A television station under any weather condition regardless of antenna location outside the right-of-way.

Grade B television signals generally provide acceptable reception at 50 percent of the receiver locations 90 percent of the time. The proposed transmission line will not interfere with the reception of Grade B signals at locations outside the right-of-way during dry weather. However, during heavy rain, there is a potential for interference with the weaker stations minimally meeting the Grade B criterion and operating on Channels 2 through 6 within as much as 110 ft of the right-of-way of the transmission lines proposed for the northern corridor or as much as 155 ft from the right-of-way of the proposed eastern corridor transmission lines. Grade B stations operating on Channels 7 and above will receive no interference during rain.

Although this analysis indicates the possibility of interference with some Grade B television stations during rain, the probability of such interference is low because it requires the simultaneous occurrence of several rare events. There will not be interference unless there is heavy rain falling, the station is a minimal Grade B station operating on Channel 2 through 6, and the antenna is in near proximity to the line and oriented in such a way that it collects the maximum amount of radio-frequency noise from the transmission lines. If television interference is found to occur, it is usually corrected by reorienting or relocating the antenna, installing a more directional antenna, or installing an antenna rotor.

The proposed transmission line will not interfere with cable television, satellite television, or normal or cellular telephone reception.

6.2 NATURAL GAS PIPELINE

Natural gas will be used as the primary fuel for the stand-alone CT and CC units planned for the Polk Power Station. Natural gas will be delivered to the site via a pipeline from either the existing or future natural gas transmission system in the region. FGT has existing gas transmission pipelines in the vicinity and crossing the western tract of the site. FGT is also currently proposing certain additions to and expansions of its system in the site vicinity such as a new metering station at the intersection of SR 37 and CR 630 within the Polk Power Station site and a new pipeline between its St. Petersburg and Sarasota laterals, which would be located primarily along CR 39 in Hillsborough County, approximately 5.5 miles to the west of the site. Other natural gas transmission companies are also considering developing new systems in the region.

At the current time, Tampa Electric Company is evaluating the various alternatives to supply natural gas to the Polk Power Station. Therefore, specific interconnection points to the existing and planned future gas transmission system in the site area and, in turn, the pipeline route or alternative routes to the Polk Power Station site have not been determined at this time. Once the proposed pipeline route has been determined, Tampa Electric Company will submit appropriate supplemental application and supporting information to the SCA for the Polk Power Station for agency review and approval of the proposed natural gas pipeline corridor from the transmission system to the site.

6.3 FUEL OIL PIPELINE

No. 2 fuel oil will be used as the fuel for the advanced CT unit during its first year of operation, prior to conversion to the IGCC unit. After conversion, the advanced CT unit will use syngas as its primary fuel with fuel oil as a backup. Based on current fuel cost considerations, Tampa Electric Company anticipates that fuel oil will also serve primarily as a backup fuel for the future stand-alone CT and CC units. It is anticipated that initially fuel oil will be delivered by tanker truck or rail car.

GATX Terminal Corporation is currently proposing to construct a new fuel oil pipeline in the site region. The proposed pipeline would parallel Fort Green Road and the CSX Railroad located adjacent to the eastern boundary of the Polk Power Station site. When constructed, fuel oil could be delivered to the site via a pipeline from the proposed GATX pipeline to the onsite fuel oil storage tanks. The corridor for this supply pipeline would be located within the boundaries of the Polk Power Station site and, therefore, would not affect offsite land uses or resources.

Tampa Electric Company will submit appropriate supplemental application and supporting information to the SCA for the Polk Power Station for agency review and approval prior to construction of the onsite pipeline to supply fuel oil to the site. Whether the pipeline is constructed or not, Tampa Electric Company will maintain the capability to deliver fuel oil to the site by truck and rail throughout the life of the project operations.

6.4 RAILROAD SPUR

Railroad access to the Polk Power Station will be provided by construction of a rail spur from the existing CSX Railroad line which runs along the east side of Fort Green Road adjacent to the eastern boundary of the site. This rail spur will be used for delivery of coal, fuel oil, and certain equipment and materials to the site. The spur will also be used to transport process by-products (i.e., slag, sulfur, and H_2SO_4) from the site.

Except for a short segment (i.e., approximately 200 ft) of the rail spur to cross Fort Green Road, the spur and associated material loading and unloading facilities will be located within the boundaries of the Polk Power Station site. Therefore, any offsite impacts associated with the construction and operation of this rail spur will be insignificant. Descriptions of the environmental characteristics on the site (e.g., land use, vegetation, and wildlife) along the onsite route for the rail spur were provided previously in appropriate sections of Chapter 2.0.

REFERENCES

U.S. Environmental Protection Agency (EPA). 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. EPA/550-9-74-004.

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CHAPTER 7.0
ECONOMIC AND SOCIAL EFFECTS OF
PLANT CONSTRUCTION AND OPERATION

7.1 SOCIO-ECONOMIC BENEFITS

The primary benefit to the region as a result of the Polk Power Station project will be the provision of a new, clean, and reliable energy source provided to the public by Tampa Electric Company. The Polk Power Station will also provide other benefits to Polk County, the region, and the State of Florida in terms of employment, tax revenues, and a productive use for a site with limited development potential.

7.1.1 TAX REVENUES

The construction and operation of the Polk Power Station will create both direct and indirect tax benefits. Local revenues will be generated from property taxes levied on the plant site and facilities, and along areas where the offsite transmission line and future natural gas pipeline will be sited. Property taxes will be primarily generated as a revenue source for Polk County. Table 7.1.1-1 provides the estimated ad valorem taxes to be generated by the Polk Power Station each year from 1996 through full build-out in 2010. As shown in this table, the total ad valorem taxes, for both realty and tangible personal property, will range from almost \$2 million in 1996 to approximately \$19.7 million in 2011. Ad valorem taxes will continue to be generated by the Polk Power Station beyond 2011 on an annual basis throughout the projected life of the facilities.

The construction of the Polk Power Station will also generate significant revenues for the state through the state sales tax. The sales tax revenues generated from the construction of the IGCC unit are estimated to be approximately \$2 million and sales tax revenues for each of the remaining units are estimated to be approximately \$100,000.

Table 7.1.1-1. Estimate of Ad Valorem Taxes for Realty and Tangible Personal Property Generated by the Polk Power Station Project, 1996 through 2011

Tax Year	Estimated Tangible Personal Property (\$)	Estimated Realty (\$)	Estimated Net Taxes* (\$)
1996	1,731,700	200,600	1,932,300
1997	7,396,200	206,600	7,602,800
1998	7,297,500	212,800	7,510,300
1999	7,186,100	228,000	7,414,100
2000	7,851,100	234,800	8,085,900
2001	8,554,600	241,800	8,796,400
2002	10,250,600	258,700	10,509,300
2003	11,025,500	266,400	11,291,900
2004	13,980,600	274,400	14,255,000
2005	14,817,800	282,700	15,100,500
2006	15,700,200	291,100	15,991,300
2007	16,630,400	299,900	16,930,300
2008	17,610,400	308,900	17,919,300
2009	17,073,600	318,100	17,391,700
2010	18,184,300	327,700	18,512,000
2011	19,357,400	337,500	19,694,900
TOTAL	194,648,000	4,290,000	198,938,000

Note: Assumed actual 1991 millages and increased 3 percent per year.

*Net taxes implies a reduction for an early payment discount has been taken.

Source: Tampa Electric Company, 1992.

Indirect economic benefits such as increased levels of spending in the area of the Polk Power Station, in Polk County, and in the region by both the construction and operational workforce will also benefit the state and local tax revenues and economies. Since the projected workforce will primarily commute from existing residences with few relocations, project-associated increases in spending are expected to benefit the local and regional economies, while not creating new demands on public services and facilities.

7.1.2 EMPLOYMENT

Additional employment for the area surrounding the Polk Power Station is another main socio-economic benefit projected to result from the construction and operation of the Polk Power Station. As previously described in Section 2.2.7, both Polk and Hardee Counties suffer from high unemployment. While the employment opportunities created by the Polk Power Station will not completely solve local unemployment problems, the project will assist in lowering the unemployment rate.

7.1.2.1 Construction Workforce

During the initial construction phase, an average of 400 workers will be employed for a 27-month construction period, with a 9-month peak of 600 construction workers. An average of 15 to 40 workers will be employed during other construction phases of the project.

As shown in Table 7.1.2-1, more than \$39 million in construction payroll wages will be generated from the initiation of construction to project build-out in 2010. Since approximately 60 percent of the construction workforce is anticipated to be drawn from Polk County, this equates to more than \$23.5 million in construction wages generated within Polk County. These payroll estimates are conservative as an average monthly construction wage of \$2,700 is held constant in 1992 dollars, and does not include any potential increase in wages due to overtime work. The monthly wage figure was based on those specialized trades associated with power plant construction, and the regional economy.

Another economic benefit resulting from the construction of the Polk Power Station will be local subcontractors hired, which should be viewed as a separate benefit relative to the percentage of the workforce projected to be drawn from Polk County. It is forecasted that 5 percent of the workforce will consist of Polk County local subcontractors, with 10 percent regional subcontractors. It is also estimated that the value of these local and regional contracts will represent 40 percent of the entire construction workforce contract value since these contracts will probably involve

Table 7.1.2-1. Annual Construction Workforce Payroll to Build-Out in 2010 (1992 dollars)

Year	Total Nominal Station Capacity (MW)	Construction Personnel		Construction Wages*		Total (\$)
		Average	Peak	Average (\$)	Additional During Peak (\$)	
1994	0	400	400	8,640,000	0	8,640,000
1995	150	400	600	12,960,000	4,860,000	17,820,000
1996	260	400	400	7,560,000	0	7,560,000
1998	260	15	20	243,000	40,500	283,500
1999	335	15	20	243,000	40,500	283,500
2000	410	15	20	243,000	40,500	283,500
2001	480	40	60	972,000	54,000	1,026,000
2002	555	40	60	1,296,000	270,000	1,566,000
2003	775	40	40	108,000	0	108,000
2005	775	15	20	243,000	40,500	283,500
2006	850	15	20	243,000	40,500	283,500
2007	925	15	20	243,000	40,500	283,500
2008	1,000	15	20	243,000	40,500	283,500
2009	1,075	15	20	243,000	40,500	283,500
2010	1,150	15	20	243,000	40,500	283,500
TOTAL				33,723,000	5,548,500	39,271,500

* Average wage of \$2,700 per month plus benefits; overtime wages not included.

Sources: UE&C, 1992.
ECT, 1992.

some of the more significant activities (e.g., earth-moving for site development/reclamation).

7.1.2.2 Operational Workforce

The Polk Power Station will also employ an estimated 210 operational workers at project build-out. The operational workforce will also include annual contracted maintenance workers to be hired for periodic routine services ranging from 6 persons in 1997 to 100 at build-out in 2010. The total combined annual operational payroll is presented in Table 7.1.2-2, and is estimated in 1992 dollars to be cumulatively more than \$109 million from 1995 to 2010. The yearly annual totals range from \$1.75 million in 1995 to almost \$10 million in 2010. Since 60 percent of the operational workforce and 50 percent of the maintenance workforce are expected to be drawn from Polk County, a total of more than \$5.7 million in payroll is expected to be generated within Polk County in 2010, at a cumulative total of more than \$63 million from 1995 to 2010 for the Polk County economy. The annual wage figures represent the expected 1992 salary average for Tampa Electric Company power plant employees and maintenance workers.

Tampa Electric Company actively maintains affirmative action hiring practices, and will continue to comply with all applicable local, state, and federal affirmative action and equal employment laws.

Table 7.1.2-2. Annual Operational Workforce Payroll to Build-Out in 2010 (1992 dollars)

Year	Total Nominal Station Capacity (MW)	Total Personnel		Wages (\$)		Total (\$)
		Opera- tional	Main- tenance	Opera- tional*	Main- tenance†	
1995	150	50	0	1,750,000	0	1,750,000
1996	260	130	0	4,550,000	0	4,550,000
1997	260	130	6	4,550,000	156,000	4,706,000
1998	260	130	66	4,550,000	1,716,000	6,266,000
1999	335	140	0	4,900,000	0	4,900,000
2000	410	147	75	5,145,000	1,950,000	7,095,000
2001	480	162	5	5,670,000	130,000	5,800,000
2002	555	167	80	5,845,000	2,080,000	7,925,000
2003	775	182	21	6,370,000	546,000	6,916,000
2004	775	182	95	6,370,000	2,470,000	8,840,000
2005	775	182	17	6,370,000	442,000	6,812,000
2006	850	187	94	6,545,000	2,444,000	8,989,000
2007	925	192	26	6,720,000	676,000	7,396,000
2008	1,000	197	89	6,895,000	2,314,000	9,209,000
2009	1,075	202	39	7,070,000	1,014,000	8,084,000
2010	1,150	210	100	7,350,000	2,600,000	9,950,000
TOTAL				90,650,000	18,538,000	109,188,000

*Average annual wage of \$35,000 plus benefits.

†Average annual wage of \$26,000 plus benefits.

Sources: UE&C, 1992. ECT, 1992.

7.1.3 BY-PRODUCT SALES

Sulfur, H_2SO_4 , and slag will be produced as saleable by-products of the gasification process. Elemental sulfur and H_2SO_4 are produced in the syngas sulfur removal processes, and have commercial value, particularly for the chemical fertilizer industry in central Florida. The slag by-product has commercial applications such as sand-blasting material, and as an aggregate in cement, road construction, and other building materials. These by-products will be transported offsite to buyers by truck and rail.

Revenues from the sale of these by-products will provide benefits to Tampa Electric Company and its Customers by offsetting some costs of the project operations and electricity. For example, assuming that 50 percent of the sulfur in the coal is recovered as elemental sulfur and 50 percent as H_2SO_4 , annual sales of sulfur would generate approximately \$1.1 million in revenues and H_2SO_4 annual sales would generate approximately \$3.4 million in revenues. Slag sales are estimated to generate approximately \$200,000 in annual revenues.

7.1.4 ENHANCEMENT OF RECREATIONAL OR ENVIRONMENTAL VALUES

The construction and operation of the Polk Power Station will efficiently use reclaimed phosphate mining lands. This use of mined land will enhance land conservation by combining multiple industrial uses on one parcel of land.

In addition, Tampa Electric Company plans to reclaim the western portion of the site to a natural habitat system of wetlands and uplands after current phosphate mining activities are completed. These reclaimed lands will create a significant wildlife habitat resource in southwestern Polk County. The planned, controlled, natural wildlife habitat area will provide enhanced environmental qualities to the adjacent properties compared to other permitted uses within the zoning district.

7.1.5 CREATION OR IMPROVEMENT OF LOCAL TRANSPORTATION FACILITIES

The transportation analysis conducted for the project (see Appendix 11.6), showed that adjacent roadway links and intersections will operate at an acceptable LOS in their current geometries with existing traffic and the projected traffic associated with the construction and operation of the Polk Power Station.

The planned points of ingress and egress for the Polk Power Station site will be designed in accordance with applicable FDOT and Polk County requirements to provide adequate and safe access to the site, and to ensure that the traffic operations and flows on the existing roadway network in the site area meet an acceptable LOS. Specific roadway improvements required to maintain an acceptable LOS on public roads will be provided, as appropriate, at the facility access roads. Schematic plans for roadway improvements at the driveway entrances are shown for the main project entrance and Bethlehem Road entrance are shown on Figures 4.1.2-1 and 4.1.2-2, respectively.

An additional transportation benefit proposed for the Polk Power Station will be the encouragement of the use of transportation demand management techniques for both the construction and operational workforce, to reduce potential traffic impacts. For the construction workforce, a bulletin board will be placed onsite for purposes of placing car-pooling advertisements and all onsite contractors will be informed that this service is available. These contractors will be requested to inform their employees of the availability of this service. For the operational workforce, bulletin boards will also be used onsite and at Tampa Electric Company office locations for placing car-pooling advertisements, and through the availability of placing car-pooling advertisements in the Tampa Electric Company newsletter sent to all Tampa Electric Company employees.

7.2 SOCIO-ECONOMIC COSTS

7.2.1 TEMPORARY EXTERNAL COSTS

According to FDLES, more than 35,000 construction workers reside in Polk, Hillsborough, Hardee, and Manatee Counties. Based on the availability of this workforce and the location of the Polk Power Station site, construction workers are expected to commute, with only minimal, temporary relocations anticipated. Tampa Electric Company will encourage transportation demand management techniques to reduce the potential traffic impacts associated with the construction workforce. As previously discussed, these techniques will include the installation of a bulletin board onsite that may be used by construction personnel for placing car-pooling advertisements, and by informing all onsite contractors that this service is available and requesting that these contractors inform their employees that this service is available. Because the majority of construction workers are anticipated to commute from their existing residences, no significant impacts to housing or public services and facilities are expected.

For the few construction workers who may decide to drive to the area in an recreational vehicle (RV) and stay at campgrounds during weekdays, sufficient RV sites exist to support this additional minimal demand. Because the majority of the construction workforce will commute, the few workers choosing to use an RV are not expected to create significant additional demands on local RV facilities. A small number of construction workers may be recruited from outside the four-county region; however, with a Polk County rental housing vacancy rate in 1990 of 12.6 percent (BEBR, 1991), this small number of workers is expected to be readily absorbed by the available rental housing stock in Polk County.

As previously discussed in Section 4.6.6 and as documented in the transportation analysis (Appendix 11.6), temporary traffic congestion may occur at certain intersections during morning and evening hours when construction workers are arriving at or departing from the Polk Power Station site. Acceleration, deceleration,

and turn lanes, as appropriate, will be constructed at plant access roads to maintain acceptable LOS standards on existing roadways at these intersections.

Residences in the vicinity of the Polk Power Station are not expected to be negatively impacted by onsite construction activities. The site is in an area predominantly used for phosphate mining, and the nearest residence is more than 1 mile from the proposed power block and fuel storage areas. After the initial site development/reclamation activities, vegetative buffers will be provided along SR 37 and Fort Green Road. The site area west of SR 37 will be enhanced and is ultimately expected to function as a wildlife habitat/corridor area. Based on distances to homes and vegetative buffers to residences near the Polk Power Station, most onsite construction activities will not be visible from residences in the area or potential viewsheds along public roadways.

7.2.2 LONG-TERM EXTERNAL COSTS

The operational impacts resulting from the Polk Power Station are expected to be minimal and localized. The Polk Power Station is not located on or near public or private recreational facilities, and therefore, will not cause a loss of access, impair recreational values, or cause a deterioration of aesthetic or scenic values. The development of the Polk Power Station at this mined-out site will also not displace persons from the land, cause a loss of income, or result in significant costs to local governments.

7.2.2.1 Aesthetics

The project will be located along SR 37, approximately 4.4 miles south of the unincorporated community of Bradley Junction. The tallest structures will be associated with gasification facilities and certain exhaust stacks which range from 150 to 250 ft in height. Other plant operational buildings are expected to be three stories or less in height.

As previously discussed, the Polk Power Station site is proposed to be located in an area predominantly used for phosphate mining. As a predominantly disturbed area, areas in the immediate vicinity of the Polk Power Station have little aesthetic or visual value. The power block and fuel storage areas will also be located more than 1 mile to the nearest residence. Development proposed west of SR 37 will include a series of wetlands and uplands, and will evolve into a significant habitat area. This area west of SR 37 is expected to be an area of a positive visual and aesthetic character for views from adjacent homes along Bethlehem and Albritton Roads to the north of the area and from public viewsheds along SR 37 and SR 674.

Only the tallest structures (e.g., certain coal gasification facilities and exhaust stacks) will be potentially visible from public roadways or offsite properties. These structures will be located approximately 0.5 mile from the nearest roadway or public viewshed, SR 37, and vegetative buffers will be provided along SR 37 and other potential public viewpoints. Based on setback distances and proposed vegetative

buffering and currently disturbed character of adjacent lands, the Polk Power Station is not expected to create significant visual impacts to the immediate area. The Polk Power Station will not be located on or near areas of scenic, historic, cultural, natural, or archaeological value, and will consequently have no visual impacts to such areas.

7.2.2.2 Land Use

The development of the Polk Power Station will use primarily mined-out land, and will cause no hardship associated with the conversion of land use. The utilization of these lands will reclaim lands into a productive use without displacing populations or causing a loss of value to the region. The development of the Polk Power Station will not displace or impact any recreational or other public lands. Based on previous mining uses, vegetative buffers, and setback distances, the development of the Polk Power Station is not expected to cause detrimental impacts to real estate values in areas surrounding the site.

7.2.2.3 Public Services

Most of the Polk Power Station operational workforce is expected to be recruited from the regional workforce, with minimal relocations. Because this population is currently served by existing public services and facilities in place relative to their residences, no significant impacts to housing, transportation facilities, or public facilities and services (i.e., schools, hospitals, police, and fire protection) are anticipated (see Section 5.9).

REFERENCES

Bureau of Economic and Business Research (BEBR). 1991. 1991 Statistical Florida Abstract. College of Business Administration, University of Florida, University Press of Florida.

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CHAPTER 8.0

SITE AND PLANT DESIGN ALTERNATIVES

As discussed in Section 1.2, Tampa Electric Company's proposed Polk Power Station project will involve several federal agency approvals and actions which are considered to be major federal actions that may significantly affect the quality of the human environment. Such federal actions are subject to NEPA and CEQ regulations promulgated to implement the provisions of NEPA and to establish uniform procedures that must be followed by all federal agencies to comply with NEPA. DOE has determined that its action to provide Tampa Electric Company with partial funding for the proposed IGCC power plant under the Clean Coal Technology Demonstration program is a major action subject to NEPA regulations. It is also anticipated that EPA will determine that its proposed action to issue a NPDES permit for certain water discharges from the proposed Polk Power Station is a major action subject to NEPA requirements. To fulfill their responsibilities under NEPA and CEQ regulations, DOE and EPA are required to prepare an EIS for the proposed Polk Power Station project. DOE will be the lead federal agency for preparation of the EIS while EPA and other affected federal agencies (e.g., USACE and USFWS) will participate in the EIS preparation as a cooperating agencies.

Under NEPA regulations, DOE and EPA are required in preparing the EIS to identify and assess all reasonable alternatives to the proposed project which could avoid or minimize potentially adverse effects on the quality of the human environment. The potential alternatives in addition to the proposed project to be considered by these agencies in the EIS include:

- Available regulatory alternatives;
- Alternatives to constructing new generating facilities;
- Alternative generation technologies;
- Alternative sites for the proposed facilities;
- Alternative facility designs, processes, and systems; and
- The no-action alternative.

In light of the alternative analyses required by DOE and EPA, this chapter of the SCA identifies the potential alternatives which were initially considered by Tampa Electric Company for the proposed Polk Power Station project. Discussions are also provided regarding Tampa Electric Company's evaluation of potential alternatives to determine if the alternative was considered a reasonable alternative compared to the proposed project. In these evaluations by Tampa Electric Company, an alternative must have met the following criteria to be considered as a reasonable alternative:

- Provide some environmental advantage to lessen, minimize, or avoid potentially adverse effects compared to the proposed project;
- Meet Tampa Electric Company's need to provide reliable, additional electric generating capacity to its Customers in the 1995 to 2010 time-frame;
- Be technically feasible and implementable within the required timeframe; and
- Be relatively more cost-effective compared to the proposed project.

In addition to these overall criteria, the evaluation of alternatives considered the objectives of the DOE Clean Coal Technology Demonstration program to support the construction and operation of facilities to demonstrate technologies which use coal for electric generation in an environmentally acceptable, more cost-effective manner and are ready to be potentially proven at the demonstration level for commercial operation. These criteria are consistent with those to be used by DOE and EPA in assessing alternatives to the proposed Polk Power Station project for the EIS in compliance with NEPA-related regulations and requirements.

As stated in the FDER Instruction Guide for Certification Applications, this chapter is not required under the FEPPSA for a complete SCA. The applicant has the option to complete this chapter to support the analyses of alternatives by federal agencies under NEPA. Also, the FDER instruction guide provides a suggested format for this chapter. Tampa Electric Company has opted to complete this chapter.

However, the FDER suggested format for presenting information has been somewhat modified and expanded to address additional alternatives which are expected to be considered by DOE and EPA and to make the format more consistent with the specific designs, systems, and requirements of the proposed Polk Power Station project.

8.1 ALTERNATIVE SITES

As required by Section 186, F.S., and implementing regulations in Chapter 22E-2, F.A.C., Tampa Electric Company identified the need for new electric generating capacity in the company's Ten-Year Site Plan for Electrical Generating Facilities and Associated Transmission Lines, January 1992 to December 2001. The proposed Polk Power Station site was also identified in the Ten-Year Site Plan as well as several alternative sites. Tampa Electric Company conducted a Power Plant Site Selection Assessment program in 1989 and 1990 which resulted in the identification of the proposed Polk Power Station site. The following provides summary descriptions of the methodologies, criteria, and analyses conducted in this program which were presented in the final Power Plant Site Selection Assessment Report (ECT, 1990).

8.1.1 INTRODUCTION

Tampa Electric Company conducted a Power Plant Site Selection Assessment program to identify a suitable site for constructing and operating future power plant facilities. The power plant facilities considered during the site assessment were a 440-MW CC plant and a coal-fueled 500-MW baseload plant as well as associated facilities. An integral aspect of this site selection program by Tampa Electric Company was the formation and participation of a Siting Task Force. The Siting Task Force was formed in response to community concerns regarding the placement of additional power plant facilities at a coastal site on Tampa Bay which was identified as a suitable site for such facilities in previous site selection studies by Tampa Electric Company. The Siting Task Force was comprised of 17 private citizens from environmental groups, businesses, and universities in the Tampa Electric Company service area and throughout Florida. Tampa Electric Company's objective in forming and committing to the Siting Task Force participation in the siting program was to ensure that local and statewide public issues and concerns relative to new power plant development were adequately and accurately considered in the process of selecting a site for the new power plants. The Siting Task Force provided inputs, guidance, and recommendations to Tampa Electric Company throughout the power plant site selection process. The Task Force members met monthly from September 1989 through September 1990 to review and guide the progress of the siting program. A listing of the Siting Task Force members and a brief description of their backgrounds at the time of the site assessment program are provided in Appendix 11.15.

8.1.2 OVERALL PROGRAM APPROACH

The overall goal of the Tampa Electric Company Power Plant Site Selection Assessment program was to select a site or sites which were considered the most suitable for developing the needed electric generating facilities to meet Tampa Electric Company's future power supply demands. The first step in the program involved the detailed review and concurrence by the Siting Task Force that Tampa Electric Company needed the new facilities to meet future Customer electricity demands. During this review, the Task Force considered Tampa Electric Company's programs to encourage energy conservation, demand management, and cogeneration to reduce future electricity demands. Input was obtained from a representative of the FPSC, which is responsible for regulating public utilities in Florida to ensure that Customers are provided with economical and reliable electric service, as well as responsible for approving the need for construction of new facilities.

In order to be located in proximity to its Customers, Tampa Electric Company preferred that the new generating facilities be located within a six-county area which included its service territory and adjacent areas--Hillsborough, Pinellas, Pasco, Manatee, Polk, and Hardee Counties. Tampa Electric Company's service areas and the six-county study region are presented in Figure 8.1.2-1. Ideally, Tampa Electric Company and the Siting Task Force concurred that the two power plant facilities (i.e., CC and baseload facilities) should be located at one contiguous area; however, the siting program also evaluated the option of locating the CC and baseload power plants on separate sites.

The suitability or acceptability of potential sites for power plant development involves a combination of environmental, social, engineering, and economic/cost factors. Usually, any potential site will have certain advantages and disadvantages in relation to these factors (i.e., no site is probably perfect considering all siting factors). Therefore, the power plant site selection process involved systematic analyses and comparisons to evaluate the advantages and disadvantages of various areas in an attempt to locate potential sites which have the most suitable or

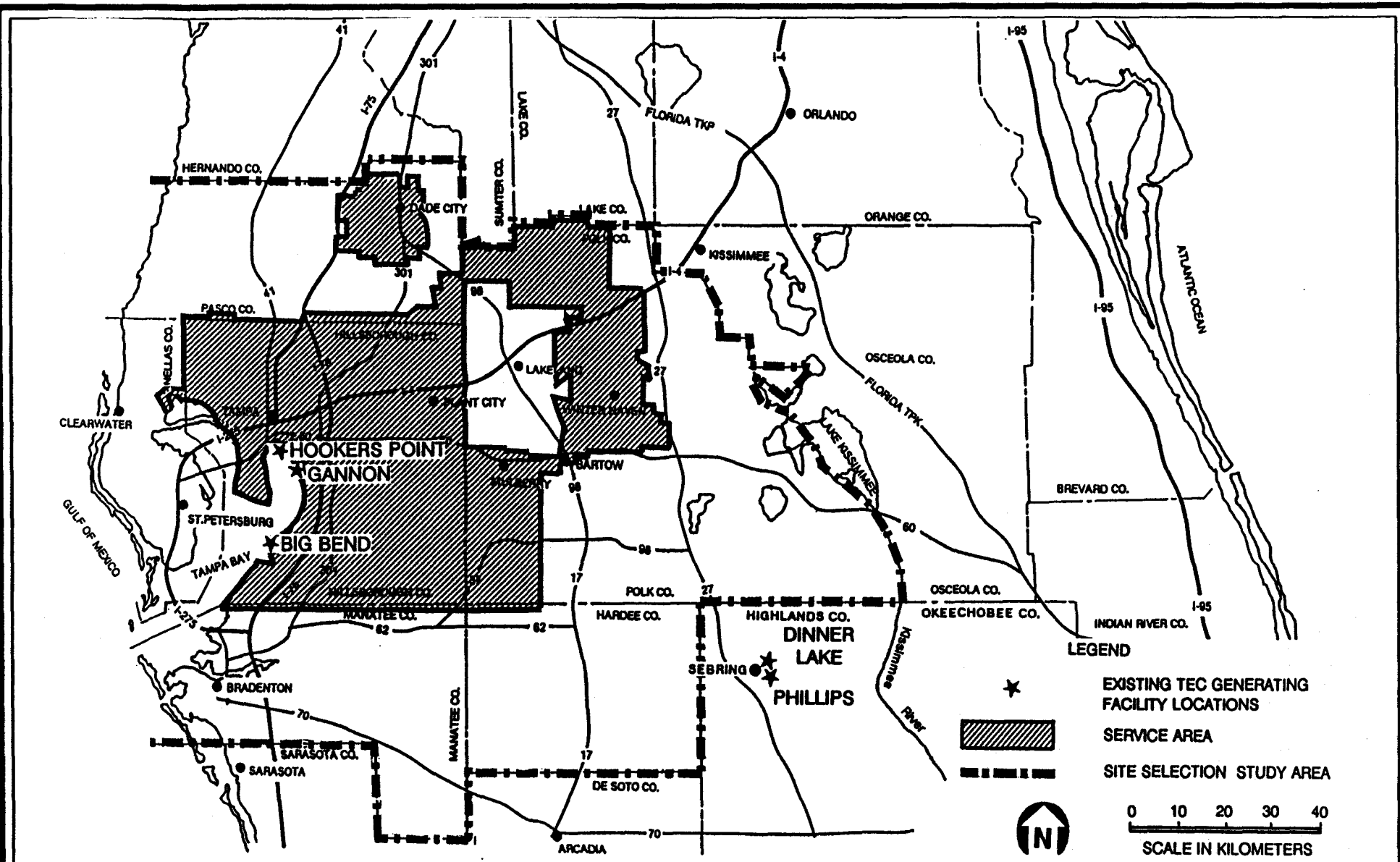


FIGURE 8.1.2-1.

TAMPA ELECTRIC COMPANY SERVICE AREA AND EXISTING GENERATING FACILITY LOCATIONS AND SITE SELECTION STUDY AREA

Sources: Tampa Electric Company, 1989. ECT, 1992.



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acceptable balance of trade-offs among the environmental, social, and engineering/economic siting factors.

The overall approach for the Tampa Electric Company Site Selection Assessment was based on a comprehensive, structured methodology which effectively integrated the multidisciplinary environmental and engineering/economic siting factors in the evaluation of potential areas for siting the new power plants. In addition, since the ultimate goal of the program was to identify sites which can be licensed or approved for power plant construction and operation, the program approach was designed to address and comply with applicable federal, state, and local regulatory requirements for siting new power plant facilities. The most comprehensive of these requirements at the federal and state regulatory agency levels are NEPA and FEPPSA, which is administered by FDER.

The Tampa Electric Company Power Plant Site Selection Assessment was structured into three major, sequential phases:

- Phase I--Regional Screening,
- Phase II--Intermediate Screening, and
- Phase III--Detailed Analyses.

The primary objective of each phase was to identify those areas within the six-county study region which were considered relatively more suitable for power plant development. As the siting process progressed through each phase, the number of potential siting areas under consideration was reduced and the level of detail involved in the environmental and engineering/economic evaluations of the remaining areas increased. The Siting Task Force actively participated throughout the siting process. The Task Force reviewed and provided inputs on the criteria and methods used for the evaluations and on the results of each phase. Figure 8.1.2-2 shows the general work flow of the site selection program and the key points of review and inputs from the Siting Task Force. The following summarizes the results of each phase of the

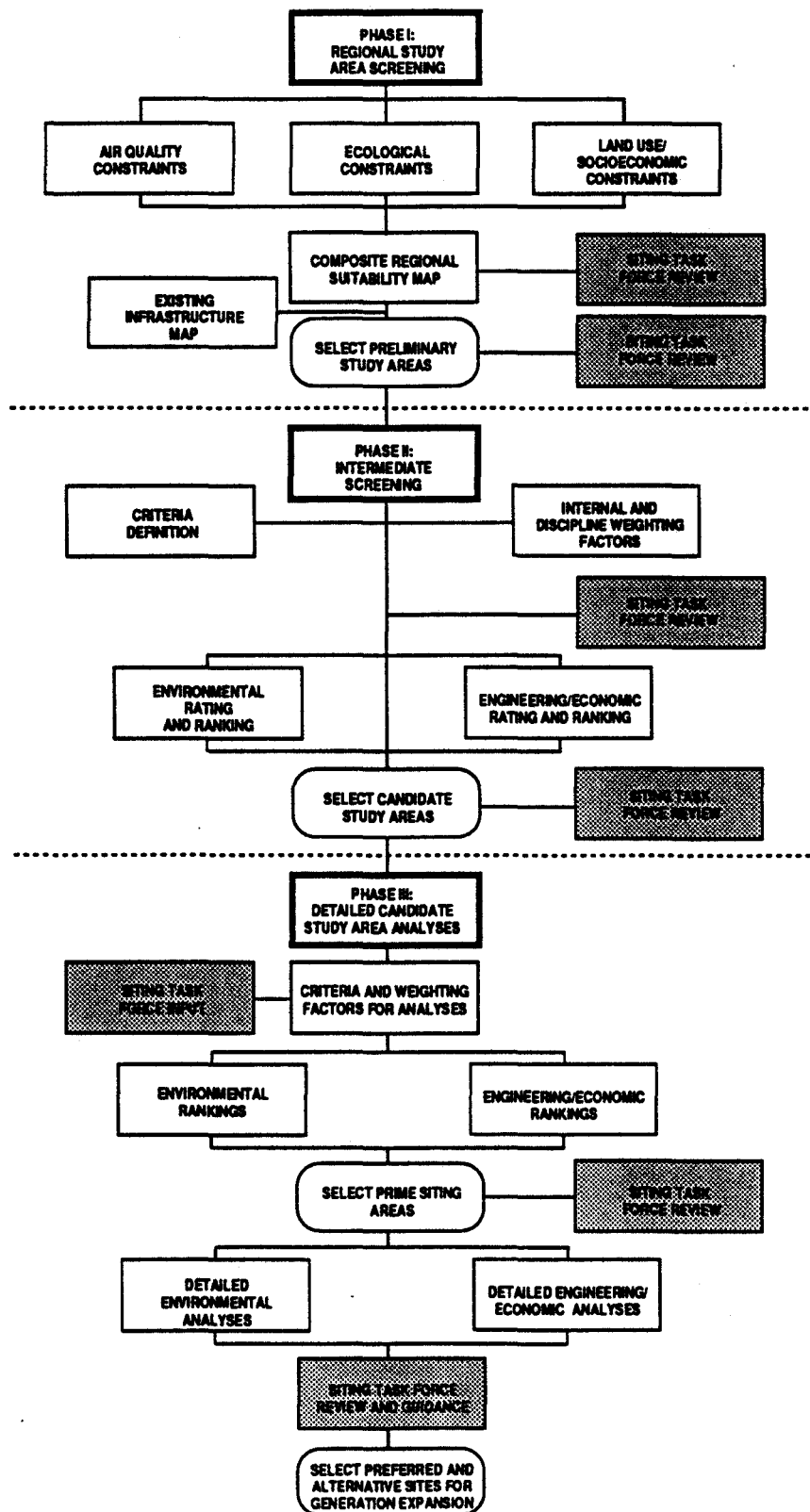


FIGURE 8.1.2-2.

GENERALIZED WORK FLOW DIAGRAM FROM TAMPA ELECTRIC COMPANY SITE SELECTION ASSESSMENT PROGRAM

Sources: Tampa Electric Company, 1989. ECT, 1992.



POLK POWER STATION

siting program and the Siting Task Force recommendations on the preferred sites for Tampa Electric Company's future generation expansion.

8.1.3 PHASE I--REGIONAL SCREENING

Regional screening involved an evaluation of the six-county study region based on various environmental criteria or constraints to power plant development. Based on this evaluation, the entire study area was screened and mapped into two ratings of potential suitability for power plant development: *potentially favorable* and *potentially restricted*. The two suitability ratings were defined as follows:

1. Potentially Favorable--Areas that generally meet all requirements for siting the power plant facilities, i.e., areas where land use/socioeconomic, ecological systems, and air quality characteristics are expected to only minimally affect, or be affected by, power plant siting; and
2. Potentially Restricted--Areas where regulatory requirements or technological limitations would probably preclude the power plant siting: (a) without major modifications in standard plant design, (b) without significant mitigative actions, or (c) within a reasonable timeframe.

The specific environmental criteria or constraints used for the regional screening are listed in Table 8.1.3-1.

As shown in the table, the regional screening criteria were grouped into three environmental discipline categories: air quality, ecological systems, and land use/socioeconomics. In general, the regional screening criteria for the ecological systems and land use/socioeconomic disciplines were designed to avoid (i.e., rate as potentially restricted) areas which contained environmentally sensitive lands such as major wetlands; aquatic preserves; national and state forests, preserves, parks, and wildlife refuges; and other government-controlled lands as well as areas which were currently in or planned for intensive land uses such as cities, towns, communities, residential and commercial areas, and other urban and suburban land uses. The air quality discipline criteria were designed to avoid areas with restrictive regulations to maintain high air quality conditions and areas with existing air quality problems or in the immediate vicinity of major existing air emission sources.

Table 8.1.3-1. Favorability Specifications for Regional Screening Criteria

Potentially Favorable	Potentially Restricted
<u>Air Quality</u>	
All other areas	Areas (other than nonattainment areas) within 5 km of ambient monitors showing maximum SO₂ or NO_x levels higher than 50 percent of AAQS Areas designated as particulate matter nonattainment areas Areas within 2.5 to 5 km of existing or proposed sources with SO₂ emissions of at least 5,000 tpy
<u>Ecological Systems</u>	
All other areas	Major wetlands as delineated on USFWS National Wetland Inventory maps
<u>Land Use/Socioeconomics</u>	
All other areas	Aquatic preserves Areas of critical state concern Urban and suburban lands Non-industrial Developments of Regional Impact National and state forests Water conservation areas Indian reservations Military reserves National and state preserves National wildlife refuges Conservation and Recreation Lands Hillsborough County Environmental Lands Acquisition and Protection Program lands Save Our Rivers lands Save Our Coasts lands Outstanding Florida Waters National and state parks and recreation areas Watershed protection overlay district

Source: ECT, 1992.

The lands associated with the criteria for each discipline were mapped within the six-county study region and were rated as potentially restricted for power plant development. All areas outside of these lands were rated as potentially favorable for each environmental discipline. The three discipline-specific maps were then composited by overlay mapping techniques to develop a composite regional screening map of the study region. For the composite map, areas within the region were considered as potentially restricted if the area was rated as potentially restricted for any one criterion in the discipline maps. Figure 8.1.3-1 presents the composite map resulting from the Phase I--Regional Screening based on the environmental discipline criteria.

The next step in the Phase I--Regional Screening was the identification and mapping of existing and planned infrastructure systems which may be needed to support Tampa Electric Company's planned facilities. These systems included arterial highways, active and abandoned railroads, natural gas and oil pipelines, and electric transmission lines with a capacity of 230 kV or larger. The suitability of potential siting areas for the planned power plant development would be enhanced (i.e., less potential environmental impacts and lower costs) by locating adjacent to or near existing infrastructure systems since the need to construct new support facilities would be reduced.

Based on the composite screening map, all areas rated as potentially favorable or where no constraints had been identified were considered as potentially suitable for siting the planned power plant facilities. These areas were examined to delineate broad areas called preliminary study areas, which were further evaluated in Phase II of the siting program. In general, the preliminary study areas varied in size and configuration, depending on the size and shape of the potentially favorable areas and, to the extent possible, were located in the vicinity of the existing infrastructure systems. Also, to the extent possible, the configuration of the preliminary study areas attempted to avoid crossing significant natural or man-made physical barriers and to include lands with relatively homogeneous environmental conditions.

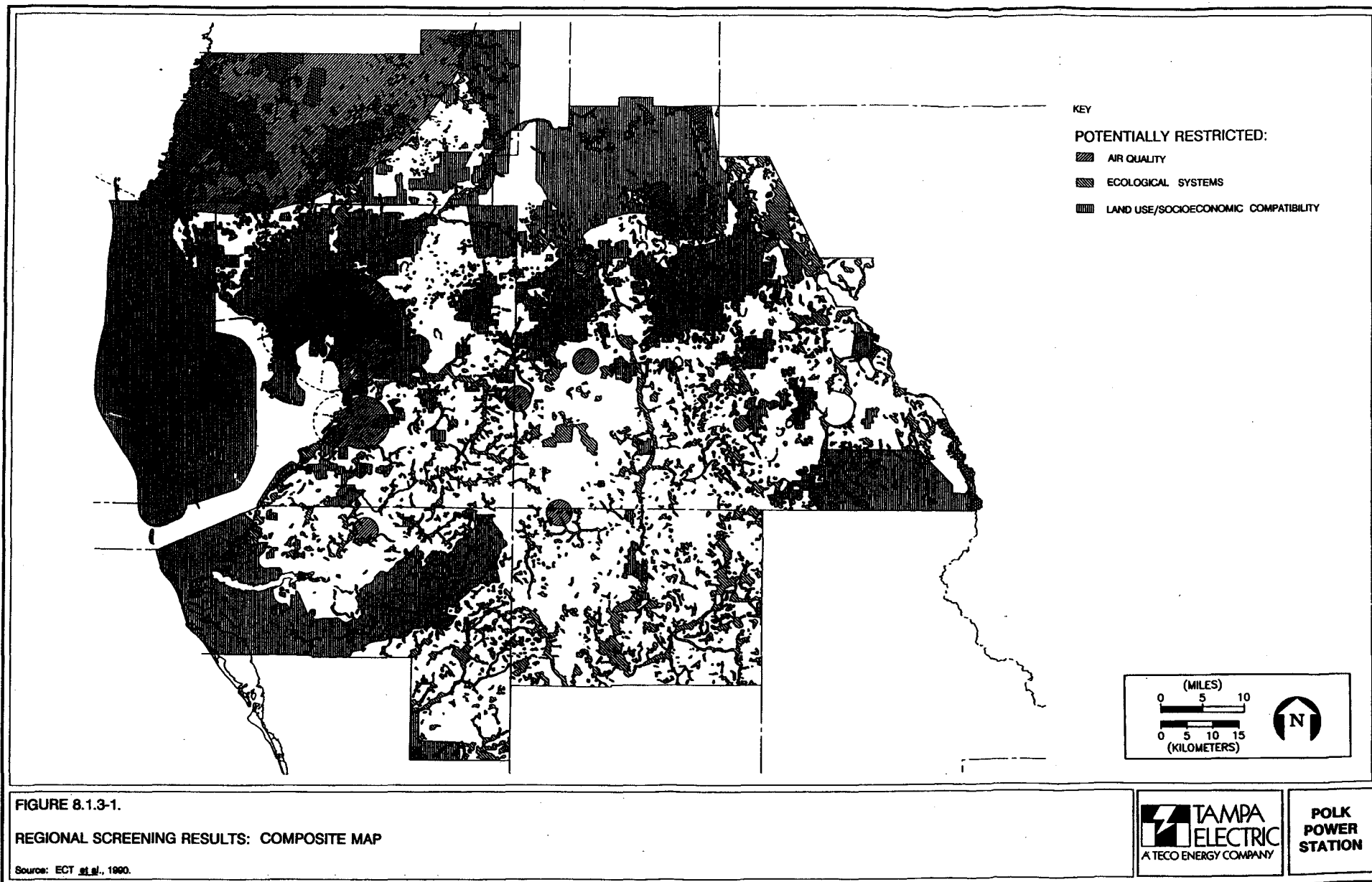
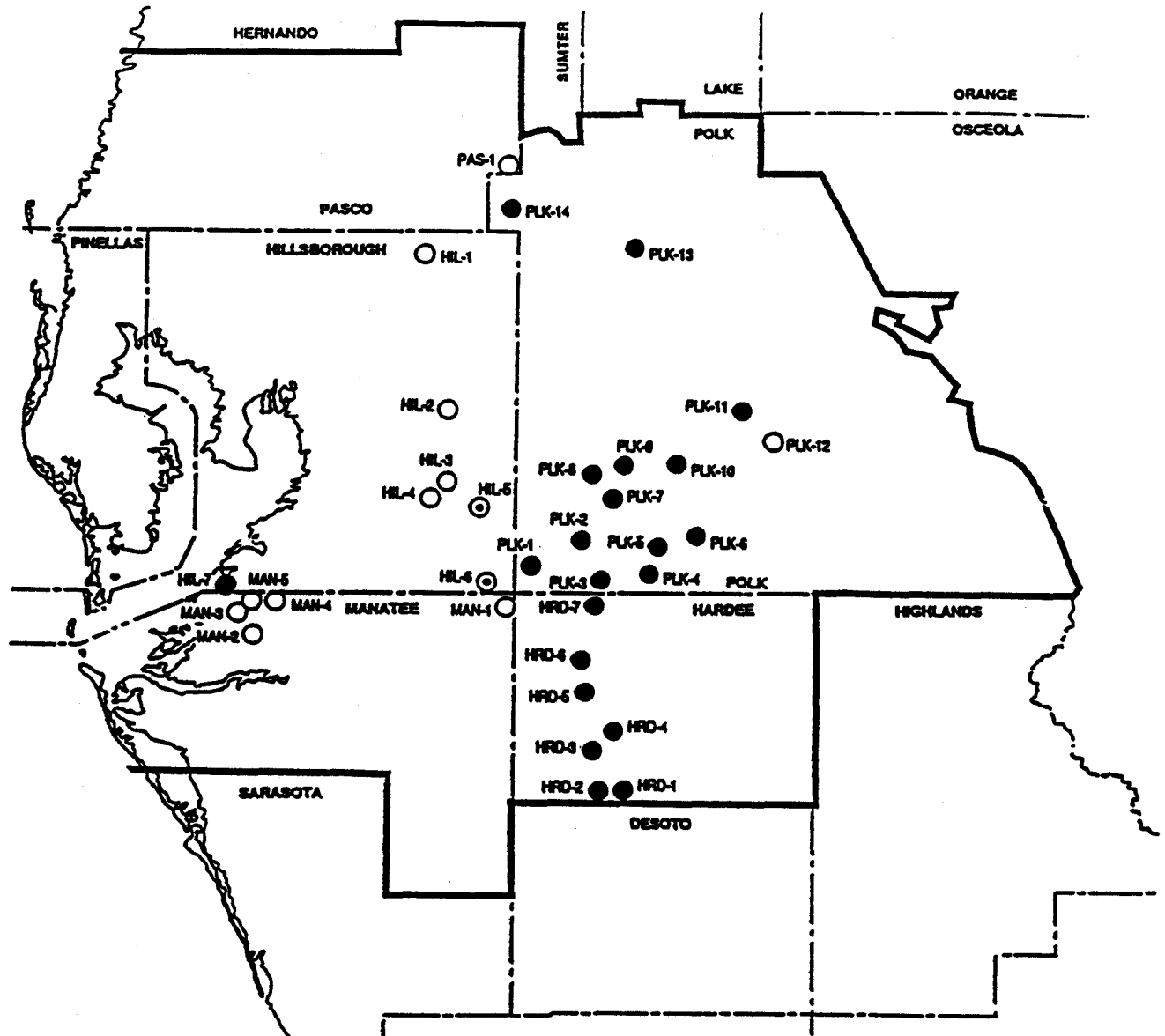


Figure 8.1.3-2 shows the general location of the preliminary study areas identified during the regional screening process. As shown on this figure, preliminary study areas were identified for each of the power plant development options: 34 areas for CC only, 23 areas for CC or baseload, and 21 areas for both CC and baseload plants on one site.

Many of the preliminary study areas were the same for each of the three development options; however, the number of areas decreased as the proposed level or intensity of power plant development and associated potential environmental impacts increased. Of the three options, the CC power plant development option was considered to have the lowest level of potential environmental impacts (e.g., least land area requirements, cooling water makeup needs, and air emissions) while the CC and baseload option was considered to have the highest level of potential impacts. For those areas identified as capable of developing either a CC or baseload plant but not both plants, the baseload power plant was considered to have a higher level of potential impacts than if a CC plant was developed on the same study area. Therefore, for the CC or baseload development option, the analyses in Phase II and Phase III of the site selection study were based on the development of a baseload power plant.

The Siting Task Force reviewed the designations of preliminary study areas and recommended that the designated areas be further evaluated in Phase II of the Site Selection Assessment as potential locations for Tampa Electric Company's planned power plants.



KEY

- Combined Cycle
- ⊙ Combined Cycle or Baseload
- Combined Cycle and Baseload

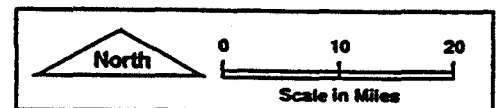


FIGURE 8.1.3-2.

**GENERAL LOCATION OF PRELIMINARY
STUDY AREAS**

Source: ECT, 1992.

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8.1.4 PHASE II--INTERMEDIATE SCREENING

The overall objective of intermediate screening was to evaluate the preliminary study areas, based on environmental and engineering/economic criteria, and select a reasonable number of study areas for detailed, site-specific analyses in Phase III. This objective was accomplished using a three-step process. First, the preliminary study areas identified from Phase I activities were examined to identify the potential, conceptual development plan for each area. The conceptual plan identified the potential cooling water system (i.e., cooling towers, reservoirs, or once through); the potential source(s) of cooling water makeup and discharge; the potential fuel delivery system (i.e., pipelines, trucking, railroad, and/or barge); and potential electrical transmission system. The conceptual plans served as the basis for evaluating the relative environmental and engineering/economic suitability of the preliminary study areas for each of the three power plant development options.

Second, the preliminary study areas were evaluated based on specific environmental and engineering/economic criteria. The environmental criteria considered the specific differences in site and facility requirements for the power plant development options. The preliminary study areas were evaluated and rated using an established five-level rating scale for each criterion in the following major environmental categories:

1. Air quality,
2. Water resources/area suitability,
3. Ecological systems, and
4. Land use/socioeconomics.

8.1.4.1 Environmental Evaluations

Environmental Criteria

The following presents descriptions of the environmental criteria and rating specifications (i.e., scale of 1 to 5 with 5 denoting most suitable for power plant siting) used in this step of the intermediate evaluations.

Air Quality Evaluation

The intermediate air quality evaluation was designed as a further examination of potentially the most constraining permitting requirements. The following were identified as the most constraining requirements that would have to be satisfied during permit review:

1. Demonstrating that no AAQS would be threatened, and
2. Demonstrating that PSD Class II increments would not be exceeded.

Each of the preliminary study areas considered in the intermediate screening evaluation phase was studied with respect to these criteria. Areas judged to be constrained by one or both of the criteria were rated lower. The evaluation considered only the most restrictive pollutant, which was identified as SO₂. The following subsections present a more detailed definition of the criteria, the rating specifications that were applied, and the results.

Ambient Air Quality Standards--During the permitting process, dispersion modeling would have to be performed to demonstrate that emissions from the proposed facility, along with emissions from existing facilities, would not pose threats to the federal and state AAQS. The AAQS for SO₂ would be the most limiting standard.

A study area's proximity to existing major sources of SO₂ could make locating the proposed facility difficult. Therefore, this criterion was defined by the distance-weighted totals of SO₂ emissions from existing sources within a 50-km radius of each site. Existing sources were identified from the state-wide emissions inventory obtained from FDER. Large sources closer to an area were weighted higher since their emissions would cause higher modeled concentrations at the site. The 50-km limit was imposed because FDER normally would not require modeling to include sources located more than 50 km away.

Although the highest distance-weighted SO₂ emissions total might be considered to have the lowest rating, the rating specifications given below reflect other consider-

ations. Based on inputs from the Siting Task Force, study areas rated the highest were those with intermediate-level emissions totals. These areas would be already impacted, but not to a point that would be considered prohibitive. The study areas rated lowest were those impacted to the smallest degree, reflecting the Siting Task Force's guidance to site the proposed facilities in areas already impacted.

The preliminary study areas were rated on a scale of 1 to 5 (5 denoting the most suitable for plant siting) based on the following definitions, consistent with the reasoning given earlier. Ratings were assigned based on SO₂ emission totals, all expressed in distance-weighted tons per year (tpy).

<u>Rating</u>	<u>Specification</u>
5	Between 50,000 and 125,000 tpy of SO ₂
4	Between 125,000 and 250,000 tpy of SO ₂
3	Greater than 250,000 tpy of SO ₂
2	Between 25,000 and 50,000 tpy of SO ₂
1	Less than 25,000 tpy of SO ₂

PSD Class II Increments--As stated previously, dispersion modeling would have to demonstrate compliance with the PSD regulations pertaining to allowable Class II increments.

Proximity to existing PSD sources of SO₂ could constrain a proposed new plant by consuming the available PSD increment. Therefore, this criterion was defined by the distance-weighted total of SO₂ emissions from existing large PSD sources within 50 km of a siting area. As for AAQS, the areas rated highest were those with intermediate-level emissions totals.

The preliminary study areas were rated on a scale of 1 to 5 (5 denoting the most suitable for plant siting) based on the following definitions. Ratings were assigned based on increment-consuming SO₂ emission totals (all distance-weighted tpy).

<u>Rating</u>	<u>Specification</u>
5	Between 20,000 and 50,000 tpy of SO ₂
4	Between 50,000 and 100,000 tpy of SO ₂
3	Greater than 100,000 tpy of SO ₂
2	Between 10,000 and 20,000 tpy of SO ₂
1	Less than 10,000 tpy of SO ₂

Ecological Systems Evaluation

The impacts on ecological systems from development of the proposed facility were assessed. This evaluation included:

1. The potential impacts associated with the construction phase (i.e. impacts from loss of habitat); and
2. The potential impacts within or outside preliminary study area boundaries (e.g., impacts on species or communities) resulting from emissions or discharges associated with facility operation.

On the basis of the sensitivities of the ecological systems at the preliminary study areas, the areas were rated on a scale of 1 to 5, with 5 denoting the most suitable area for the facility. This evaluation considered the diversity of area systems, habitat function, and protected species.

Diversity of Area Systems--The evaluation of impacts within a particular preliminary study area resulting from plant construction and operation required the consideration of the diversity of the area systems. As the number of different vegetative communities of a particular area increases, so does the potential for a greater number of species, the presence of rare, threatened, and endangered species, and the complexity of interrelationships among area systems.

The preliminary study areas were rated on a scale of 1 to 5 (5 denoting the most suitable for plant siting) based on the following definitions:

Rating

Specification

- | | |
|---|---|
| 5 | The area contains essentially a single habitat or land form. These areas were generally either mined for phosphate or contained monocultures, such as citrus grove. Siting of the facility would result in negligible reduction of area system diversity. |
| 4 | The area contained a large percentage of a single system, but also contains small percentages of one or two additional systems. These areas were generally agricultural land containing some isolated wetlands and or stream headwater wetlands. Siting of the facility would result in minor impacts to area system diversity, and could be avoided and/or mitigated with facility site planning. |
| 3 | The area contained a moderate diversity of systems including several wetland and upland communities, and was generally contained within a single drainage basin. A relatively large percentage of the area contained palmetto prairie and improved pasture. Although siting of the facility may have moderate impact on area system diversity, it could be avoided and/or mitigated by facility site planning. |
| 2 | The area contained a moderate diversity of systems, including several different wetland and upland communities, and was contained in more than one drainage basin. A relatively large percentage of the area could contain palmetto prairie, but contained little improved pasture. Although siting of the facility may result in moderately severe impacts on area system diversity, it could be avoided and/or mitigated by facility site planning. |
| 1 | The area contained a high diversity of systems, including several different wetland and upland communities, and was contained in several different drainage basins. No single community type occupied a significantly large percentage of the area and onsite systems were highly interconnected. Siting of the facility would have severe impacts on site system diversity and could not be avoided or mitigated. |

Habitat Function--The evaluation of impacts to a particular area resulting from site development and plant operation requires consideration of the site habitat function. Habitat function included: (1) maintenance of surface water quality and quantity; (2) groundwater recharge; (3) maintenance of population gene pools; (4) breeding, spawning, nursery, and forage areas; and (5) maintenance of rare, threatened, and endangered species populations.

On the basis of habitat function, the preliminary study areas were rated on a scale from 1 to 5 (5 denoting the most favorable for plant siting) based on the following definitions:

<u>Rating</u>	<u>Specification</u>
5	The natural habitat function was completely or nearly completely lost, primarily due to land alterations. Siting of the facility would have negligible impact on site habitat function.
4	The natural habitat function had been severely altered. A small percentage of habitat remained which provided natural function. Siting of the facility would have minor impact on natural habitat function, and could be avoided and/or mitigated by facility site planning.
3	The natural habitat function had been moderately altered. A relatively large percentage of habitat remained functional. Siting of the facility could have a moderate impact on habitat function, but could be avoided and/or mitigated by facility site planning.
2	The natural habitat function remained largely intact, and only minor alterations in habitat function had occurred. Siting of the facility could have moderately severe impacts to natural habitat function, but could be avoided and/or mitigated by facility site planning.
1	The natural habitat function remained intact; no alterations to habitat function had occurred. Siting of the facility could have severe impacts to habitat function which cannot be avoided or mitigated.

Protected Species--The evaluation of impacts to a particular area resulting from site development and plant operation must consider rare, threatened, and endangered species. The preservation of these species is required under Florida and federal law. The presence of endangered species could stop development of a particular site. The characteristics that define the sensitivity of rare, threatened, and endangered species to siting the facility include the potential presence or known presence of these species on or adjacent to the site, the degree to which they use onsite systems, and the uniqueness of those systems that provide required habitat.

On the basis of these species, preliminary study areas were rated on a scale of 1 to 5 (5 denoting the most suitable for plant siting) based on the following definitions:

<u>Rating</u>	<u>Specification</u>
5	Rare, threatened, or endangered species were potentially present within the area, but anticipated impacts of site development and operation would be negligible.
4	Rare, threatened, or endangered species potentially utilize the area, but anticipated impacts of site development and operation would be minor. Impacts could be avoided and/or mitigated by facility site planning.
3	The area was potentially suitable for rare, threatened, or endangered species. Anticipated impacts of site development would be moderate, but could be avoided and/or mitigated by facility site planning.
2	The area was potentially suitable for these species and contains habitats that were not endangered but were required for certain endangered and threatened species. These species are known to or likely to occur in or utilize the siting area. Anticipated impacts of the site development would be moderately severe, but could be avoided and/or mitigated by facility site planning.
1	The area was potentially suitable for these species and contains habitats that were both endangered and required for certain endangered or threatened species. These species are known to or likely to occur in or utilize the siting area. Anticipated impacts of site development and operation would be severe, and could not be avoided or mitigated.

Water Resources/Area Suitability Evaluation

Water makeup and discharge considerations and area suitability were evaluated for the three different power plant development options: CC, CC or baseload, and CC and baseload. Because each option involves different makeup water and wastewater discharge volumes, separate evaluations were considered necessary during intermediate screening. The individual criterion definitions and rating specifications are presented in the following.

Cooling Water Makeup Advantages--During intermediate screening, the preliminary study areas were examined to determine whether any areas had distinct advantages over other areas with respect to water availability. All areas appeared to have sufficient water available to meet the cooling water makeup requirements for the three development options.

The water makeup criterion actually consisted of five identifiable advantages. For the evaluation, these advantages were posed as yes-or-no questions, with any positive answer resulting in a point being awarded to a preliminary study area. The higher the score, with 5 being the highest score, the more advantages a particular study area had over other areas. The following questions, or advantages, comprised the water makeup criterion:

1. Is the 5-ft drawdown radius wholly within the delineated boundary of the study area?
2. If groundwater is the only viable source of water, is this area *not* designated a Water Use Caution Area by SWFWMD?
3. Is there an alternative surface water source of sufficient size available within 1 mile?
4. Is the proposed makeup water currently considered non-potable (i.e., average total dissolved solids concentration >500 mg/L)?
5. Based on the May 1987 and 1989 Florida aquifer potentiometric maps, is the site in a non-major stress area?

Cooling Water Discharge Advantages--Discharge considerations are as important as makeup water considerations. The water discharge criterion actually consisted of four identifiable advantages; a dummy variable with a score of 1 was added to ensure that the highest possible score for this criterion matched the high score for the water makeup criterion. Again, the advantages were posed as yes-or-no questions, with any positive answer resulting in a point being awarded to a preliminary study area. The higher the score, with 5 being the highest score, the more advantages a particular study area had over other areas. The following questions, or advantages, comprised the water discharge criterion:

1. *Dummy* variable with a score of 1 awarded to each study area.
2. Is the potential surface receiving water designated as Class III, IV, or V?
3. Does current or past phosphate activity provide a receptor for discharge either as phosphate plant process water or ponds?
4. Is the study area located in a drainage basin that is isolated from Outstanding Florida Waters and Aquatic Preserves?
5. Is the potential receiving water considered nonpotable?

Area Suitability Advantages--Finally, each study area was evaluated with respect to area suitability. The purpose of this evaluation was to determine if any study area had distinct advantages over other areas because the area was less subject to flooding or sinkhole formation, or the potential for contaminating the Floridan aquifer was less.

The area suitability criterion actually consisted of three identifiable advantages; two dummy variables, each with a score of 1, were added to ensure that the highest possible score for this criterion matched the high score for the other two criteria. The advantages were posed as yes-or-no questions, with any positive answer resulting in a point being awarded to a preliminary study area. The higher the score, with 5 being the highest score, the more advantages a particular study area had over other areas. The following questions, or advantages, comprised the area suitability criterion:

1. Are there sufficient contiguous acres located above the 100-year flood zone (acreage including cooling reservoir)?
2. Dummy variable with a score of 1 awarded to each study area.
3. Is this area designated A or B with respect to sinkhole formation?
4. Dummy variable with 1 awarded to each study area.
5. Is this an area of either very low recharge or discharge with respect to the Floridan aquifer?

Land Use/Socioeconomic Evaluation

Each preliminary study area was evaluated with respect to five land use/socioeconomic rating criteria. These criteria, which included existing and planned land use patterns, historical/archaeological resources, community impact, and agricultural impact, provided an overall preliminary evaluation of how potential power plant development would impact human/cultural resources within and in proximity to the preliminary study areas.

Existing Land Use Patterns--The existing land uses of each preliminary study area and its immediate surroundings were examined. Each study area was rated according to the degree of compatibility between power plant development and various adjacent land uses. The term land use encompasses a myriad of interests, with no clearly defined boundaries that distinguish it from other social, economic, or environmental variables. This land use compatibility analysis focused on land use patterns including the type and intensity of human activities existing on a particular parcel of land.

Specific land uses treated in this criterion were residences, commercial and industrial businesses, recreational facilities, and public and quasi-public facilities. Specifically excluded land uses were historical/ archaeological and agricultural resources which were treated as separate criteria in this analysis.

The preliminary study areas were rated on a scale of 1 to 5 (5 denoting the most suitable for plant siting) based on the following definitions:

<u>Rating</u>	<u>Specification</u>
5	Usage of the preliminary study area for a power plant would be compatible with the existing land use patterns in the vicinity of the area.
4	Usage of the preliminary study area for a power plant would generally be compatible with the existing land use patterns in the vicinity of the area, with only minor mitigative design measures required.
3	Usage of the preliminary study area for a power plant would conflict with some part of the existing land use patterns in the vicinity of the area; however, the conflict could be mitigated by design changes.
2	Usage of the preliminary study area for a power plant would be incompatible with existing land use patterns in the vicinity of the area, and mitigative design measures would generally not be feasible.
1	Usage of the preliminary study area for a power plant would be incompatible with existing land use patterns in the vicinity of the area that are not likely to change within an acceptable timeframe, and mitigative design measures would not be feasible.

Planned Land Use Patterns--Planned land use patterns and regulatory constraints were assessed by examining future land use maps, comprehensive plans, and selected development regulations.

The Local Government Comprehensive Planning and Land Development Regulation Act of 1985, Section 163.3167, F.S., requires each incorporated municipality and county to adopt and amend comprehensive plans, or elements or portions of the plans, to guide their future growth and development. Each comprehensive plan should be adopted by the local governmental entity and submitted to FDCA for review and approval. These plans must then be updated periodically, usually every 5 years thereafter. In addition, the Growth Management Act requires that all county

and municipality plans be consistent with the State Comprehensive Plan and their respective regional policy plan.

The preliminary study areas were rated on a scale of 1 to 5 (5 denoting the most suitable for plant siting) based on the following definitions:

<u>Rating</u>	<u>Specification</u>
5	Usage of the preliminary study area for a power plant would be compatible with planned land use patterns of the area and land use policies of the local, regional, and state comprehensive plans.
4	Usage of the preliminary study area for a power plant would generally be compatible with the planned land use patterns of the area and land use policies of the local, regional, and state comprehensive plans.
3	Usage of the preliminary study area for a power plant would conflict with some part of the planned land use patterns or certain land use policies of the local, regional, and state comprehensive plans.
2	Usage of the preliminary study area for a power plant would be incompatible with planned land use patterns or land use policies of the local, regional, and state comprehensive plans.
1	Usage of the preliminary study area for a power plant would be incompatible with future land use patterns and land use policies of the local, regional, and state comprehensive plans.

Archaeological/Historical Resources--This analysis involved determining the probability of finding significant prehistoric and historic resources. The locations of archaeological or historical resources are a function of previous natural resource patterns. Literature surveys and record checks are important data sources on these resources. The discovery of an archaeological/historical resource on a tract of land is not in itself undesirable. The information obtained from a resource through survey and excavation is often of more value than the artifacts themselves. Therefore, if artifacts are found, the suitability of the site for the proposed project is not neces-

sarily affected, depending on the significance of the find and on the project's impact on the find.

In determining the impact of power plant construction and operation on archaeological/historical resources, a review of the preliminary study area was made to: (1) identify areas which have been previously disturbed to the extent that any potential archaeological/historical resource was likely destroyed, and (2) determine the probability of archaeological/historical resources onsite due to the presence or absence of natural features which typically indicate the presence of cultural resources.

It is recognized that unforeseen discoveries of significant archaeological or historical resources may occur in any area during a later intensive survey; however, the most reliable data currently available were used for this analysis.

The preliminary study areas were rated on a scale of 1 to 5 (5 denoting the most suitable for plant siting) based on the following definitions:

<u>Rating</u>	<u>Specification</u>
5	Significant historical or archaeological resources are not likely within the preliminary study area due to previous disturbance to the area and the absence of natural features which typically indicate the enhanced probability of cultural resources.
4	Significant historical or archaeological resources are not likely within the preliminary study area due to previous disturbance to the area or the absence of natural features which typically indicate the enhanced probability of cultural resources.
3	Significant historical or archaeological resources may be likely to occur within the preliminary study area due to natural features which typically indicate the enhanced probability of cultural resources.
2	Significant historical or archaeological resources are likely to occur within the preliminary study area due to natural features which typically indicate the enhanced probability of cultural resources.

Significant historical or archaeological resources are very likely to occur within the preliminary study area due to natural features which typically indicate the enhanced probability of cultural resources.

Community Impact--Many elements of a community are direct functions of the proximity of population concentrations. Thus, in determining the level of community impact that might be associated with each preliminary study area, two elements were considered:

1. The population levels of urban areas within a 50-mile radius of the preliminary study area; and
2. The presence of existing communities in the proximity (within 2 miles) of the preliminary study area.

It was first assumed that the presence of larger established cities within reasonable daily commuting distance would minimize the community impact of power plant construction and operation. The work force associated with the project would then account for only a small share of each local community's population and, therefore, would conceptually have less impact. Moreover, a large share of the workforce could be drawn from current residents of the communities without adversely impacting the local labor market or necessitating immigration of workers. In a situation in which the communities within reasonable commuting distance are quite small, the incoming-worker households would lead to a larger relative increase in community residents. This increase would be reflected in a comparable increase in the demand for local goods and services, a demand that may not be met adequately by the local communities.

In contrast, general land use compatibility principles suggest the location of large electric power plants in areas where present and projected population densities are low. The location of a power plant in proximity to existing small communities, defined as a 2-mile radius from the preliminary study area, would potentially result in impacts on these communities. Not only would workers desire to reside there, but congestion, commercial activity, and the demand for public services would accelerate.

Therefore, the optimal situation would be a complete absence of communities within the immediate radius of the preliminary study area. The closer to a study area the existing communities occur, the more the study area's desirability diminishes.

The preliminary study areas were rated on a scale of 1 to 5 (5 denoting the most suitable for plant siting) based on the following definitions:

<u>Rating</u>	<u>Specification</u>
5	(a) Area was within a 1-hour commute to cities whose cumulative population was greater than 250,000, and
	(b) There were no communities within 2 miles of the area.
4	(a) Area was within a 1-hour commute to cities whose cumulative population was greater than 250,000, and
	(b) There were one or two communities within 2 miles of the area.
3	(a) Area was within a 1-hour commute to cities whose cumulative population was greater than 250,000, and
	(b) There were three or more communities within 2 miles of the area.
2	(a) Area was within a 1-hour commute to cities whose cumulative population was less than 250,000, and
	(b) There were one or two communities within 2 miles or the area.
1	(a) Area was within a 1-hour commute to cities with a total population less than 250,000, and
	(b) Area was within or contiguous to existing communities.

Agricultural Impact--Agriculture is considered Florida's second largest revenue generator, accounting for \$4.6 billion throughout the state in 1987. In addition, federal, state, regional, and local policies have been established for the conservation of agricultural land. Power plant development, like any land-intensive industrial or urban activity, competes with the agricultural interests in the state. Impacts are

considered more significant to the citrus industry and row crops (higher capital yields per acre) than field crops or improved pasture (lower capital yields per acre). Since prime and unique farmland soils are based upon the presence of certain high-capital yield crops, or the potential of a soil to support such crops, the agricultural impact criterion rating specifications were based upon the extent of these soils, if any, within the preliminary study areas.

The preliminary study areas were rated on a scale of 1 to 5 (5 denoting the most suitable for plant siting) based on the following definitions:

<u>Rating</u>	<u>Specification</u>
5	Prime and unique farmland soils are not present in the preliminary study area.
4	Prime and unique farmland soils account for less than 10 percent of the preliminary study area.
3	Prime and unique farmland soils account for 10 to 33 percent of the preliminary study area.
2	Prime and unique farmland soils account for 34 to 66 percent of the preliminary study area.
1	Prime and unique farmland soils account for 67 to 100 percent of the preliminary study area.

Weighting Factors

Within the environmental evaluation process, two types of weighting factors were developed and used to reflect the relative importance of the criteria and environmental disciplines in determining the overall siting suitability of the preliminary study areas. The first were called internal weighting factors which indicated the relative importance of the criteria or associated environmental impacts within each of the four major disciplines. The second were called discipline weighting factors which reflected the relative importance of the four major environmental disciplines to each other in evaluating the siting suitability of the preliminary study areas. The internal weighting factors for the various criteria are shown in Table 8.1.4-1. These factors ranged from 5 to 1, with 5 indicating the highest level of importance of a criterion

Table 8.1.4-1. Phase II--Intermediate Screening Criteria and Internal Weighting Factors

Discipline	Criteria	Internal Weighting Factor
Air quality	AAQS	4
	PSD Class II increments	3 or 4*
Ecological resources	Diversity of area systems	4
	Value of habitat function	4
	Impact on protected species	5
Water resources/ area suitability	Advantages for cooling water makeup	5
	Advantages for cooling water discharge	5
	Area suitability advantages	3
Land use/socio- economics	Compatibility with existing land use patterns	5
	Compatibility with planned land use patterns	5
	Impact on archaeological/historical resources	3
	Community impact	4
	Agricultural impact	1

* An internal weighting factor of 3 was used for the CC and CC or baseload development options and a factor of 4 was used for the CC and baseload option.

Source: ECT *et al.*, 1990.

within the environmental discipline. The internal weighting factors were initially developed by the multidisciplinary technical project team. The factors were then reviewed by the Siting Task Force and revised, as necessary, prior to use in developing the environmental ratings of the preliminary study areas.

The discipline weighting factors were developed by the Siting Task Force using a pairwise comparison technique. In developing these factors, each Task Force member completed a pairwise comparison matrix within which the member rated the relative importance of the disciplines to power plant siting. The four disciplines were compared two at a time and assigned a score of 1.0 if the discipline was considered more important than the other, a score of 0.0 if the discipline was less important, and a score of 0.5 if the Task Force member felt that the disciplines were of equal importance in evaluating the suitability of potential power plant sites. The average scores of the Task Force member evaluations were used as the discipline weighting factors. Based on these results, water resources/area suitability and ecological systems, both with average scores of 2.92, were considered to be relatively more important than the other two disciplines; the average air quality score was 2.15; and land use/socioeconomics had the lowest score with an average of 2.00.

Results of Environmental Evaluations

Using these weighting factors, the discipline ratings were composited into an overall environmental ranking of the preliminary study areas. Table 8.1.4-2 presents the overall results of the environmental ratings and rankings of the preliminary study areas for the full development option (i.e., CC and baseload units). In this table, a higher weighted score indicates that the study area is considered more suitable environmentally for power plant development. Based on these rankings, preliminary study areas PLK-7, PLK-2, PLK-3, and PLK-1 were considered as the most suitable areas.

At the recommendation of the Siting Task Force, several sensitivity analyses were conducted on the environmental rankings to determine the effect of the weighting

Table 8.1.4-2. Summary of Phase II Environmental Ratings and Rankings for the CC and Baseload Development Option

Study Area	Air (2.15)				Ecology (2.92)				Water Resources (2.92)				Land Use/Socioeconomics (2.00)						Total Weight Score	Rank								
	Existing SO ₂ Emiss.	Existing PSD SO ₂ Sources	Wght Avg.		System Diver-sity	Habitat Functn	Protctd Species	Wght Avg.	Water Makeup Consid.	Dis-charge Consid.	Area Suita-bility	Wght Avg.	Exist. Land Use	Planned Land Use	Cult. Res.	Commnty Impact	Agric. Impact	Wght Avg.										
	(4)	+	(4)	= (8)	(4)	+	(4)	+	(5)	= (13)	(5)	+	(5)	+	(3)	= (13)	(5)	+			(5)	+	(3)	+	(4)	+	(1)	= (18)
PLK-7	5		5	10.75	5		5		5	14.60	3		4		3	9.88	5		5		5		5		5	10.00	45.23	1
PLK-2	4		5	9.68	4		4		4	11.68	3		4		4	10.56	5		5		5		5		5	10.00	41.91	2
PLK-3	4		5	9.68	4		4		4	11.68	3		4		4	10.56	5		5		4		5		4	9.56	41.47	3
PLK-1	4		5	9.68	4		4		4	11.68	3		4		3	9.88	5		5		6		5		6	9.56	40.79	4
PLK-8	4		5	9.68	4		4		4	11.68	3		4		3	9.88	5		4		5		4		5	9.00	40.24	5
PLK-9	2		5	7.53	4		5		4	12.58	3		4		4	10.56	5		5		5		4		5	9.56	40.22	6
PLK-10	2		5	7.53	4		5		4	12.58	3		4		4	10.56	5		5		5		4		4	9.44	40.10	7
PLK-5	2		5	7.53	4		4		4	11.68	3		4		4	10.56	5		5		4		4		5	9.22	38.98	8
PLK-4	2		5	7.53	4		4		4	11.68	3		4		4	10.56	4		4		4		4		3	7.89	37.65	9
PLK-6	2		2	4.30	4		4		4	11.68	3		4		4	10.56	4		4		4		4		3	7.89	34.43	10
HIL-7	4		2	6.45	3		3		2	7.64	4		3		5	11.23	5		4		4		4		3	8.44	33.76	11
HRD-7	2		2	4.30	4		4		4	11.68	3		3		4	9.43	4		5		4		3		3	8.00	33.41	12
PLK-14	5		3	7.53	3		2		3	7.86	3		3		3	8.76	5		5		4		4		5	9.22	33.37	13
PLK-13	2		2	4.30	4		4		3	10.56	3		4		3	9.88	4		4		5		3		5	8.00	32.74	14
PLK-11	2		2	4.30	4		4		4	11.68	2		3		2	6.96	5		5		4		4		5	9.22	32.17	15
HRD-5	2		2	4.30	3		3		3	8.76	3		3		4	9.43	5		5		4		4		5	9.22	31.72	16
HRD-4	2		1	3.23	3		3		3	8.76	3		3		5	10.11	5		5		4		4		3	9.00	31.09	17
HRD-3	2		1	3.23	3		3		3	8.76	3		3		4	9.43	5		5		5		4		4	9.44	30.86	18
HRD-6	2		2	4.30	2		3		2	6.74	3		3		4	9.43	5		5		4		5		5	9.67	30.14	19
HRD-1	1		1	2.15	3		3		3	8.76	2		3		5	8.98	4		4		4		4		3	7.89	27.78	20.5
HRD-2	1		1	2.15	4		3		3	9.66	1		3		5	7.86	4		4		4		4		5	8.11	27.78	20.5

Source: ECT *et al.*, 1990.

factors on the overall rankings of the areas. The results of these analyses indicated that the discipline and internal criteria weighting factors did not have significant effects on the overall environmental rankings of the preliminary study areas.

8.1.4.2 Engineering/Economic Evaluations

In conjunction with the environmental evaluations of the preliminary study areas, an engineering/economic evaluation of each area was conducted. The engineering/economic evaluation focused on the relative present worth cost differentials in developing the areas for the planned power plant facilities. The major siting area requirements which affect the relative costs of developing the areas are:

- Site access (i.e., road and railroad),
- Electrical transmission system,
- Cooling water system, and
- Fuel delivery.

The present worth costs for developing each of the preliminary study areas were estimated relative to these potential major improvements. The costing information was considered rather conceptual at this stage, but was of sufficient detail to allow for relative cost comparisons among the areas. The preliminary study areas were then ranked based on these development cost estimates using the study area with the lowest cost as the base case for ranking purposes.

Table 8.1.4-3 shows the results of the engineering/economic evaluations of the preliminary study areas for the full development option. The initial estimated costs for all preliminary study areas for freshwater cooling towers using groundwater as the water source were less than cooling reservoirs; therefore, the costs for freshwater towers as the cooling system were used in developing the total cost estimates for the areas, except for HIL-7. As indicated in the tables for HIL-7, the total costs were calculated based on the use of either saltwater cooling towers or once through saltwater cooling since this study area was near enough to Tampa Bay to use saltwater versus freshwater from wells as a source of water for cooling purposes.

Table 8.1.4-3. Present Worth Cost Estimates for Preliminary Study Areas for the CC and Baseload Development Option (in millions of 1990 dollars)

Preliminary Study Area	Road Access	Rail Access	Transmission Lines/Substations	Cooling Towers	Natural Gas Pipeline	Fuel Oil Pipeline	Coal Handling Facilities	Coal Delivery*	Total
HIL-7 ¹	0.285	0.401	6.517	85.250	16.705	0.456	71.416	0.000	181.030
HIL-7 ²	0.285	0.401	6.517	125.929	16.705	0.456	71.416	0.000	221.709
PLK-11	0.285	0.401	4.139	65.258	8.270	4.708	108.616	44.500	236.177
PLK-13	0.570	2.003	11.226	67.045	0.662	1.975	108.616	44.500	236.597
PLK-8	0.285	0.401	0.690	66.366	9.923	6.227	108.616	44.500	237.008
PLK-9	0.285	0.401	0.690	67.697	9.262	5.620	108.616	44.500	237.071
PLK-14	1.142	0.801	11.092	65.660	2.812	4.101	108.616	44.500	238.724
PLK-7	0.285	0.401	2.760	65.923	11.743	7.139	108.616	44.500	241.367
PLK-2	0.285	0.401	1.380	68.584	13.231	6.987	108.616	44.500	243.984
PLK-3	1.993	1.202	2.760	65.923	14.389	10.328	108.616	44.500	249.711
PLK-10	0.854	7.362	9.659	65.479	8.766	5.164	108.616	44.500	250.400
PLK-1	0.285	0.801	9.315	66.366	13.231	8.354	108.616	44.500	251.468
PLK-4	0.854	0.401	8.969	66.810	13.066	9.113	108.616	44.500	252.329
PLK-5	0.570	0.401	13.798	66.810	11.743	7.898	108.616	44.500	254.336
HRD-7	1.424	2.003	9.030	66.366	15.878	11.695	108.616	44.500	259.512
HRD-5	0.285	0.401	3.953	69.206	18.524	14.125	108.616	44.500	259.610
HRD-6	2.563	0.801	3.953	69.471	17.531	13.214	108.616	44.500	260.649
HRD-4	0.854	1.202	5.185	66.366	19.516	15.037	108.616	44.500	261.276
HRD-3	0.570	0.801	5.493	69.206	20.178	15.644	108.616	44.500	265.008
PLK-6	0.285	8.313	18.628	65.923	12.570	8.658	108.616	44.500	267.493
HRD-1	0.854	0.801	9.190	66.810	22.163	17.467	108.616	44.500	270.401
HRD-2	0.854	0.801	8.573	69.915	22.163	17.467	108.616	44.500	272.889

Note: Assumes the use of freshwater cooling towers, except:

¹Saltwater cooling towers, and

²Once-through cooling.

*Represents differential cost for rail delivery of coal from a terminal on Tampa Bay relative to the HIL-7 study area.

Source: ECT, 1990.

Also, the total estimated costs include the costs for both the natural gas and fuel oil pipelines since both of these fuels are desired for a CC plant to maintain flexibility in fuels.

As shown in Table 8.1.4-3, the HIL-7 preliminary study area had the lowest estimated costs for the power plant development primarily due to the lower coal handling and delivery costs associated with this study area. The estimated costs for HIL-7 were approximately \$55.1 million to \$14.5 million less than the next most cost-effective study area depending on the cooling system used.

8.1.4.3 Composite Results of Intermediate Screening

In the final step of Phase II, the environmental and engineering/economic rankings of the preliminary study areas were combined to provide decision-making tools to identify the areas which were relatively the more suitable for power plant development. The rankings were combined and displayed using both numerical indexing and graphical, frontier mapping techniques. A final weighting factor was used in the Phase II evaluations in developing the composite environmental and engineering/economic indexed rankings.

The frontier mapping method involved plotting the environmental rating scores for the preliminary study areas versus the relative cost savings for each area. The relative cost savings were computed by subtracting the estimated present worth costs for areas from the present worth cost for the area with the highest costs. Thus, the figures plotted on the frontier map represent the estimated cost savings relative to the study area with the highest costs. Based on the frontier maps, the more suitable study areas with a combination of the highest environmental scores and greatest relative cost savings would be plotted in the upper-right portion of the map, while less suitable study areas would be plotted in the lower-left portion of the map.

For the indexing method, the environmental rating scores and estimated present worth costs for the preliminary study areas were converted to figures indexed on a

possible 0 to 100 scale and then added together to develop a composite environmental and economic score. The conversion of the environmental scores was accomplished by setting the highest environmental score for the study areas at 100 and then calculating the indexed scores for the remaining study areas using a technique which maintained the relative differences in the base scores to the highest score. To index the cost figures, the lowest cost was set at 100 and again the costs for the other study areas were converted to indexed costs which maintained the relative differences of the study area costs to the lowest cost.

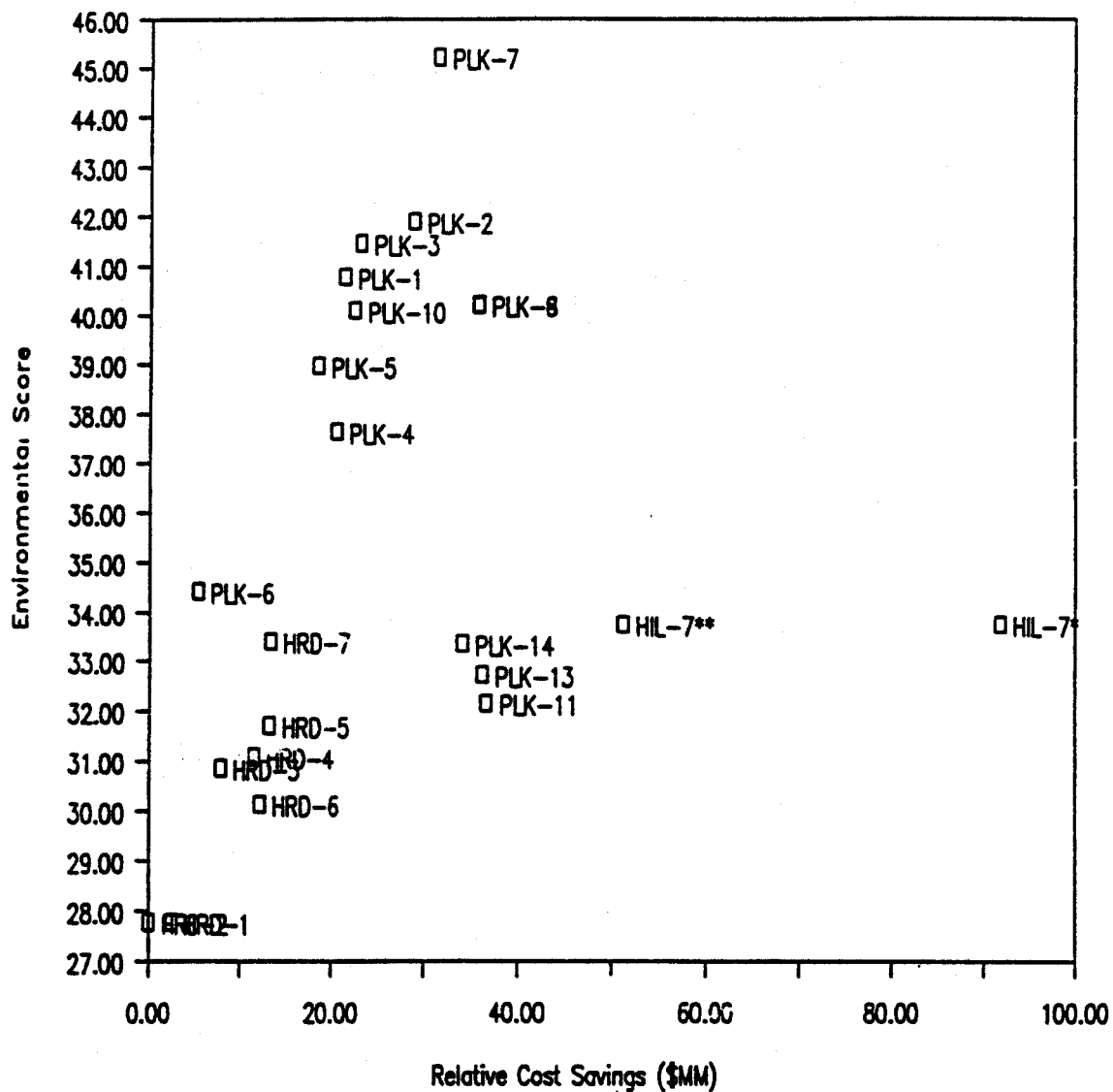
When combining the environmental and engineering/economic indexed rankings at this phase of a typical siting study, the relative importance of each type of ranking to the overall suitability of the area can vary from a weighting factor of 3 to 1 in favor of the environmental ranking to an equivalent weighting factor of 1 to 1 for the environmental and engineering/economic rankings. The Siting Task Force recommended the use of a mid-range 2 to 1 weighting in favor of the environmental rankings for the indexed composite rankings.

Figures 8.1.4-1 and 8.1.4-2 present the frontier maps for the CC and baseload development option, including and excluding the HIL-7 study area, respectively, and Table 8.1.4-4 presents the indexing method results.

8.1.4.4 Selection of Candidate Study Areas

As stated previously, the results of the frontier mapping and composite indexed scores served as tools for the Siting Task Force in selecting the candidate study areas for further evaluation. The Task Force members reviewed these results and considered several other factors in selecting the candidate study areas. These other factors included:

- Current information on the availability of land for Tampa Electric Company's use within the preliminary study areas,
- Desire to maintain some geographical diversity in the locations of the remaining study areas, and



Note: Assumes the use of freshwater cooling towers, except:
 HIL-7*--Saltwater Cooling Towers
 HIL-7**--Once Through Cooling

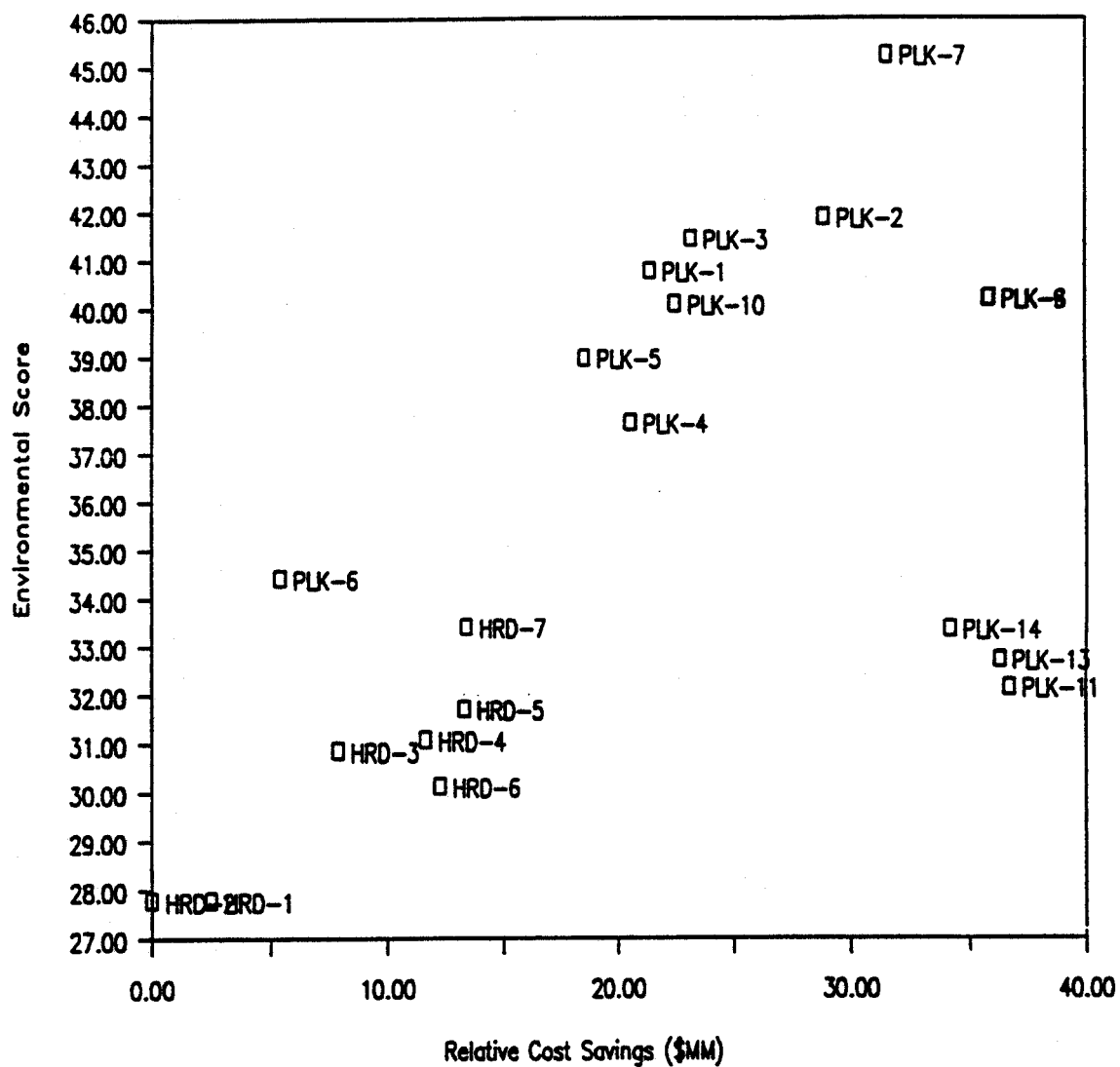
FIGURE 8.1.4-1.

PHASE II FRONTIER MAPPING RESULTS FOR THE
 CC AND BASELOAD DEVELOPMENT OPTION

Source: ECT, 1990.



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Note: Assumes the use of freshwater cooling towers.

FIGURE 8.1.4-2.

PHASE II FRONTIER MAPPING RESULTS FOR THE
CC AND BASELOAD DEVELOPMENT OPTION,
EXCLUDING HIL-7 STUDY AREA

Source: ECT, 1990.



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Table 8.1.4-4. Indexed Composite Rating Results for the CC and Baseload Development Option

Study Area	Environmental Base Score	Cost* CC Baseload FWT	Indexed Environmental Score	Indexed Cost	Comparison (1:1)	Comparison (2:1)	Rank (1:1)	Rank (2:1)
PLK-7	45.23	241.367	100.00	76.75	176.75	276.75	1	1
PLK-2	41.91	243.984	92.66	75.74	168.41	261.07	3	2
PLK-3	41.47	249.711	91.68	73.53	165.22	256.90	6	3
PLK-8	40.24	237.008	88.96	78.43	167.39	256.36	4	4
PLK-9	40.22	237.071	88.91	78.41	167.32	256.23	5	5
PLK-1	40.79	251.468	90.19	72.86	163.05	253.24	7	6
PLK-10	40.10	250.400	88.67	73.27	161.94	250.61	8	7
HIL-7 ¹	33.76	181.030	74.65	100.00	174.65	249.29	2	8
PLK-5	38.98	254.336	86.19	71.75	157.94	244.13	10	9
PLK-4	37.65	252.329	83.24	72.53	155.77	239.01	11	10
HIL-7 ²	33.76	221.709	74.65	84.32	158.97	233.62	9	11
PLK-14	33.37	238.724	73.78	77.77	151.54	225.32	12	12
PLK-13	32.74	236.597	72.39	78.59	150.97	223.36	13	13
PLK-11	32.17	236.177	71.11	78.75	149.86	220.98	14	14
PLK-6	34.43	267.493	76.11	66.68	142.80	218.91	16	15
HRD-7	33.41	259.512	73.88	69.76	143.63	217.51	15	16
HRD-5	31.72	259.610	70.12	69.72	139.84	209.96	17	17
HRD-4	31.09	261.276	68.74	69.08	137.82	206.57	18	18
HRD-3	30.86	265.008	68.24	67.64	135.88	204.11	20	19
HRD-6	30.14	260.649	66.63	69.32	135.95	202.59	19	20
HRD-1	27.78	270.401	61.43	65.56	126.99	188.42	21	21
HRD-2	27.78	272.889	61.42	64.60	126.03	187.45	22	22

Note: Assumes the use of freshwater cooling towers, except:

¹ Saltwater cooling towers, and

² Once-through cooling.

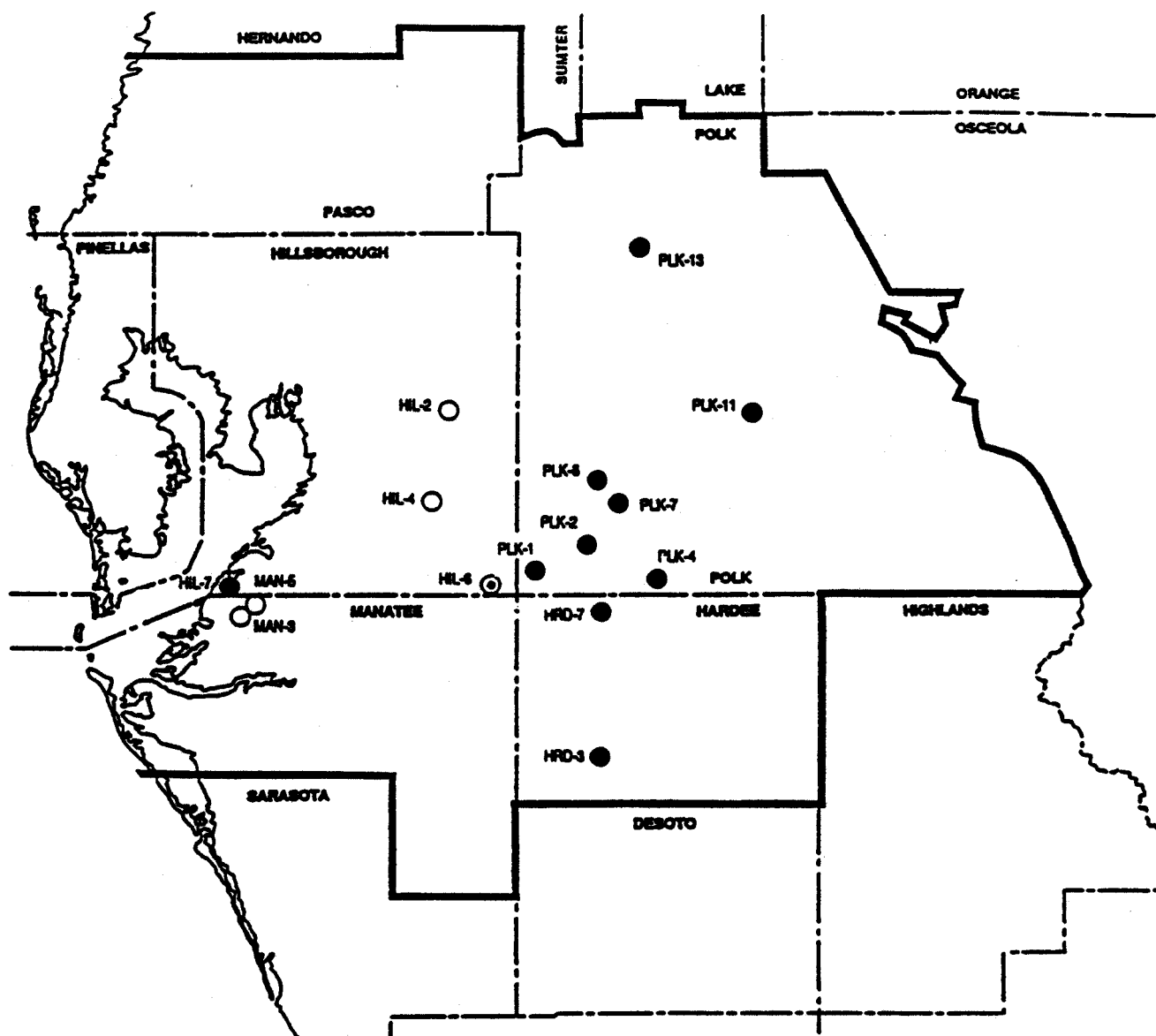
FWT = freshwater cooling tower.

* Shown in millions of 1990 dollars and assumes the use of freshwater cooling towers, except as noted.

Source: ECT, 1990.

- Desire to carry forward only one area where study areas were in close proximity and had similar environmental characteristics.

Therefore, based on the evaluation results and these other considerations, the Siting Task Force selected the candidate study areas shown in Figure 8.1.4-3 for more detailed analyses in Phase III of the siting program. Ten areas were selected for the CC and baseload development option, 11 areas for the baseload (or CC) option, and 15 areas for the CC only option. Also, as shown in the figure, ten of the areas were similar for the three development options.



KEY

- Combined Cycle Only
- ⊙ Combined Cycle or Baseload
- Combined Cycle and Baseload

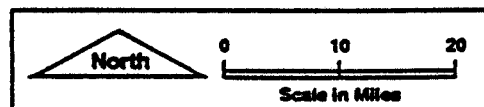


FIGURE 8.1.4-3.

GENERAL LOCATIONS OF CANDIDATE STUDY AREAS

Source: ECT, 1990.



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8.1.5 PHASE III--DETAILED ANALYSES

The overall objective of the detailed analyses was to select the preferred site(s) for Tampa Electric Company's future generation expansion from the areas remaining after the Phase II evaluations. The Phase III Detailed Analyses were performed in the following five steps:

1. Develop the environmental and engineering/economic criteria used to rate the suitability of the candidate study areas based on inputs from the Siting Task Force;
2. Evaluate, rate, and rank the candidate study areas based on the environmental and engineering/economic criteria and weighting factors to select the prime siting areas which were considered most suitable for power plant siting;
3. Perform detailed environmental and engineering/economic analyses of the advantages, disadvantages, and trade-offs associated with each prime siting area;
4. Conduct a future scenario evaluation of the prime siting areas; and
5. Recommend the overall preferred site(s) for Tampa Electric Company's future generation expansion needs based on guidance from the Siting Task Force.

8.1.5.1 Environmental Analyses of Candidate Study Areas

In the first step, a listing of concerns or issues associated with power plant development on the candidate study areas was developed. These concerns and issues were translated into environmental criteria which were used to evaluate the areas and discriminate among the study areas according to their advantages and disadvantages. The Siting Task Force reviewed and modified, as necessary, the environmental criteria to determine the final listing of criteria which best reflected their concerns and the issues associated with power plant development in the study region. Once the criteria were finalized, weighting factors which represented the relative importance of each criterion in power plant siting were developed and also approved by the Siting Task Force.

The environmental evaluation was performed using the pairwise comparison technique. The technique involves comparing the study areas, two at a time, with respect to each criterion. For each pair of study areas, judgements were made as to whether one area was clearly better than the other area or if the study areas were roughly equivalent with regard to each criterion. When one study area was clearly better or more suitable for the criterion, it was given a score of 1.0 and the other area was given a score of zero. Where the two study areas were judged equivalent for a specific criterion, both areas were given a score of 0.5. The study area scores from each major environmental discipline area were tabulated using the weighting factors and the weighted scores of all disciplines were combined to obtain an overall environmental score for each candidate study area.

The following subsections present the criteria definitions and results of the environmental analyses of the candidate study areas in the four major environmental discipline areas: air quality, ecological systems, water resources/area suitability, and land use/socioeconomics.

Air Quality Analyses

Air quality criteria were developed to allow a more detailed evaluation of the candidate study areas. These criteria were:

1. Maximum SO₂ impacts of existing sources,
2. Maximum total SO₂ impacts, and
3. PSD Class I impacts.

As in previous phases, SO₂ was considered to be the most limiting pollutant. Hence, SO₂ was the focus of the three criteria. For the first criterion listed previously, modeling studies were conducted to determine the highest SO₂ impacts to occur in the immediate vicinity of each area. Areas where these impacts were between 25 and 75 percent of standards were rated higher than areas with impacts either less than 25 percent or greater than 75 percent of the standards. Again, the intent was to rate lower areas either with high existing air quality impacts or with minimal

existing impacts, while areas with a middle range of air quality impacts were rated the most suitable for power plant development.

For the second criterion, modeling studies were completed to project the maximum total impacts of the proposed facilities plus the existing facilities. The modeling studies examined the immediate vicinity of the study area and in the vicinity of other nearby sources. Study areas where total impacts were less than 75 percent of the standards were rated higher than those that had at least some impacts greater than the standards. The latter were considered to have the potential to be constrained due to air quality impacts.

The final criterion considered potential impacts at the Chassahowitzka PSD Class I area. The proposed CC and baseload plants at each study area were modeled to determine the potential impacts. Those areas more than approximately 100 km away from the Class I area were rated highest, since review of Class I impacts would probably not be required at that distance. Rated next highest were areas where all maximum SO₂ impacts were less than 75 percent of the standards. Areas where some impacts were greater than 75 percent of the standards were rated the lowest.

Ecological Systems Analyses

Ecological evaluations were based on a comparative assessment of the ecological resources on and adjacent to each of the candidate study areas. Each of the siting areas was compared with regard to system diversity, habitat function, and rare, threatened and endangered species. Evaluations took into consideration the overall ecological value of a study area, and the potential impacts of a power plant on that value. Also considered were the relative positions of communities within site boundaries and the potential for mitigation by avoidance of communities of higher ecological value.

In the system diversity evaluation, each study area was compared for the quantity and quality of upland and wetland habitats onsite and adjacent to site boundaries. Areas

were compared with respect to row crops, pasture, old fields, citrus groves, sod farms, pine-palmetto flatwoods, palmetto range, scrubby flatwoods, hardwood hammocks, mined areas, herbaceous marsh, and forested wetlands. Wetlands were also evaluated as to whether they were isolated or connected with waters of the state.

The evaluation of habitat function of each study area compared the areas with respect to the value and importance of habitats and ecological systems. Considered in this evaluation was whether the study areas contained stream headwaters, discharged to Outstanding Florida Waters, contained critical habitat for rare, threatened, or endangered species, contained any unique systems, provided important fish nursery or spawning habitat, provided wildlife corridors, provided important wildlife feeding areas, or contained rookeries. Also evaluated were the regional and local significance of aquatic systems and whether the study area habitats were an integral part of a larger interconnected system of high value.

The candidate study areas were compared with each other for the potential impacts of development on rare, threatened, and endangered species. The known or potential occurrence of species of concern was evaluated for each area.

Evaluations of candidate study areas were primarily based on aerial surveys, site drive-bys, aerial photographs, and USGS quad maps. Information on species of concern was obtained from FNAI, FGFWFC, and various environmental impact statements for the phosphate industry.

Water Resources and Area Suitability Analyses

Phase III water resources (water makeup and discharge considerations) and area suitability criteria were similar to the Phase II criteria. Some of the evaluation questions, however, were modified slightly to reflect the changes in the configurations of the individual study areas, to incorporate more data as they became available, and to respond to specific requests of the Siting Task Force. These evaluation criteria are discussed in the following paragraphs.

The purpose of the Phase III analyses was to further differentiate the remaining study areas using additional information and more detailed evaluation techniques.

Water makeup and discharge considerations and area suitability were again evaluated for three different power plant development options since each option involves different makeup water and wastewater discharge volumes.

The water makeup, water discharge, and area suitability criteria once again consisted of identifiable advantages posed as a series of yes-or-no questions. Again, any positive answer resulted in a point being awarded to a candidate study area. The higher the score, the more advantages a particular site had over other sites. Unlike Phase II, however, the questions were not limited to five.

Cooling Water Makeup Advantages

The following questions, or advantages, comprised the Phase III water makeup criterion:

1. Is the 5-ft drawdown radius wholly within the delineated study area boundary?
2. If groundwater is the only viable source of water, is this area a non-Water Use Caution Area according to SWFWMD?
3. Is there an alternative surface water source of sufficient size available within 3 miles?
4. Is the proposed makeup water currently considered non-potable (i.e., average total dissolved solids concentration > 500 mg/L)?
5. Are major municipal wellfields located at least 5 miles from the geographic center of the site?
6. Based on the May 1987 and 1989 Florida aquifer potentiometric maps, is the site in a non-major stress area?

Cooling Water Discharge Advantages

The water discharge criterion consisted of five identifiable advantages. Again, the advantages were posed as yes-or-no questions, with any positive answer resulting in a point being awarded to a candidate study area. The following questions, or advantages, comprised the water discharge criterion:

1. According to FDER's Water Quality Index, are all potential receiving waters within 3 miles of the study area considered good or fair?
2. Is the potential surface receiving water designated as Class III, IV, or V?
3. Does current or past phosphate activity provide a receptor for discharge either as phosphate plant process water or ponds?
4. Is the study area located in a drainage basin that is isolated from Outstanding Florida Waters and aquatic preserves?
5. Is the potential receiving water considered nonpotable?

Area Suitability Advantages

Finally, each study area was evaluated with respect to area suitability. The purpose of this evaluation was to determine if any study area had distinct advantages over other areas because the area was less subject to flooding or sinkhole formation, or the potential for contaminating the Floridan aquifer was less.

The area suitability criterion actually consisted of four identifiable advantages. The advantages were posed as yes-or-no questions, with any positive answer resulting in a point being awarded to a candidate study area. The higher the score, the more advantages a particular study area had over other areas. The following questions, or advantages, comprised the area suitability criterion:

1. Are there sufficient contiguous acres located above the 100-year flood zone (acreage including cooling reservoir)?
2. According to SWFWMD, is the DRASTIC pollution potential less than 100 for the Floridan aquifer?
3. Is this area designated A or B with respect to sinkhole formation?

4. Is this an area of either very low recharge or discharge with respect to the Floridan aquifer?

Land Use/Socioeconomic Analyses

The land use/socioeconomic analyses consisted of rating the candidate study areas against three criteria. These criteria included existing land use compatibility, consistency with land use plans and zoning ordinances, and presence of landmarks/designated areas. These areas serve as the primary focus for land use/socioeconomic issues related to power plant licensing in the state of Florida.

Existing Land Use Compatibility

Under the existing land use compatibility criteria, each candidate study area was examined in relationship to existing land use patterns. Compatibility was assessed based upon the type of land use within and adjacent to a candidate study area, the quality/character of the land use, and its location relative to the candidate study area boundary. The presence of infrastructure in proximity to the candidate study area and recent/projected land use trends were also evaluated.

Consistency with Land Use Plans and Zoning Ordinances

Consistency evaluations were performed by identifying the future land use category/categories and zoning for each candidate study area. A review of the appropriate comprehensive plan land use element and zoning ordinance was conducted to determine whether the candidate study area was consistent with land use plans and zoning ordinances (i.e., does the area have appropriate land use and zoning designations or would a land use plan amendment or rezoning be required).

Landmarks/Designated Areas

Each candidate study area was also reviewed for their location with respect to landmarks and designated areas as defined in FEPPSA guidelines. Each candidate study area was evaluated against the number, location, and type of landmarks/designated areas within one mile of the candidate study area boundary. The type of land-

mark/designated area was an important consideration since many landmarks/designated areas were established to protect natural and/or cultural resources.

Results of Phase III Environmental Ratings

Table 8.1.5-1 presents the overall results of the environmental ratings of the candidate study areas for the CC and baseload power plant development options. The total environmental scores for the areas were calculated based on the results of the pairwise comparisons for the areas and using the internal criteria and discipline weighting factors. As shown in these tables, the PLK-1, PLK-2, PLK-4, and PLK-7 study areas rated as the most suitable areas for the proposed power plants. Also, the HIL-7 study area had the fifth highest environmental score for the full development options.

Similar to the Phase II evaluations, several sensitivity analyses were conducted for the environmental ratings of the candidate study areas to determine the effect of the internal criteria and discipline weighting factors on the overall environmental scores. This analysis showed that the four Polk County study areas, which rated the highest according to the weighted scores, remained as the highest rated four areas after eliminating the effects of the weighting factors although the order of the areas changed. Also, based on the results of eliminating the effects of the weighting factors, the HIL-7 study area had the fifth highest environmental rating score for all three of the development options.

8.1.5.2 Engineering/Economic Evaluation of Candidate Study Areas

Concurrent with the environmental evaluation, an engineering/economic evaluation of the candidate study areas was conducted. This evaluation used the same present worth costing factors as were used in Phase II. The estimated present worth costs were refined compared to the Phase II figures to reflect more site-specific information regarding the power plant location within the study area. Again, these estimated costs involved those components of a power plant for which costs vary primarily based on the geographic location of the facilities, including road and rail access,

Table 8.1.5-1. Phase III Environmental Ratings Results for the Candidate Study Areas for the CC and Baseload Development Option

Study Area	Air (2.15)					Ecology (2.92)					Water Resources (2.92)					Land Use/Socioeconomics (2.00)					Total Weight Score	
	Existing SO ₂ Impacts	Total SO ₂ Impacts	PSD Class I Impacts	Wght Avg.	System Diversity	Habitat Functn	Protctd Species	Wght Avg.	Water Makeup Consid.	Dis-charge Consid.	Area Suita-bility	Wght Avg.	Exist. Land Use	Land Use Plan/ Zoning	Landmrk Designed Areas	Wght Avg.						
	(4)	+	(5)	+	(4)	=	(13)	(4)	+	(4)	+	(5)	=	(13)	(5)	+	(4)	+	(3)	=		(12)
PLK-1	8.0		7.5		6.0		15.46	6.0		6.5		7.0		19.09	6.5		8.5		3.0		19.79	69.35
PLK-7	8.0		2.0		6.0		10.92	6.0		10.0		10.0		25.61	6.5		8.5		3.0		19.79	69.31
PLK-2	8.0		3.0		6.0		11.74	6.0		7.0		6.5		18.98	6.5		8.5		7.5		21.25	66.97
PLK-4	3.0		7.5		6.0		12.16	6.0		6.5		7.0		19.09	6.5		8.5		7.5		21.25	66.67
HIL-7	8.0		9.0		6.0		16.70	6.0		2.0		2.0		9.43	10.0		4.0		7.5		22.55	62.19
HRD-7	3.0		4.0		6.0		9.26	6.0		6.5		6.5		18.53	6.5		4.0		7.5		16.87	54.75
PLK-8	8.0		1.0		6.0		10.09	6.0		6.5		7.0		19.09	6.5		4.0		3.0		15.41	54.26
HRD-3	3.0		10.0		6.0		14.22	1.0		2.0		2.0		4.94	2.0		4.0		7.5		9.57	38.82
PLK-11	3.0		6.0		6.0		10.92	6.0		6.0		5.0		16.40	2.0		1.0		1.0		4.54	37.44
PLK-13	3.0		5.0		1.0		6.78	6.0		2.0		2.0		9.43	2.0		4.0		7.5		9.57	29.70

Source: ECT *et al.*, 1990.

transmission line and substation requirements, cooling system needs, and fuel delivery facilities. The estimated present worth costs for these components were summed to obtain a total cost for each candidate study area for each development option. Table 8.1.5-2 shows the estimates for the candidate study areas for the full development option. Based on these evaluations, HIL-7 was the most cost-effective study area for the CC and baseload power plants.

8.1.5.3 Composite Environmental and Economic Ratings

Similar to the Phase II evaluations, the environmental ratings of the candidate study areas and the engineering/economic evaluations were combined using two methods, frontier mapping and indexed scores and costs. The indexed environmental scores and costs were again composited on both a 2:1 ratio of the environmental versus cost figures and a 1:1 ratio. The results of these compositing methods provided evaluation tools for the Siting Task Force in determining the prime siting areas for further analysis in Phase III.

Figures 8.1.5-1 and 8.1.5-2 present the results of the frontier mapping for the CC and baseload development option, including and excluding the HIL-7 study area, respectively. As in the baseload option, HIL-7 was the most cost-effective study area, while the PLK-1, PLK-2, PLK-4, and PLK-7 study areas were the more environmentally suitable areas. These five study areas also were rated the highest based on the indexed evaluation results shown in Table 8.1.5-3 for the CC and baseload development option.

8.1.5.4 Prime Siting Area Selection

Based on the results of the composite environmental and economic evaluations, the Siting Task Force selected five of the study areas as prime siting areas for further evaluation in the next step of Phase III. Four of these areas were located in southwestern Polk County, PLK-1, PLK-2, PLK-4, and PLK-7, and one area was located in the extreme southwestern corner of Hillsborough County and the northwestern

Table 8.1.5-2. Present Worth Cost Estimates for the Candidate Study Areas for the CC and Baseload Development Option (in millions of 1990 dollars)

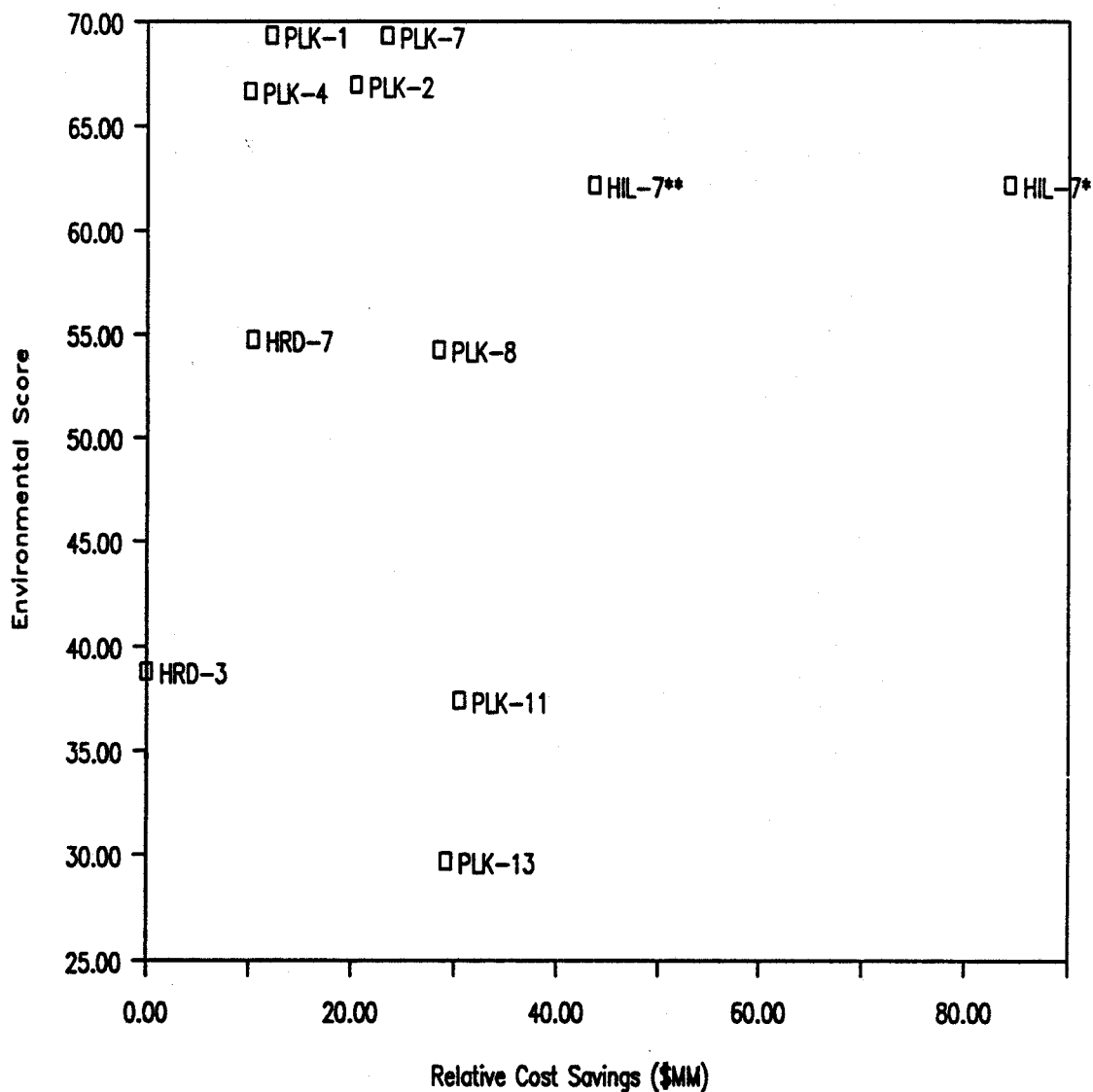
Preliminary Study Area	Road Access	Rail Access	Transmission Lines/ Substations	Cooling Towers	Natural Gas Pipeline	Fuel Oil Pipeline	Coal Handling Facilities	Coal Delivery	Total
HIL-7 ¹	0.285	0.355	6.311	85.250	16.705	0.456	71.416	0.000	180.778
HIL-7 ²	0.285	0.355	6.311	125.929	16.705	0.456	71.416	0.000	221.457
PLK-11	0.285	0.801	2.334	65.120	8.270	4.708	108.616	44.500	234.634
PLK-13	0.285	1.603	11.248	67.045	0.662	1.975	108.616	44.500	235.934
PLK-8	0.285	0.401	0.345	66.366	9.923	6.227	108.616	44.500	236.663
PLK-7	0.142	0.200	3.450	65.923	11.743	7.139	108.616	44.500	241.713
PLK-2	0.57	0.200	2.070	68.584	13.231	6.987	108.616	44.500	244.758
PLK-1	0.285	0.801	10.842	66.366	13.231	8.354	108.616	44.500	252.995
HRD-1	0.57	2.003	4.249	67.253	15.878	11.695	108.616	44.500	254.764
PLK-4	0.854	0.401	11.729	66.810	13.066	9.113	108.616	44.500	255.089
HRD-3	0.285	0.819	7.342	67.697	20.178	15.644	108.616	44.500	265.081

Note: Assumes the use of freshwater cooling towers, except:

¹ Saltwater cooling towers, and

² Once-through cooling.

Source: ECT, 1990.



Note: Assumes the use of freshwater cooling towers, except:
 HIL-7*—Saltwater Cooling Towers
 HIL-7**—Once Through Cooling

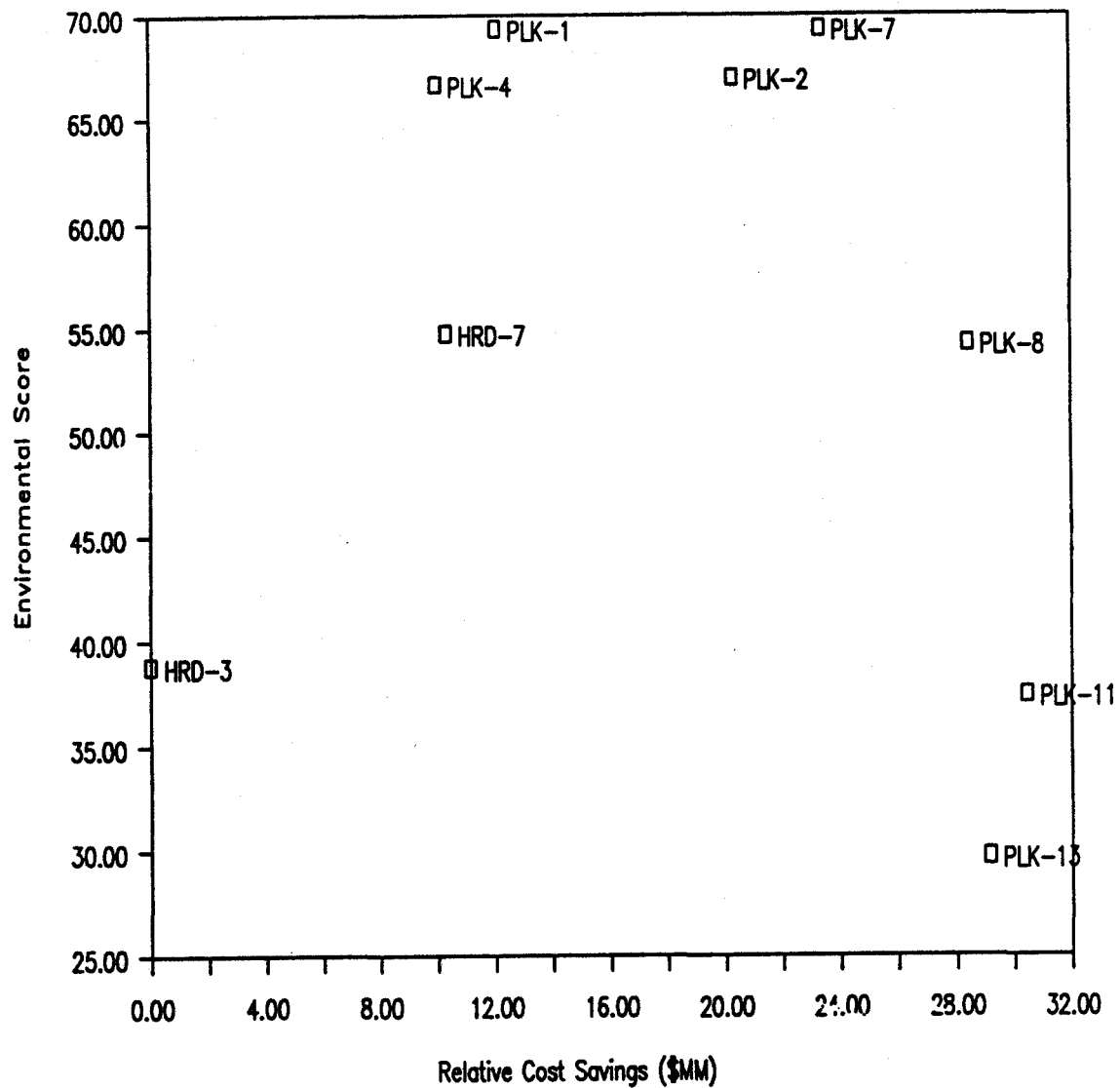
FIGURE 8.1.5-1.

PHASE III FRONTIER MAPPING RESULTS FOR THE
 CC AND BASELOAD DEVELOPMENT OPTION

Source: ECT, 1990.



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Note: Assumes the use of freshwater cooling towers.

FIGURE 8.1.5-2.

PHASE III FRONTIER MAPPING RESULTS FOR THE
CC AND BASELOAD DEVELOPMENT OPTIONS,
EXCLUDING HIL-7 STUDY AREA

Source: ECT, 1990.



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Table 8.1.5-3. Phase III Indexed Composite Evaluation Results for the CC and Baseload Development Option

Study Area	Environ- mental Base Score	Cost* CC Baseload FWT	Indexed Environ- mental Score	Indexed Cost	Compar- ison (1:1)	Compar- ison (2:1)	Rank (1:1)	Rank (2:1)
HIL-7 ¹	62.19	108.778	89.68	100.00	279.35	189.68	1	1
PLK-7	69.31	241.713	99.94	77.01	276.90	176.96	2	2
HIL-7 ²	62.19	221.457	89.68	84.65	264.01	174.33	6	3
PLK-1	69.35	252.995	100.00	72.76	272.76	172.76	3	4
PLK-2	66.97	244.758	96.57	75.86	269.00	172.43	4	5
PLK-4	66.67	255.089	96.14	71.97	264.24	168.10	5	6
PLK-8	54.26	236.663	78.24	78.92	235.40	157.16	7	7
HRD-7	54.75	254.764	78.95	72.09	229.98	151.04	8	8
PLK-11	37.44	234.634	53.99	79.68	187.66	133.67	9	9
HRD-3	38.82	265.081	55.98	68.20	180.15	124.17	10	10
PLK-13	29.70	235.934	42.83	79.19	164.85	122.02	11	11

Note: Assumes the use of freshwater cooling towers, except:

¹ Saltwater cooling towers, and

² Once-through cooling.

FWT = freshwater cooling tower.

* Shown in millions of 1990 dollars and assumes use of freshwater cooling towers, except as noted.

Source: ECT, 1990.

corner of Manatee County, HIL-7. Figure 8.1.5-3 shows the general location of the five prime siting areas.

At this time in the siting process, another area in southwestern Polk County was brought to the attention of the Siting Task Force as a potential power plant site by the phosphate mining company that owned the site. This area had just recently been considered available for power plant use due to changes in the company's mining plans. The area was designated as PLK-A and its general location is shown on Figure 8.1.5-3. After review by the technical siting consultants and the Siting Task Force, the environmental characteristics of PLK-A were considered to be similar to the previously selected prime siting areas in southwestern Polk County. Also, the engineering/economic features of PLK-A were similar to the PLK-1 and PLK-2 siting areas due to its proximity to these areas. Based on these reviews and findings, the Siting Task Force recommended the inclusion of the PLK-A area as a prime siting area for further evaluation. All of the six prime siting areas appeared to be capable of supporting the full CC and baseload power plant development option. Therefore, the Siting Task Force recommended that the further evaluations of these areas be based on locating both the CC and baseload plants at one site.

8.1.5.5 Site-Specific Environmental Evaluations of Prime Siting Areas

In the next step of Phase III, the prime siting areas were subjected to detailed, site-specific environmental evaluations. The environmental evaluations highlighted the advantages, disadvantages, and trade-offs associated with power plant development on each prime siting area. The analyses clearly identified the potential impacts, positive and adverse, which were expected from the development as well as potential measures to mitigate adverse impacts.

Tables 8.1.5-4 through 8.1.5-9 provide summaries of the environmental advantages and disadvantages associated with power plant development on the six prime siting areas. The detailed analyses of the issues and these summaries provided the key

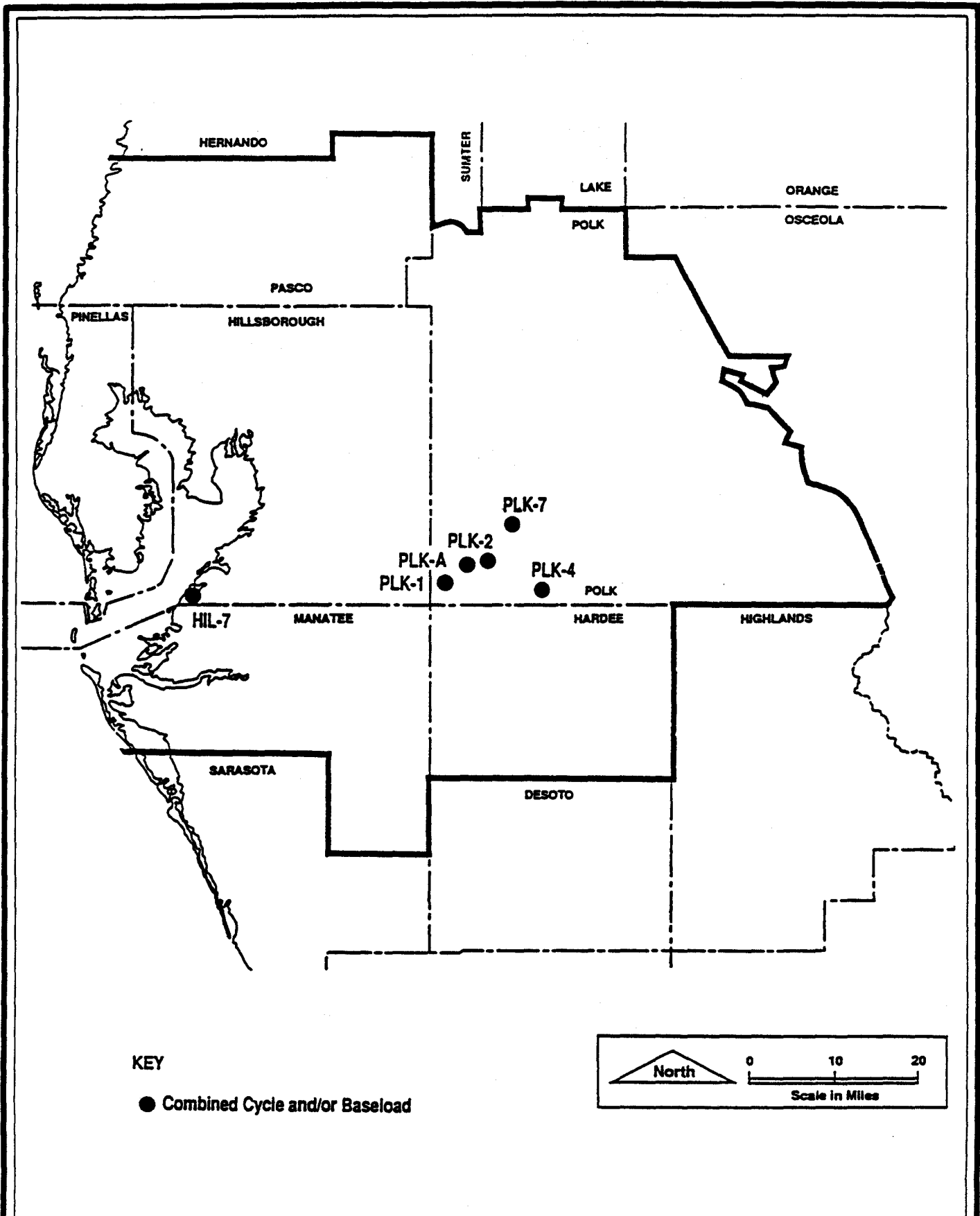


FIGURE 8.1.5-3.

GENERAL LOCATION OF PRIME SITING AREAS

Source: ECT, 1990.



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Table 8.1.5-4. Summary of Air Issues

Advantages	Disadvantages
<u>AAQS</u> ● All six appear to be permittable ● PLK-1 has most available AAQS margins ● AAQS margins are very slim for PLK-2, PLK-7, and HIL-7 due to existing sources ● PLK-4 and PLK-7 have the most restrictive AAQS margins in the site vicinity with mitigative action by an existing source required for PLK-4	
<u>PSD Increments</u> ● All six sites appear to be permittable ● HIL-7 has least restrictive PSD increment constraints due to greater distances to other PSD sources than PLK sites ● PSD margins are slim, but adequate for PLK-1 and PLK-4 ● PLK sites have higher potential to interact with other PSD sources	
<u>O₃ Nonattainment</u> ● PLK-2, PLK-A, PLK-4, and PLK-7 farthest from Hillsborough County O₃ nonattainment area ● A portion of HIL-7 is within O₃ nonattainment area ● PLK-1 is adjacent to nonattainment area	

Source: ECT, 1990.

Table 8.1.5-5. Summary of Ecological Issues: PLK Sites

Advantages	Disadvantages
<u>Habitat Systems</u> • Areas have been previously impacted by phosphate operations • Clay settling ponds provide aquatic habitats which would be lost by reclamation if not used for cooling reservoirs • In-ground pond at PLK-A would provide most conducive edge characteristic • Minimal wetlands in areas to be impacted • Use of remaining unmined uplands which may be refuges for animals to escape mining • Use would require modification of FDNR reclamation plans, including possible offsite mitigation • Re-disturbance of areas already reclaimed as uplands or wetlands	
<u>Threatened/Endangered Species</u> • Most suitable habitats previously disturbed • Presence of eagle's nest near PLK-2 and PLK-A	
<u>Aquatic Systems</u> • Cooling reservoirs provide suitable habitat for fish and bird feeding • Offsite discharges to small creeks may cause water quality and hydro-period concerns	

Source: ECT, 1990.

Table 8.1.5-6. Summary of Ecological Issues: HIL-7 Site

Advantages	Disadvantages
<u>Habitat Systems</u> ● Plant site on agricultural areas and previously disturbed areas ● Proximity to sensitive wetland, mangrove areas ● Need upland buffer and positive controls to avoid potential water quality impacts on adjacent areas	
<u>Threatened/Endangered Species</u> ● Immediate plant site area does not contain suitable habitat ● Several species potentially present in surrounding area ● Potential for eagle to rebuild nest east of plant site	
<u>Aquatic Systems</u> ● Velocity of 0.5 ft per second or less recommended by EPA to minimize impingement of fishes ● Proximity to aquatic preserves and Piney Point Creek ● Locations of intake/discharge to minimize aquatic impacts ● Potential impacts from entrainment/impingement and discharge may be a concern ● National Estuary Program may impose additional development constraints	

Source: ECT, 1990.

Table 8.1.5-7. Summary of Water Issues: PLK Sites

Advantages	Disadvantages
<u>Water Use</u> • All sites have sufficient groundwater for makeup/process-SWFWMD • Opportunity to replace existing water use rather than new use as phosphate moves out of area • PLK-1 has least drawdown impact • PLK sites not located in water use caution area • Involves use of potable quality groundwater • PLK-1 is adjacent to water use caution area--SWFWMD • PLK-4 and PLK-7 have largest off-site water use competition • PLK-7 has greatest drawdown impact • Cooling reservoirs cannot be used at PLK-4	
<u>Cooling/Water Discharge</u> • Potential to use clay settling areas or mine cuts for cooling reservoirs • Cooling reservoirs probably have lower discharges than towers • In-ground, mine cut ponds (PLK-A and part PLK-7) have less discharges than clay settling ponds (PLK-1 and PLK-2) • Discharges to small creeks will require variances to meet state water quality standards • Berms for clay settling ponds may require rebuilding and heightening in accordance with Chapter 17-9 to minimize safety concerns (PLK-1 involves most reconstruction) • Use of clay settling areas may involve clay re-suspension questions • PLK-4 may have largest discharge volume since cooling towers must be used	
<u>Groundwater Quality</u> • No existing groundwater quality problems evident at PLK-1, PLK-2, PLK-A, and PLK-4 • Potential for existing groundwater quality problems at PLK-7 due to presence of industrial operations and gypsum stack	

Source: ECT, 1990.

Table 8.1.5-8. Summary of Water Issues: HIL-7 Site

Advantages	Disadvantages
<u>Water Use</u> ● Use of non-potable, saltwater for cooling ● Existing, permitted groundwater uses sufficient for process water needs ● Intake located in disturbed Port Manatee area ● Potential impingement/entrainment concerns ● Located within Water Use Caution Area--SWFWMD ● Potential saltwater intrusion concerns	
<u>Cooling/Water Discharge</u> ● Use of cooling towers reduces make-up water needs to 4 percent of once-through needs and for discharge to 2 percent of once-through needs which significantly lessen impingement/entrainment and discharge concerns ● Thermal plume and water quality of discharge will require less than 5-acre mixing zone ● Design of intake velocity at 0.5-ft per second should minimize impacts on juvenile fishes ● Discharge point in proximity of dredge disposal area should minimize impacts to seagrasses and benthic communities ● Proximity to aquatic preserves, Outstanding Florida Waters, and Class II waters represents potential concerns ● Designation of Tampa Bay in National Estuary Program may create additional concerns ● Potential plume impacts need to be addressed	
<u>Water Quality</u> ● Not in area of recharge to Floridan aquifer ● Need to design controls to avoid potential leachate impacts to sensitive wetland areas	

Source: ECT, 1990.

Table 8.1.5-9. Summary of Land Use/Socioeconomic Issues

Advantages	Disadvantages
<u>Land Use</u> ● Existing onsite land use relatively compatible on all sites--mining, industrial, agricultural, vacant ● Future land use designation on all PLK sites is mining ● Future land use designation on HIL-7 is EPGF and industrial-heavy ● Tampa Bay Regional Planning Council does not support EPGF designation for HIL-7 site	
<u>Proximity to Communities</u> ● All sites relatively remote in relation to communities and residential uses ● Trailer park located to the east of HIL-7 site	
<u>Nearby Designated Areas</u> ● No designated areas in vicinity of PLK-1, PLK-2, PLK-A, and PLK-4 sites ● PLK-7 adjacent to IMC Wildlife Management Area ● HIL-7 has several nearby areas--ELAPP/CARL lands and aquatic preserves	

Note: EPGF = Electrical Power Generating Facility.
 ELAPP/CARL = Environmental Land Acquisition and Protection Program/Conservation and Recreation Lands.

Source: ECT, 1990.

information used by the Siting Task Force to determine the preferred sites for further evaluation.

The results of these detailed environmental evaluations were reviewed and discussed with the Siting Task Force. The Task Force provided additional inputs regarding the concerns and the issues associated with power plant development on each of the prime siting areas. Also, the Task Force members conducted flyovers and ground reconnaissance surveys of the siting areas to ensure the evaluations accurately reflected the environmental advantages and disadvantages and potential impacts for each siting area.

8.1.5.6 Engineering/Economic Evaluation of Prime Siting Areas

Engineering/economic evaluations were conducted for the six prime siting areas. These evaluations used the present worth costing factors similar to those used for the evaluations in Phase II and earlier in Phase III. However, several of the resulting cost estimates were revised based on the conceptual facility layouts for the siting areas. With these layouts, more detailed estimates were developed particularly regarding the piping distances for recirculating, makeup, and discharge waters for the cooling systems. Also, based on the facility layout, additional present worth costs were developed for site preparation activities such as the construction of cooling reservoir berms and filling and piling for foundations. For the HIL-7 siting area, the coal delivery cost estimates were revised to reflect the specific length of conveyors needed to transport coal from the port to the baseload plant site.

Table 8.1.5-10 presents the results of the present worth cost evaluations for developing the CC and baseload plants at the prime siting areas under the assumption that cooling towers would be used at all the sites. Table 8.1.5-11 presents the present worth cost estimates for the siting areas under the assumption that cooling reservoirs would be used, to the extent possible, at the siting area. As shown in these tables, the HIL-7 siting area was estimated to be the most cost effective area, followed by the PLK-2 and PLK-A areas depending on the cooling system assumptions.

Table 8.1.5-10. Present Worth Estimates for Prime Siting Areas Using Cooling Towers (in millions of 1990 dollars)

Prime Siting Area	Road Access	Rail Access	Transmission Lines/ Substations	Cooling System*	Natural Gas Pipeline	Fuel Oil Pipeline	Coal Handling Facilities	Coal Delivery	Additional Foundation Costs	Total
HIL-7	0.853	0.932	6.246	85.594	16.705	0.161	71.416	12.569	4.715	199.191
PLK-2	0.683	0.861	3.004	69.152	13.231	6.987	108.616	44.500	2.860	249.894
PLK-A	0.587	1.114	1.485	71.744	12.579	6.379	108.616	44.500	3.897	250.901
PLK-7	0.766	1.363	5.882	72.038	11.743	7.138	108.616	44.500	2.860	254.906
PLK-1	0.107	0.943	8.279	71.870	13.231	8.354	108.616	44.500	4.164	260.064
PLK-4	0.107	0.331	9.801	70.366	13.066	9.113	108.616	44.500	9.937	265.837

*Cooling system assumptions: PLK-1, PLK-2, PLK-A, PLK-4, and PLK-7 = freshwater towers; HIL-7 = saltwater towers.

Source: ECT, 1990.

Table 8.1.5-11. Present Worth Cost Estimates for Prime Siting Areas Using Cooling Reservoirs Where Possible (in millions of 1990 dollars)

Prime Siting Area	Road Access	Rail Access	Transmission Lines/ Substations	Cooling System*	Natural Gas Pipeline	Fuel Oil Pipeline	Coal Handling Facilities	Coal Delivery	Additional Foundation Costs	Total
HIL-7	0.853	0.932	6.246	85.594	16.705	0.161	71.416	12.569	4.715	199.191
PLK-A	0.587	1.114	1.485	60.978	12.579	6.379	108.616	44.500	3.897	240.135
PLK-2	0.683	0.861	3.004	80.042	13.231	6.987	108.616	44.500	2.860	260.784
PLK-4	0.107	0.331	9.801	70.366	13.066	9.113	108.616	44.500	9.937	265.837
PLK-7	0.766	1.363	5.882	84.160	11.743	7.138	108.616	44.500	2.860	267.028
PLK-1	0.107	0.943	8.279	115.503	13.231	8.354	108.616	44.500	4.164	303.697

* Cooling system assumptions: All sites cooling reservoirs, except PLK A = ponds and 220-MW CC freshwater towers; PLK-4 = freshwater towers; and HIL-7 = saltwater towers.

Source: ECT, 1990.

8.1.5.7 Future Scenario Analyses

A power plant site selection study is based on available physical, ecological, sociological, and economic information; is reviewed within the context of the existing regulatory framework; and is conducted within a specific timeframe. Based on these qualifications and limitations, the overall environmental and engineering/economic suitability of alternative sites for power plant development was evaluated and recommendations were developed as to the more suitable or preferred sites. However, future events may affect the overall suitability of certain siting areas. Such future events could include such factors as:

1. Changes in the existing applicable regulatory requirements;
2. Changes in the environmental characteristics and sensitive resources of potential siting areas over time or discovered through more site-specific data collections;
3. Changes in the technologies or engineering design of power plants which change the expected environmental impacts or economics of the facilities; and
4. Changes in the interests or attitudes of regulatory agencies, environmental groups, business community, or the general public relative to the important criteria affecting siting area suitability.

Any of these future events could affect the relative suitability of the siting areas evaluated in the site selection process. Also, and perhaps more importantly, such events could cause long delays in the environmental permitting of the recommended siting area or even result in the denial of the required permits and licenses for a particular siting area. Therefore, as part of the Tampa Electric Company site selection study, a future scenario analysis was conducted to evaluate the potential effect of possible future events or changes on the overall suitability of the six prime siting areas for the planned power plant development.

Table 8.1.5-12 provides a summary of the results of the future scenario analyses. These results were reviewed and considered by the Siting Task Force as part of their

Table 8.1.5-12. Summary of the Future Scenario Analyses

Event	Potential Effect on Site Suitability
• High population growth and/or continuing drought conditions cause SWFWMD to expand Water Use Caution Areas or implement other restrictions on potable, groundwater uses in the future	• If one or both plants have not been licensed, it may be extremely difficult to obtain permit for new water use, especially at any of the PLK sites because of freshwater cooling needs at these sites
• Expansion of aquatic preserve areas or Class II waters in the vicinity of Port Manatee	• Licensing of HIL-7 may be more difficult
• More restrictive requirements in using Tampa Bay waters due to Federal (NEP) or state (SWIM) programs	• Uncertain, but licensing of HIL-7 probably more difficult
• Peace River or certain tributaries designated as Outstanding Florida Waters	• Permitting of water discharges to an Outstanding Florida Water would be extremely difficult
• Another large power plant or SO₂ source located in the southwest Polk County area	• It may be difficult or impossible to license one or both of the proposed Tampa Electric Company power plants due to the existing marginal PSD increments available in the area
• Passage of the Clean Air Act with SO₂ reduction and O₃ nonattainment area buffer requirements	• Proposed SO₂ reductions could expand the slim AAQS margins at HIL-7 and thus, lessen potential permitting concerns at HIL-7; however, proposed 25-mile buffers for O₃ nonattainment area may require offsets at HIL-7 and the PLK sites which may be difficult to obtain

Source: ECT, 1990.

decision-making process in determining the preferred siting areas for Tampa Electric Company's future power plant development plans.

8.1.5.8 Selection of Preferred Site and Alternative Sites

The Siting Task Force reviewed the results of the detailed analysis of environmental advantages and disadvantages of the six prime siting areas, the engineering/economic evaluations, and the future scenario analyses in developing their recommendations to Tampa Electric Company regarding the preferred sites for construction and operation of the power plant facilities. Based on these reviews, the Siting Task Force determined that the PLK-4, PLK-7, and HIL-7 areas, while highly suitable for power plant development, were relatively not as suitable as the PLK-1, PLK-2, and PLK-A prime siting areas. During the evaluation process, the task force did not identify any factors or *fatal flaws* which would preclude power plant development on the three prime siting areas determined to be less suitable for power plant development.

The primary concerns associated with the PLK-4 siting area involved potential air quality and groundwater impacts and limitations on the cooling water system alternatives. Also, the use of the PLK-4 area would involve collocating the power plants with ongoing phosphate processing operations. Although the siting area contains several large clay settling areas, these areas could not be used for power plant cooling reservoir purposes. Thus, relative to the other Polk County siting areas, the use of cooling towers was considered to be the only cooling system alternative for the PLK-4 area. For the PLK-7 siting area, the primary concerns relative to the other areas were associated with the potential for existing groundwater quality problems at the site since the proposed location of the planned power plant facilities would be at the same location as the existing phosphate processing and shipping facilities on the siting area.

The primary concerns of the Siting Task Force associated with the HIL-7 siting area involved the potential impacts of the power plants on the fishery resources and other ecological systems of Tampa Bay and the Cockroach Bay area, and on the natural

resource, aesthetic qualities of the area due to changes in land uses in the area. The planned power plant facilities could be designed to avoid or minimize potential impacts to the sensitive resources of Tampa Bay and Cockroach Bay areas; however, some level of impact may occur. The Siting Task Force determined that the potential for impacts to the sensitive ecological systems of Tampa Bay and nearby estuarine systems made the HIL-7 siting area relatively less suitable than certain other prime siting areas.

Based on these considerations, the Siting Task Force recommended the PLK-1, PLK-2, and PLK-A siting areas in southwestern Polk County as the preferred sites for locating the planned power plant facilities (see Figure 8.1.5-4). Each of these sites had certain environmental and engineering/economic advantages and disadvantages; however, the overall suitability of the sites for power plant development was considered to be relatively equivalent. Thus, the Siting Task Force recommended that Tampa Electric Company pursue site acquisition and environmental licensing efforts for any of the preferred sites, PLK-1, PLK-2, and PLK-A, in order to meet its future generating capacity expansion needs. Tampa Electric Company concurred with the resulting recommendations and guidance from the Siting Task Force and selected PLK-A as the proposed site for the power plant facilities. The PLK-1 and PLK-2 sites were designated as alternative sites.

8.1.5-30

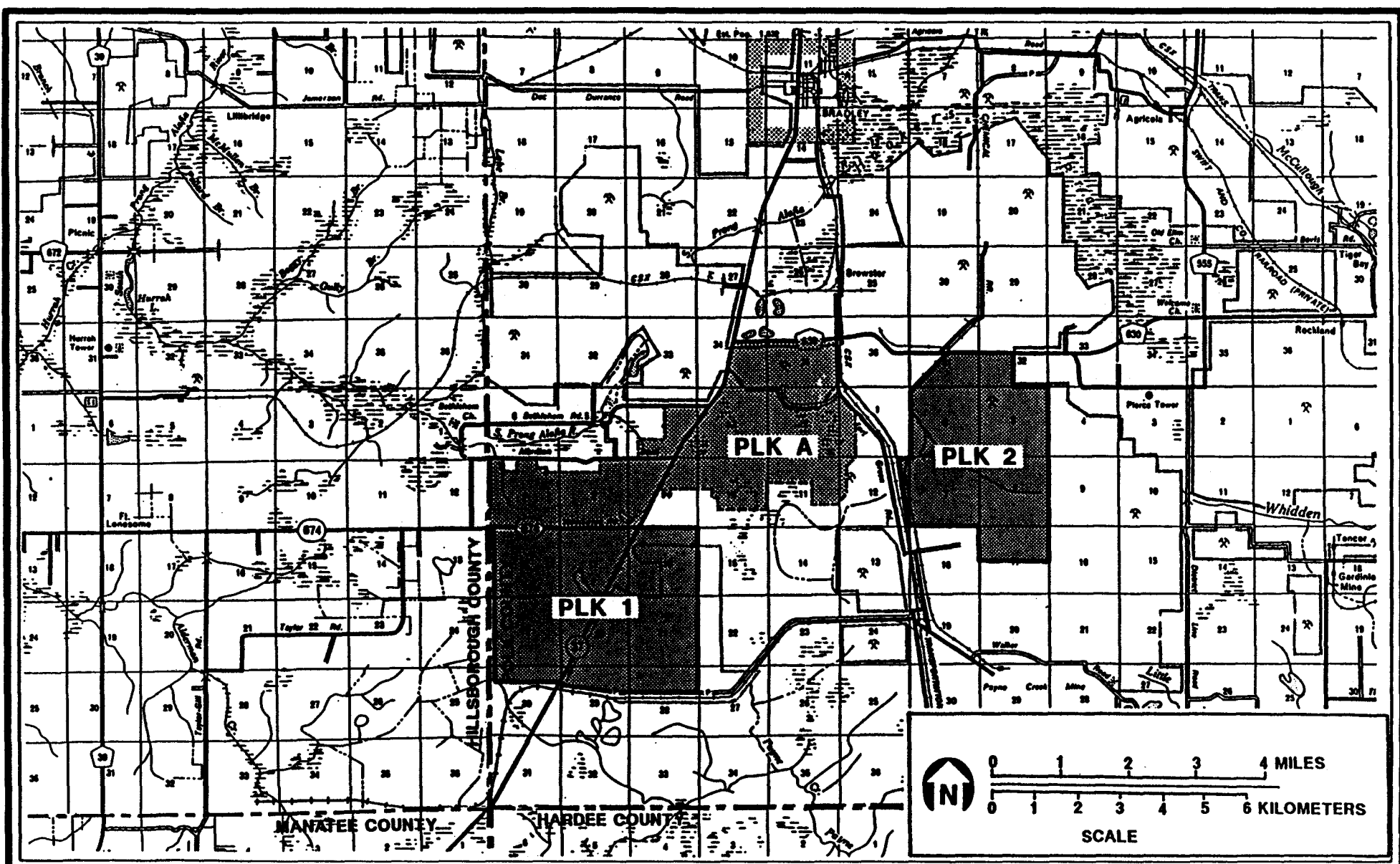


FIGURE 8.1.5-4.

POLK POWER STATION SITE (PLK-A) AND ALTERNATIVE SITES (PLK-1 AND PLK-2)

Sources: FDOT. ECT, 1992.



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8.1.6 PROPOSED AND ALTERNATIVE SITES

8.1.6.1 Proposed Polk Power Station Site

Within the Power Plant Site Assessment program, the proposed Polk Power Station site was termed the PLK-A site. As with all three of the alternative sites, the proposed PLK-A site has been significantly impacted by previous and ongoing phosphate mining activities in southwest Polk County. However, the proposed site was considered by Tampa Electric Company to have certain environmental, engineering, and economic advantages compared to the other two sites recommended by the Siting Task Force. These advantages primarily involve the ability to locate the power block facilities on unmined lands, the ability to construct the cooling reservoir principally as a below-grade facility, and the ability to create an environmentally enhanced wildlife management/corridor area.

The location of the main power block and other major facilities on unmined lands lessens the engineering and related cost requirements for constructing the foundations for these facilities.

The construction of the cooling reservoir within an area which was previously mined and currently consists of a series of water-filled mine cuts and spoil piles creates the opportunity to construct the required cooling reservoir as a primarily below-grade facility. This proposed construction technique significantly lessens the requirements for groundwater withdrawals and water use to provide the heat dissipation cooling requirements for the proposed project and the required land area size of the cooling reservoir. The proposed primarily below-grade cooling reservoir also lessens the potential for berm failures and maintenance costs versus an above-grade reservoir.

Since the majority of the proposed site has been or will be mined and has not been reclaimed, Tampa Electric Company has the opportunity to reclaim the mined lands to conditions which will enhance environmental resources in southwest Polk County while meeting the needs of the proposed Polk Power Station project. According to the proposed project plans, the approximately 1,511-acre portion of the site to the

west of SR 37 will be reclaimed as an integrated series of forested and non-forested wetlands and uplands. Tampa Electric Company's proposed reclamation plans for this area will create a significantly enhanced environmentally diverse habitat compared to conditions which existed prior to mining. With Tampa Electric Company's proposed project, this area will serve as a significant wildlife habitat/corridor between the headwater areas of the Payne Creek and Little Manatee River and the South Prong Alafia River system.

Based on these environmental, operational, and economic advantages, the proposed Polk Power Station site was considered the only reasonable site alternative for the proposed project.

8.1.6.2 Alternative Sites

In addition to the proposed Polk Power Station site, PLK-A, the Siting Task Force recommended two other preferred sites in southwest Polk County as potential locations for the proposed power plant facilities. These potential alternative sites were known as the PLK-1 and PLK-2 sites. The locations of these alternative sites relative to the proposed site are shown in Figure 8.1.5-4

Alternative PLK-1 Site

The PLK-1 site is located to the south of the proposed Polk Power Station site and SR 674. The site is bordered on the west by the Hillsborough County line and on the south by the access road and railroad to the Agrico Fort Green Mine phosphate processing plant. SR 37 bisects the site, running in a southwest to northeast direction. In general, the PLK-1 site consists of mined-out lands with the portion of the site to the west of SR 37 reclaimed with sand tailings and currently consists of pasture and citrus grove land uses. An unmined segment of the headwater area of Payne Creek also runs through this western portion of the PLK-1 site. The portion of the PLK-1 site to the east of SR 37 consists of active and inactive clay settling ponds. Several of the inactive ponds are currently under dewatering and reclamation.

Conceptually, use of the alternative PLK-1 site for the proposed project would involve locating the main power plant facilities to the west of SR 37 and potentially constructing a cooling reservoir in the clay settling areas to the east of SR 37. Unlike the proposed site which has not been reclaimed, the construction of these facilities on the PLK-1 site would involve re-disturbing lands which have already been or are currently being reclaimed. Construction of the cooling reservoir in the clay settling areas would require re-construction of earthen berms in the areas which are currently under reclamation. The cooling reservoir would be located entirely above-grade since the clay settling areas have been filled to more than 30 ft above pre-mining elevations. The above-grade cooling reservoir would require significantly more groundwater well withdrawals to provide cooling water makeup than the below-grade reservoir at the proposed site since there will be no surficial groundwater seepage into the reservoir. Also, the operation of the reservoir would require careful control and maintenance in order to avoid re-suspending the clays in the recirculating water system. Based on these considerations, the PLK-1 site offered no environmental nor economic advantages and some disadvantages compared to the proposed site and was not considered a reasonable alternative for further analysis.

Alternative PLK-2 Site

As shown in Figure 8.1.5-4, the alternative PLK-2 site is located to the east of the proposed Polk Power Station site. The PLK-2 site is bordered on the north by CR 630 and on the east by Fort Green Road and the CSX Railroad line. The northern area of the site contains an approximately 500-acre clay settling pond which has recently been retired from use and is currently undergoing the long dewatering process for reclamation. The southern area of the site contains an approximately 575-acre clay settling pond which is currently in use and will not be inactivated until the late 1990s. The area of the PLK-2 site between the two clay settling ponds consists primarily of unmined land which has been covered by waste sand tailings to a height of more than 20 ft above pre-mining elevations.

Conceptually, use of the alternative PLK-2 site for the proposed project would probably involve locating the main power plant facilities on the unmined, central portion of the site. The significant volume of sand tailings currently on this area would need to be removed in order to provide stable land for the facilities. The two clay settling ponds would be developed as cooling reservoirs. Again, these cooling reservoirs would be located significantly above pre-mining elevations and would require significantly more groundwater well withdrawals to provide makeup water compared to the planned below-grade reservoir at the proposed site. Other environmental issues such as potential air quality and ecological impacts were considered relatively similar compared to the proposed site. Based on these considerations, the alternative PLK-2 site offered no environmental advantages relative to the proposed Polk Power Station site and was not considered a reasonable alternative for further analysis.

8.2 ALTERNATIVE MEANS OF SATISFYING THE NEED FOR THE PROJECT

As discussed in Section 1.3, the FPSC has the statutory responsibility for determining and approving the need for construction of new power plants in Florida. According to Section 403.519, F.S., the FPSC must consider four specific items in determining the need for a new power plant:

- Need for electric system reliability and integrity,
- Need for adequate electricity at a reasonable cost,
- Cost-effectiveness of the proposed power plant versus available alternatives, and
- Conservation measures which might mitigate the need for the proposed power plant.

The FPSC must evaluate these specific items in relation not only to the system needs of the applicant proposing the new power plant, but also to the power supply and Customer needs of peninsular Florida. The FPSC evaluation must also consider compliance of the proposed project with the mandates of FEECA to ensure the most cost effective use of natural gas and oil. Other key considerations in the FPSC decision-making process are the identification and evaluation of reasonable alternatives to the construction of the proposed power plant while maintaining electric system reliability and minimizing the cost of electric power to Customers. The alternatives considered by the FPSC include available means to mitigate or avoid the need to construct a new power plant such as conservation, load management, and power purchases from other generators, as well as alternative generation technologies and fuels, to ensure that the proposed project represents the most cost-effective means of supplying reliable electric power.

Again, as discussed in Section 1.3, Tampa Electric Company provided the FPSC with all information required to support the petition to determine the need for the proposed IGCC project, Polk Unit 1, as well as information documenting its additional, future generating capacity needs planned for the Polk Power Station project. The information included the results of Tampa Electric Company's long-

range power resources planning effort; evaluations of available conservation, load management, and power purchase programs to avoid constructing new generating facilities; and evaluations of alternative generation technologies to supply the needed electric power. The FPSC approved the need for the IGCC unit, Polk Unit 1, and issued a need determination order on March 2, 1992 (see Appendix 11.14).

Summaries of the supporting information submitted to the FPSC which evaluated alternatives considered by Tampa Electric Company to meet its power supply needs are provided in the following sections. It should be noted that some of the numerical estimates and projections presented in the Tampa Electric Company need determination petition and supporting studies may vary from figures presented elsewhere in this SCA and other documents since such projections are continually under revision and updating as part of the company's ongoing power resource planning process.

8.2.1 NEED FOR ADDITIONAL POWER SUPPLY

Based on its long-range power resource planning process, Tampa Electric Company has determined the need for additional resources of approximately 800 MW beginning in 1995 through the year 2001 and approximately 1,300 MW from 2002 through 2010. Thus, over the future 15-year period, the company will need a total of approximately 2,100 MW in additional resources to meet its Customer needs. The need for these additional resources is primarily based on the projected continued growth of population and resulting electricity demands in the Tampa Electric Company service area.

Based on this forecasted growth in demand, Tampa Electric Company will not meet its dual system reliability criteria in this future timeframe without the additional resources. These reliability criteria are a minimum 20-percent winter generation reserve margin and an assisted LOLP of less than 0.1 day per year. These criteria are considered to be reasonably adequate by the FPSC for the Tampa Electric Company system. The following sections present the alternatives available and considered by Tampa Electric Company to meet these additional approximately 2,100 MW in resources required to meet its Customer future power demands.

8.2.2 ALTERNATIVES TO CONSTRUCTING NEW GENERATING FACILITIES

To avoid or minimize the potential environmental effects and costs of constructing new power plants, Tampa Electric Company considered and evaluated a variety of alternatives to avoid constructing all or a portion of the proposed Polk Power Station project. The evaluations of non-construction alternatives considered both demand and supply side alternatives including:

- Conservation,
- Load management,
- Interruptible load,
- Qualifying cogeneration power purchases, and
- Other purchased power.

Tampa Electric Company's analyses show that the most cost-effective implementation of all of these non-construction alternatives will reduce the amount of needed resources by approximately 1,000 MW or by almost 50 percent compared to its total future needs in the 1995 through 2010 timeframe. In its need determination proceedings, the FPSC concluded that Tampa Electric Company had considered and implemented all reasonably available conservation and other non-generating alternatives to avoid construction of new generating facilities (i.e., Polk Unit 1) in the 1995 to 1996 timeframe.

Tampa Electric Company's projected resource needs beyond 1996 also consider and include the implementation of available non-construction alternatives to avoid and/or delay constructing new generating facilities. Again, these non-construction alternatives include conservation, load management, and purchased power from cogenerators and other utilities. These non-construction alternatives will reduce the company's future power supply needs by almost 50 percent. Therefore, based on these evaluations, construction of Tampa Electric Company's proposed Polk Power Station project is needed to reliably meet future energy demands in addition to the implementation of available non-construction alternatives.

8.2.3 ALTERNATIVE GENERATION TECHNOLOGIES

An integral step in Tampa Electric Company's power resource planning process is the identification and consideration of alternative generation technologies which could be constructed to meet future Customer demands. The objective of the alternative generation technology study is to identify the most reliable, feasible, environmentally acceptable, and cost-effective generating facilities for consideration in a comprehensive power resource plan.

The alternative technology study conducted by Tampa Electric Company involved a systematic review and assessment of a wide variety of conventional and nonconventional energy generation technologies. Initially, 46 technologies were identified for evaluation. These alternative technologies were screened in a two-step process: preliminary and economic screening analyses. In step one, a preliminary screening analysis was conducted to eliminate those technologies which could not be utilized because regional geography/weather is not suitable for a technology, costs were higher when compared to similar type technology alternatives, proven demonstration of the technology has not been performed, public opposition to technology exists, and/or questions exist regarding the technology safety. Table 8.2.3-1 lists each technology assessed and some of the technology assumptions, and also contains reasons why various technologies were eliminated from further consideration as a result of the preliminary screening analysis.

The technologies that passed the preliminary screening were:

- Conventional PC with FGD,
- Advanced PC with FGD,
- Atmospheric fluidized bed,
- IGCC,
- CT,
- CT with steam injection,
- CC,
- Phosphoric acid fuel cell,

Table 8.2.3-1. Alternative Technology Preliminary Screening Analysis

Technology	Plant Size (MW)	Total Plant Cost (91 \$/kw)	Average Annual Heat Rate (Btu/kwh)	Commercial Availability	Technology Development	Retain for Economic Screening
Pulverized coal-wet limestone FGD						
Subcritical	300	1,533	10,044	1989	Mature	Better economics exist for similar unit types
Subcritical	500	1,274	9,829	1989	Mature	Yes
Supercritical	300	1,517	9,644	1989	Mature	Yes
Pulverized coal-spray dryer FGD						
Subcritical	300	1,438	10,370	1989	Mature	Better economics exist for similar unit types
Pulverized coal-regenerable FGD						
Subcritical	300	1,756	10,183	1989	Mature	Better economics exist for similar unit types
Pulverized coal (SOAPP)						
Subcritical advanced FGD	300	1,575	9,080	1989	Demonstration	Yes
Atmospheric fluidized bed						
Bubbling bed	200	1,757	9,960	1994	Demonstration	Better economics exist for similar unit types
Circulating bed	200	1,644	10,058	1994	Demonstration	Better economics exist for similar unit types
Pressurized fluidized bed						
CC	340	1,545	8,980	1996	Pilot	Yes
Pressurized fluidized bed turbo-charged boiler						
Circulating bed	250	1,610	9,703	1996	Laboratory	Technical development only laboratory

8.2.3-2

Table 8.2.3-1. Alternative Technology Preliminary Screening Analysis (Continued, Page 2 of 4)

Technology	Plant Size (MW)	Total Plant Cost (91 \$/kw)	Average Annual Heat Rate (Btu/kwh)	Commercial Availability	Technology Development	Retain for Economic Screening
Bubbling bed	250	1,500	10,278	1996	Laboratory	Technical development only laboratory
IGCC	200	1,933	9,320	1994	Demonstration	Yes
	400	1,597	9,220	1994	Demonstration	Yes
Non-integrated gasification combined cycle						
Gasification onsite	200	1,933	9,600	1994	Demonstration	Technical development only laboratory
	400	1,694	9,510	1994	Demonstration	Technical development only laboratory
Gasification offsite	400	1,905	9,625	1994	Demonstration	Technical development only laboratory
CT-natural gas/distillate fuel						
Conventional	80	433	14,020	1989	Mature	Yes
Advanced	140	418	13,210	1991	Demonstration	To reduce analysis time, only the conventional CT was evaluated
CT-steam injection						
Steam injected	150	941	9,425	1989	Demonstration	Yes
CT-CC-natural gas/distillate fuel						
Conventional	120	595	8,055	1989	Mature	Yes
Advanced	210	561	7,580	1991	Demonstration	To reduce analysis time, only the conventional CC was evaluated
Fuel cells-phosphoric acid						
Centralized	100	1,172	8,549	1998	Pilot	Yes

8.2.3-3

Table 8.2.3-1. Alternative Technology Preliminary Screening Analysis (Continued, Page 3 of 4)

Technology	Plant Size (MW)	Total Plant Cost (91 \$/kw)	Average Annual Heat Rate (Btu/kwh)	Commercial Availability	Technology Development	Retain for Economic Screening
Geothermal						
Binary	54	1,917	29,000	1992	Demonstration	Not feasible for Florida
Dry steam	113	1,065	21,868	1989	Mature	Not feasible for Florida
Solar parabolic through gas hybrid	80	3,016	24,391	1989	Mature	Yes
Solar photovoltaic-central station						
Flat plate	99	2,630	22,765	1995	Pilot	Yes
Wind turbines-high production volume	75	1,101	0	1990	Mature	Not feasible for Florida
Municipal solid waste-mass burn and refuse derived fuel (RDF)						
Mass burn	40	4,741	17,040	1989	Mature	Yes
RDF	24	4,985	15,450	1989	Mature	Yes
Nuclear-advanced light water reactor (evolutionary)	1,200	1,470	10,530	2000	Pilot	Commercial availability after 1999
Nuclear-advanced light water reactor (passive safety)	600	1,667	10,530	2002	Pilot	Commercial availability after 1999
Nuclear-light metal/high temperature gas cooled	1,350	1,947	9,000	2006	Pilot	Commercial availability after 1999

8.2.3-4

Table 8.2.3-1. Alternative Technology Preliminary Screening Analysis (Continued, Page 4 of 4)

Technology	Plant Size (MW)	Total Plant Cost (91 \$/kw)	Average Annual Heat Rate (Btu/kwh)	Commercial Availability	Technology Development	Retain for Economic Screening
Advanced battery energy storage						
3-Hour	20	474	11,400	1997	Pilot	High scale production of batteries were not considered realistic to meet Tampa Electric Company's early peaking needs
5-Hour	20	614	11,000	1997	Pilot	High scale production of batteries were not considered realistic to meet Tampa Electric Company's early peaking needs
Lead acid battery energy storage						
3-Hour	20	707	13,500	1989	Mature	High scale production of batteries were not considered realistic to meet Tampa Electric Company's early peaking needs
5-Hour	20	948	13,100	1992	Mature	High scale production of batteries were not considered realistic to meet Tampa Electric Company's early peaking needs
Pumped hydro energy storage						
Conventional	1,050	918	13,600	1989	Mature	Limited feasibility for Florida
Compressed air energy storage						
Rock	110	574	11,640	1993	Demonstration	Not feasible for Florida
Salt	110	447	11,640	1991	Demonstration	Not feasible for Florida
Aquifer	110	438	11,640	1992	Demonstration	Not feasible for Florida

Note: All data developed from the September 1989 EPRI TAG.

Source: Tampa Electric Company, 1991.

- Solar thermal, and
- Photovoltaic solar cell.

In step two of the screening analysis, the economics of the ten technologies which survived the preliminary screening were compared against each other. The comparisons were made within similar service duty classes with all baseload technologies compared against each other as were all peaking and intermediate technologies. These economic screening curves reflected the levelized annual/lifecycle cost of various technologies at different capacity factors. Figures 8.2.3-1 through 8.2.3-3 represent the screening curves for baseload, intermediate load, and peaking load technologies, respectively. The baseload technologies were evaluated from 50- to 100-percent, the intermediate technologies were evaluated from 15- to 50-percent, and the peaking technologies from 0- to 15-percent capacity factors. The technologies which were selected for the economic optimization analysis were:

Baseload Technologies

- Conventional PC with FGD, and
- IGCC,

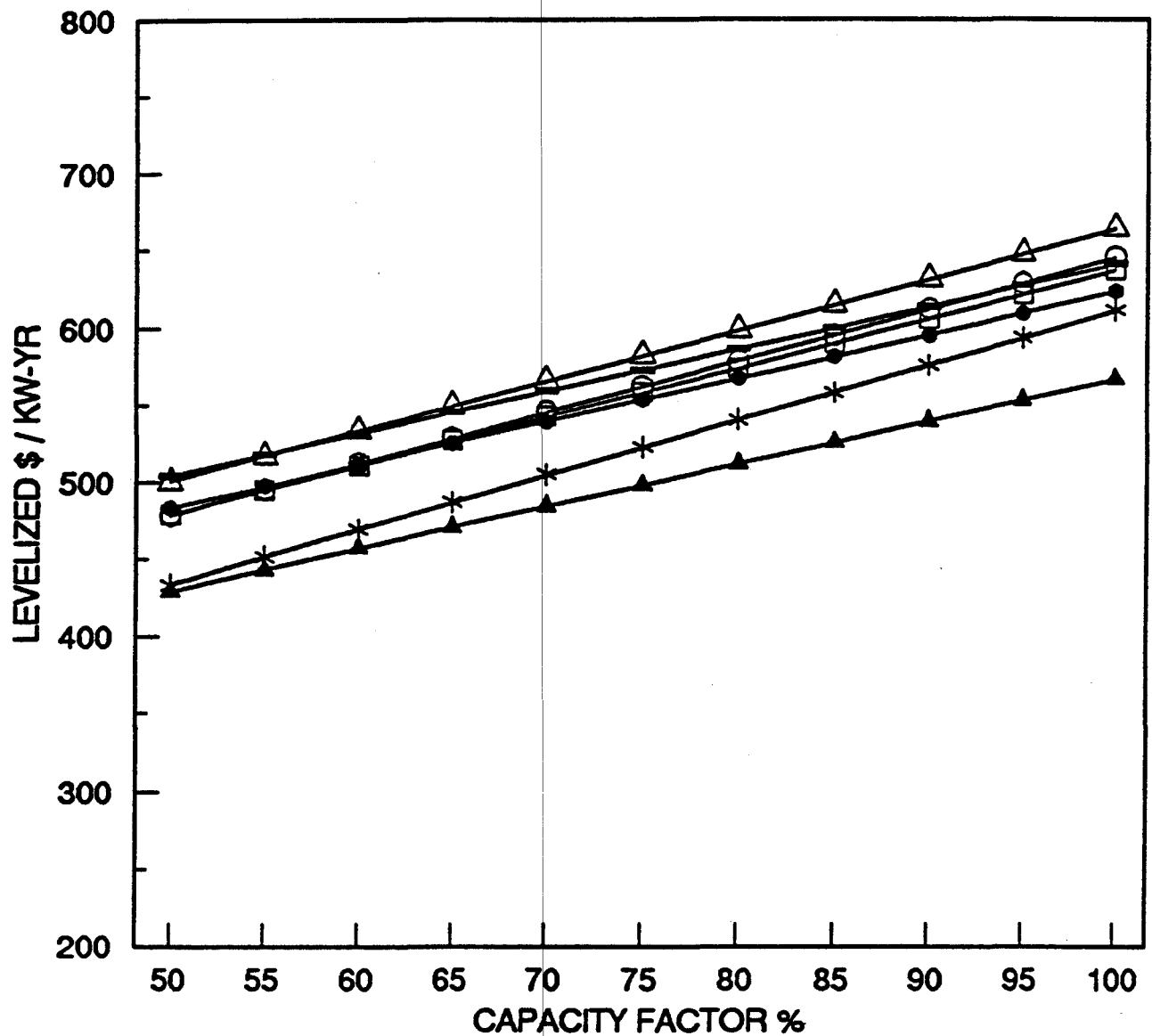
Intermediate Load Technologies

- IGCC,
- CC,
- Phosphoric acid fuel cell,
- Photovoltaic solar cell, and
- Solar thermal, and

Peaking Technologies

- CT.

The baseload conventional PC and IGCC technologies were maintained because of their relatively low levelized costs, and compared to other baseload technologies, the favorable environmental performance of IGCC units compared to conventional coal units. The CC unit had the best economics of all of the intermediate technologies, but the fuel cells and solar technologies were advanced into the economic analysis



SUBCRITICAL COAL SUPERCRITICAL COAL ADVANCED SUPERCRITICAL COAL FLUID BED
 —*— —○— —□— —△—
 IGCC MASS BURN 220 MW IGCC W/DOE FUND 220 MW IGCC W/O DOE FUND
 —●— —■— —▲— ——

NOTE: MSW-MASS BURN not pictured because the minimum Levelized Cost (Capacity = 0%) is greater than 800 \$/KW-YR.

FIGURE 8.2.3-1.

ECONOMIC SCREENING CURVES--BASELOAD UNITS

Source: Tampa Electric Company, 1991.



POLK
POWER
STATION

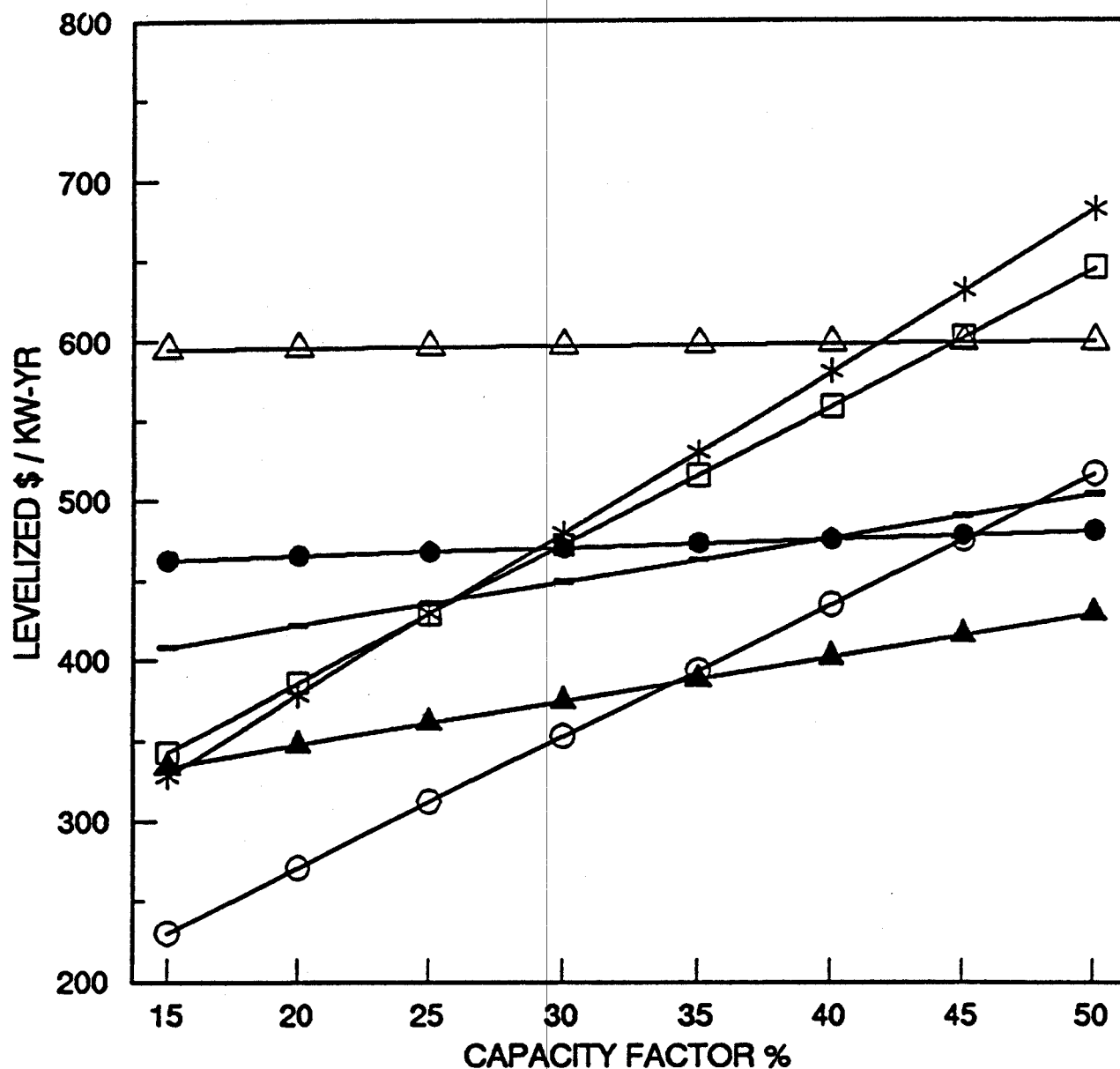


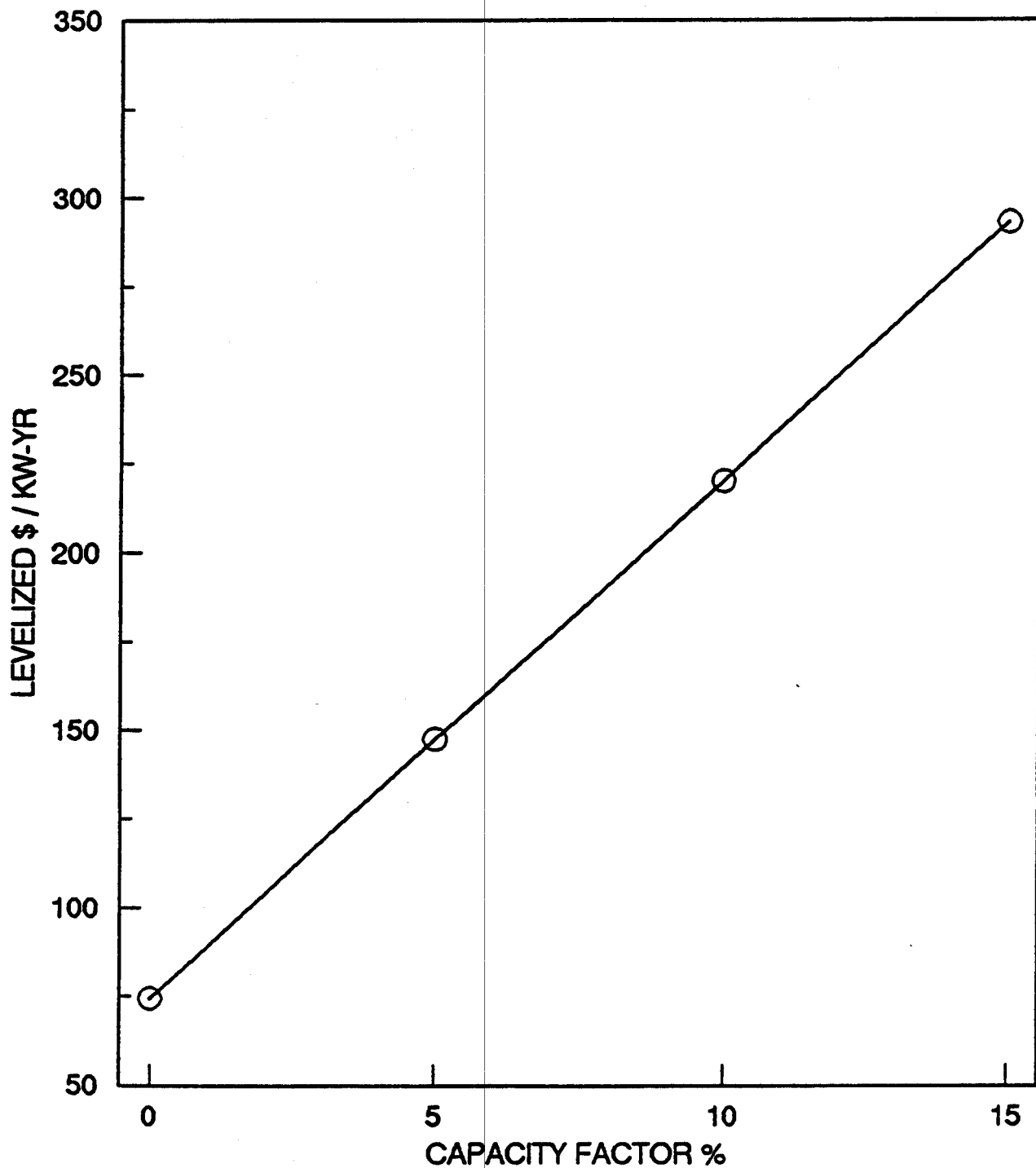
FIGURE 8.2.3-2.

ECONOMIC SCREENING CURVES--INTERMEDIATE UNITS

Source: Tampa Electric Company, 1991.

TAMPA ELECTRIC
A TECO ENERGY COMPANY

POLK POWER STATION



CT



FIGURE 8.2.3-3.

ECONOMIC SCREENING CURVES--PEAKING UNITS

Source: Tampa Electric Company, 1991.



POLK
POWER
STATION

because of their exceptional environmental performance (very low noise, extremely low or no emissions, possibility of siting in or close to load centers).

The goal of the economic optimization analysis was to identify the best resource plan for serving the forecasted energy requirements. The development of the supply side plan involved the use of dynamic programming to optimize the mix of generating capacity on the system. The objective function of the optimization analysis was to minimize present worth revenue requirements for the Tampa Electric Company system.

First, in the analysis, various power resource scenarios, comprised of a mixture of the remaining alternative generating technologies, joint participation and purchased power generation, and DSM programs were developed. Next, these alternatives were analyzed, along with future system demand and energy requirements, future DSM programs, and existing generating capabilities, to arrive at a number of viable generating expansion scenarios involving combinations of the alternative generation technologies, conservation, DSM programs, and power purchases. Each alternative satisfied the established reliability criteria.

The capital expenditures associated with each capacity addition were determined based on the alternative generation technology, fuel type, and in-service year. The fixed charges resulting from the capital expenditures were expressed in present-worth dollars for comparison.

The fuel and the operation and maintenance costs associated with each power resource scenario were projected based on estimated unit dispatch. The projections, also expressed in present-worth dollars, were combined with the fixed charges to obtain the total present worth of revenue requirements for each alternative power resource plan.

The expansion plan which was initially identified by this analysis as having the lowest revenue requirements was then compared to other generation plans which may be strategically superior for Tampa Electric Company and its Customers. These various expansion plans were again compared to one another on an economic basis, including an analysis of the sensitivity of the revenue requirement projections to changes in base case assumptions regarding fuel availability and costs.

The final step in the power resource planning process was a strategic issues/risk analysis which was conducted to compare the overall performance of each individual generation expansion plan alternative under additional factors that were not easily quantified. These strategic issues may affect the type, capacity, and/or timing of Tampa Electric Company's future generation resource requirements. These issues, such as high and low fuel price, natural gas availability, environmental legislation, and potential joint ownership projects, were evaluated in the process of determining the optimal expansion plan. In this way, an economically sound expansion plan is selected which has the flexibility to respond to future technological and economical changes.

8.2.3.1 Proposed Project Technologies

Based on these analyses, Tampa Electric Company's proposed power resource plan for generating capacity additions which best meets its Customers needs during the 1995 through 2010 period was presented in Table 1.3.3-1. The proposed plan includes three of the seven alternative generation technologies which were considered in the economic optimization analyses. The proposed plan involves a combination of IGCC, CC, and CT generation technologies. The four technologies not included in the proposed plan were conventional PC with FGD units, phosphoric acid fuel cell, photovoltaic solar cell, and solar thermal. Despite their exceptional environmental performance, the latter three technologies were not included at this time primarily due to the status of the technology development (i.e., pilot scale for the solar photovoltaic cell and phosphoric acid fuel cell) and their relatively high costs.

As baseload technologies, IGCC and PC with FGD have relatively similar costs; however, IGCC technology was selected due to its better environmental performance. Further, Tampa Electric Company's opportunity to obtain \$120 million in DOE funding for the Polk Unit 1 under the Clean Coal Technology Demonstration program makes the IGCC unit the most cost-effective generation alternative to meet the capacity needs and Customer demands.

8.2.3.2 Potential Alternative Technologies

Based on the previous evaluations, potential alternative technologies to the proposed Polk Power Station project may include:

- Three CC units without CG facilities,
- Three IGCC units, and
- PC with FGD units.

CT units are the most reliable, cost-effective, and environmentally acceptable technology for providing peak load needs; therefore, no alternatives for these units were considered reasonable for the proposed six stand-alone CT units for the Polk Power Station project.

Three CC Units Without CG Facilities

CC units using only natural gas or oil as fuel would have certain environmental advantages compared to the proposed IGCC technology since this alternative does not involve the handling and storage of coal or coal combustion by-products. However, natural gas and fuel oil can be subject to availability limits and significant changes in price in certain economic and political conditions, while coal prices and supplies are projected to be relatively stable in the foreseeable future. The capability of the proposed CC units to burn a combination of natural gas, fuel oil, or coal gas provides a high degree of fuel flexibility to maintain a reliable and cost-effective power supply. Due to this fact, the alternative of using three CC units without CG capabilities would not meet the overall objective of the project and may have an

adverse effect on Tampa Electric Company's ability to supply reliable, cost-effective power to its Customers in the future.

Three CC units without CG facilities would also not meet the project objectives of DOE to conduct cost-shared projects to demonstrate innovative, energy-efficient, and environmentally acceptable generating technologies using coal under its Clean Coal Technology Demonstration program. The fact that the proposed IGCC unit will include both the HGCU demonstration technology and the proven CGCU technology to control emissions of SO₂ avoids any risks for Tampa Electric Company and its Customers in providing a reliable power supply. Therefore, since the alternative of using all three CC units without CG capabilities would not meet the overall project objectives of Tampa Electric Company and DOE, this alternative was not considered reasonable for further analysis.

Three IGCC Units

The two stand-alone CC units proposed for the Polk Power Station project will be designed, with some modifications, to be capable of using coal gas as well as the currently proposed primary natural gas and backup fuel oil fuels. The alternative of using three IGCC units would primarily involve constructing additional CG facilities at the site to provide coal gas for the two CC units and expanding certain of the coal handling and storage facilities and, possibly, the temporary by-product (i.e., slag and sulfur) storage areas. The proposed treatment system for CG wastewaters and the associated brine storage area would also need to be expanded. Therefore, the expansion of these facilities would involve a greater use of land resources on the site compared to the proposed project. Sufficient land area is available within the main plant site area to locate these additional and/or expanded facilities.

For this alternative, most of the other facilities proposed for the project, such as the rail spur, process water supply system, and cooling reservoir, would not require changes or expansions. Also, potential environmental issues such as air emissions

and water uses and discharges would be relatively similar between the proposed project and the alternative of providing CG capabilities for the two other CC units.

Construction of the additional CG facilities would involve increased capital expenditures. According to Tampa Electric Company's power resource planning efforts, the two stand-alone CC units are currently proposed to meet future intermediate load power supply needs, while the proposed IGCC unit is proposed to meet baseload needs. Therefore, at this time, additional capital expenditures for the CC units with lower, intermediate loads would not be as cost-effective as the proposed project based on projected prices for natural gas, fuel oil, and coal. However, since natural gas and fuel oil can be subject to unanticipated, significant changes in price, the cost-effectiveness of providing the additional CG facilities may change in the future and meet Tampa Electric Company's project objective of providing the most cost-effective power supply to meet its Customer needs. In addition, the alternative of providing CG capabilities for all three CC units would provide Tampa Electric Company with additional flexibility to respond to future changes in relative prices and availability of natural gas, fuel oil, and coal as fuels.

This alternative would also meet the project objectives of DOE since it would not affect the proposed project demonstrations of the integration of CG and CC technologies and the HGCU system. The possible addition of CG facilities for the two proposed stand-alone CC units may even further DOE's overall Clean Coal Technology Demonstration program objectives for the commercialization of its demonstration projects.

Based on these facts, the alternative generation technology of providing CG facilities for the two proposed stand-alone CC units is considered a reasonable alternative. There is sufficient land area within the main plant site area to locate the additional CG facilities and to expand associated facilities such as coal, slag, and sulfur storage areas and CG wastewater treatment and brine storage areas. Most other facilities, such as the cooling reservoir, water supply and use, rail spur, and access roads, would

not require changes or expansions. Any potential environmental issues could be avoided or minimized by proper design and controls similar to the proposed IGCC unit. Therefore, Tampa Electric Company could implement this alternative of adding CG facilities for one or two of the stand-alone CC units at the Polk Power Station at some time in the future. The future decision to implement this alternative would be primarily based on economic considerations regarding the level of additional capital expenditures and the relative prices of coal, natural gas, and fuel oil as fuels for the units and Tampa Electric Company's obligation to implement the most cost-effective power resource plan to meet the electricity demands of its Customers.

PC With FGD Units

Similar to the IGCC technology, the use of PC units with a FGD system was considered as a potential alternative generating technology based on future natural gas and fuel oil availability and price stability considerations relative to coal fuel. This potential alternative would involve the use of PC unit(s) instead of the proposed IGCC unit and/or instead of one or both of the two proposed stand-alone CC units.

The use of the PC unit generating technology instead of the proposed IGCC unit would similarly avoid the price stability and availability concerns associated with natural gas and fuel oil. However, the alternative PC technology has the relative disadvantage compared to the IGCC technology in not allowing the flexibility to use these other fuels in the event of coal delivery disruptions and unforeseen coal price fluctuations. This lack of fuel flexibility could adversely impact Tampa Electric Company's project objective and obligation to most cost-effectively meet the future power demands of its Customers.

Several potential environmental issues associated with proposed IGCC and alternative PC technologies are similar since both technologies involve the delivery, handling, and storage of coal, and generate solid by-products which require development of some onsite storage facilities. However, the PC technology also has certain environmental disadvantages relative to the proposed IGCC unit.

Table 8.2.3-2 provides a comparison of key facility and environmental requirements for nominal 400-MW IGCC and PC with FGD power plants. These requirements were developed based on a study sponsored by EPRI which specifically evaluated and compared the overall performance, capital cost, and environmental emissions and issues for comparable IGCC and PC generating units (EPRI, 1988). In this EPRI study, specific criteria and design assumptions were established to evaluate the IGCC and PC technologies on the most consistent basis possible. For example, the evaluations were based on units and systems that would provide similar nominal net generating capacities and used a single design coal fuel, Illinois No. 6, which also is the coal, with certain modifications, considered for licensing purposes for the proposed IGCC unit for the Polk Power Station. Also, the sites for both units were assumed to be *green field* locations where all generating unit and associated facilities (e.g., rail spur, access roads, fuel storage area, cooling system, etc.) would need to be developed.

As shown in Table 8.2.3-2, the PC unit requires slightly more land area for the main power plant facilities than an equivalent IGCC unit, primarily due to the need for a larger coal storage area to provide a similar time period of fuel supply based on its relatively higher coal consumption rate (i.e., higher net heat rate). The PC unit would require almost twice as much land area for permanent storage of solid by-products (i.e., bottom and fly ash and gypsum) due primarily to its higher production volume of gypsum from the FGD system to control SO₂ emissions relative to the elemental sulfur recovery and H₂SO₄ volumes from the IGCC unit syngas cleanup systems. A higher land area requirement would also be required to provide a similar period of storage for gypsum from the PC unit on a temporary basis relative to the elemental sulfur from the IGCC unit, assuming that both by-products were marketable for offsite use. The PC unit with a FGD system also requires facilities for the delivery, handling, and storage of limestone which is not required for the assumed IGCC unit technology.

Table 8.2.3-2. Comparison of Key Facility and Environmental Requirements for Nominal 400-MW IGCC and PC Power Plants

Facility Requirement	IGCC Plant	PC Plant
Land area		
Power plant and fuel handling/storage facilities (acres)	190	215
Permanent solid waste/by-product disposal, if needed (acres)	100	180
Net heat rate (Btu/kwh)	9,132	9,737
Coal usage, as received, 100 percent load (tph)	153	176
Limestone usage (tph)	N/A	21
Water flows		
Condenser circulating water (gpm)	99,010	158,330
Cooling makeup water (gpm)	2,014	3,228
Process/service water supply (gpm)	875	519
Wastewater flows		
Cooling tower blowdown (gpm)	206	330
Boiler blowdown (gpm)	23	30
Demineralizer spent regenerant (gpm)	46	10
Other treated wastewater (gpm)	414	10
Air emissions, stacks only		
SO ₂ (lb/hr)*	996	1,190
NO _x (lb/hr)*	345	790
Particulates (lb/hr)	†	33
Solids		
Sulfur (tpd)	119	
Gypsum, dry (tpd)		776
Slag/ash, dry (tpd)	345	383

Note: N/A = not applicable.

* Air emission rates from the PC plant have been modified from the EPRI study to reflect 95-percent sulfur removal efficiency versus 90-percent in the study, and NO_x emissions of 0.2 lb/MMBtu versus 0.5 lb/MMBtu in the study.

† Negligible.

Sources: EPRI, 1988.
ECT, 1992.

The alternative PC technology would require more than 60 percent more water for condenser cooling purposes as an equivalent IGCC unit since PC unit electricity generation is totally based on STs whereas only the HRSG/ST component of the IGCC unit requires cooling water. The EPRI study was based on the use of mechanical draft cooling towers as the heat dissipation system for both the IGCC and PC units. If a cooling reservoir was used as the proposed heat dissipation system, PC units would also involve significantly higher water volumes for circulating water, makeup water, and blowdown purposes than IGCC units. Therefore, if a PC unit was used instead of the proposed IGCC unit or the CC units for the Polk Power Station, the proposed cooling reservoir area would need to be increased and the proposed cooling water makeup from the Floridan aquifer and discharge volumes would be significantly increased. However, the PC unit would require less process/service water than an equivalent IGCC unit and would require the treatment of significantly less wastewater than the IGCC unit, primarily due to water uses in the CG process.

The air pollutant emission rates presented in Table 8.2.3-2 reflect modifications of the rates contained in the EPRI study to represent similar sulfur removal efficiencies (i.e., 95 percent) for SO₂ emissions for both technologies and more current assumed performance standards for NO_x emissions from PC units. Even with these modifications to reflect better efficiency and performance of the PC unit, the use of the PC technology would still result in higher SO₂ emissions and more than two times higher NO_x emissions than from the equivalent IGCC unit. Also, particulate emissions from the exhaust stack would occur from the PC unit, while particulate emissions from the IGCC unit are negligible.

Finally, using conventional PC generation technology instead of the proposed IGCC unit would not meet DOE's objective to demonstrate clean coal technologies and DOE would not be a cost-sharing participant in the project. Therefore, Tampa Electric Company and its Customers would not have the financial benefit of DOE's \$120 million participation in the proposed project. Based on this fact and the

relative environmental disadvantages of the PC technology in terms of land and water use requirements, the use of a PC unit instead of the proposed IGCC unit was not considered a reasonable generation alternative for further analysis by Tampa Electric Company.

The use of PC units instead of one or two of the proposed stand-alone CC units would also involve limitations in future fuel use flexibility and additional land use and environmental acceptability issues compared to the proposed project. For example, even though not proposed at this time, use of PC units versus CC units would preclude the flexibility and possible cost-effectiveness to use natural gas or fuel oil in addition to coal as fuel for the two CC units. Compared to the proposed stand-alone CC units, one or two PC units would involve the use of significantly more land area for the power block facilities, coal and by-product storage, and cooling reservoir areas; significantly increased groundwater withdrawals and cooling water blowdown; and increased NO_x and particulate air emissions.

Also, the CC technology allows the development of generating capacity in phases to cost-effectively match the growth in electricity demands. For example, one or two CT units can be developed and operated in simple-cycle mode for some time period prior to adding HRSG and ST facilities to complete the CC units. Therefore, capital expenditures can also be phased to most cost-effectively meet future demands and changes in future demands. On the other hand, PC units must be developed in total at one time and generally must be relatively larger (i.e., generating capacities of 300 MW or more) than CC to be considered cost-effective for electricity generation. Therefore, the PC technology requires that all capital investment be made at one time and may result in development of excess capacity for some time until demand growth catches up with the large capacity addition.

Finally, CC units have more operational flexibility than PC units in responding to and meeting the various types of demands and system needs (i.e., peaking, intermediate, and baseloads). CC units can start and stop generating electricity relatively faster

than PC units to meet peak and intermediate loads, particularly when the CT components are operated in simple-cycle mode using bypass exhaust stacks. Whereas, PC units can require up to 24 hours to begin generating electricity depending on their shutdown status and are generally used to meet only baseload demands. Based on Tampa Electric Company's power resource plan, the proposed CC units at the Polk Power Station are needed to meet future intermediate loads for which PC units are generally not considered operationally suitable.

Thus, the generation technology alternative of using PC instead of the proposed stand-alone CC units was not considered to offer any environmental, operational, or cost-effectiveness advantages in meeting the project objectives compared to the proposed project. This alternative generation technology was not considered as a reasonable alternative for the proposed Polk Power Station project.

8.3 PROPOSED SITE DESIGN ALTERNATIVES

The following sections discuss the potential alternatives to the major processes, facilities, and systems comprising the proposed Polk Power Station project. These potential alternatives were identified and evaluated by Tampa Electric Company to determine which alternatives were considered reasonable compared to the proposed project based on environmental, engineering, and economic factors. The introduction to Chapter 8.0 described the approach for determining whether or not an alternative was considered reasonable relative to the objectives and needs for the proposed project based on environmental, technical, and economic considerations.

8.3.1 SITE LAYOUT ALTERNATIVES

Within the Polk Power Station site, two potential alternatives were considered regarding the location and layout of the proposed facilities. These potential alternatives included Tampa Electric Company's proposed site layout and a layout reversing the locations of the coal and slag storage areas. Due to the size of the proposed site (i.e., 4,348 acres), numerous site layout alternatives could have been considered. However, the use of the limited unmined area on the site to the east of SR 37 for the main power plant structures and facilities, and the use of mined-out portions for the cooling reservoir and other water management/wildlife habitat areas were determined to take the best advantage of the existing site conditions. These proposed uses would minimize earth-moving costs, while enhancing the environmental quality of the mined-out areas through effective reclamation programs.

8.3.1.1 Proposed Site Layout

Figures 3.3.0-1 and 3.2.0-2 show the proposed layout of the major facilities for the Polk Power Station project. The main power plant facilities will be located on unmined lands to the east of SR 37. Although not mined, this area has been disturbed (e.g., used for dragline walks, service roads, and material storage) by adjacent mining activities. The area contains several small, isolated marsh and willow/elderberry swamp wetlands. Most of these wetland areas have also been previously disturbed by adjacent phosphate mining activities. According to Tampa

Electric Company's proposed development plans, the entire main facility area which is currently approximately 140 ft-NGVD will be filled to an elevation of between 140 to 145 ft-NGVD to provide adequate flood protection and drainage for the facilities. The fill material will be obtained from spoil piles in adjacent mined-out areas during the cooling reservoir construction. Therefore, the existing small wetland areas on the main plant site area will be impacted by the proposed project site layout.

Since these small wetlands are in scattered locations on the unmined plant site area, it would be extremely difficult and costly to design a facility layout which avoided these wetlands. As discussed in Section 2.3.6, the overall ecological value and function of these isolated wetlands are limited. Further, as discussed in Section 4.4, the proposed development/reclamation plan for the Polk Power Station site will result in an overall net increase in wetland acreages on the site compared to pre-mining conditions which will provide appropriate mitigation for the loss of these small wetland areas. Therefore, the impact of the loss of these wetlands on the main plant site area is considered minimal and mitigated by the reclamation of wetlands on other areas within the site.

8.3.1.2 Alternative Site Layout

In the proposed project layout, the coal storage area is located within the onsite rail loop and the temporary slag storage area is located east of the coal yard and adjacent to the CG facilities (see Figure 3.2.0-2). Tampa Electric Company evaluated the alternative of reversing the coal and slag storage area locations. However, the alternative of reversing the area locations was found to have no environmental advantages and would decrease the efficiency (i.e., increase costs) of the operations. This alternative layout would also involve the filling of the small wetland areas on the main plant site area. Based on these findings, Tampa Electric Company selected the proposed site layout and did not consider the alternative layout as a reasonable alternative for further analysis.

8.3.2 FUEL HANDLING AND STORAGE ALTERNATIVES

The proposed Polk Power Station project will involve the delivery, handling, and storage of primarily three fuels: natural gas, No. 2 fuel oil, and coal. Natural gas will be delivered to the site by pipeline from the existing or future gas transmission system in the region. The specific route for the pipeline has not been determined at this time (see Section 8.3.9). Natural gas will not be stored on the site. Fuel oil will be delivered to the site by tanker truck, rail, or potentially pipeline if the proposed GATX fuel oil pipeline is constructed along Fort Green Road adjacent to the eastern boundary of the site. Fuel oil will be stored in steel tanks designed in accordance with applicable regulatory standards and include a surrounding impervious spill catchment berms and stormwater collection and oil/water separation treatment systems. Coal will be delivered to the site by rail and/or by truck. A rail spur accessing the site will be constructed from the existing CSX Railroad line which runs adjacent to the eastern site boundary along Fort Green Road. Truck delivery of coal will involve the use of custom-designed aluminum, bottom-dump trailers with knife gate top covers to prevent fugitive dust impacts during transport.

All of the proposed fuel delivery systems will be designed to meet applicable regulatory standards and codes to minimize potential safety concerns and environmental impacts. No reasonable alternatives to these proposed fuel delivery systems were identified and considered by Tampa Electric Company.

For the proposed Polk Power Station project, coal will be unloaded from the rail cars and/or trucks by bottom dumper into receiving hoppers and transported by conveyor to the coal storage area. Reclaiming of the coal pile will be by mobile equipment (i.e., bulldozers). The coal storage area will be lined with a synthetic liner or other materials with similar low-permeability characteristics and be designed with stormwater runoff and leachate collection and treatment systems prior to discharge of the treated runoff water to the cooling reservoir for reuse. The coal handling and storage facilities will also include appropriate fugitive dust controls (e.g., covered conveyors, baghouses at transfer points, and water spraying of piles).

Potential alternatives to the proposed coal unloading and stacking methods include rail car rotary dumpers, boom stacker, traveling stacker/reclaimer, and rotary plow reclaim. Since these alternatives do not provide environmental advantages compared to the proposed methods and would involve significantly higher costs, Tampa Electric Company did not consider these alternatives reasonable for further analysis.

Potential alternatives to the proposed lined coal storage area would involve use of an unlined storage area and/or a covered storage area. An unlined coal storage area would result in significant cost savings; however, it would have greater potential environmental impacts due to leachate seepage into the surficial aquifer. Due to the environmental disadvantages, the unlined storage area alternative was not considered reasonable.

The alternative of a covered coal storage area would have several environmental advantages. The cover would eliminate or minimize rainfall from entering the coal pile and, therefore, minimize potential leachate seepage impacts. Also, the cover would potentially reduce fugitive air emissions from the coal pile relative to an uncovered pile. However, the covered coal storage area alternative would involve significantly higher costs than the proposed storage area plans.

The proposed lined coal storage area will minimize potential leachate seepage impacts and the management plans for the pile include appropriate fugitive emission control measures such as wetting and use of crusting agents on the inactive pile. Thus, the relative environmental advantages of the covered coal storage area alternative versus the proposed storage area plans are minimal and Tampa Electric Company selected the proposed plan since it involved significantly lower costs.

8.3.3 COOLING SYSTEM ALTERNATIVES

The cooling or heat rejection system involves the transfer and/or rejection to the atmosphere of waste heat from the condensation of the steam turbine exhaust steam. Optimization of the heat rejection system will minimize plant capital and operation costs as well as potential environmental impacts of the operations. In general, three alternative cooling systems are available for power plant facilities involving steam turbine generating technology:

- Cooling reservoir,
- Cooling towers, and
- Once-through cooling.

Once-through cooling requires the availability of very large quantities of water compared to the other cooling systems and is, therefore, usually feasible only for coastal sites or inland sites adjacent to large rivers or lakes. Given the location of the proposed Polk Power Station site, the alternative of a once-through cooling system was not considered to be a reasonable or even a feasible alternative.

8.3.3.1 Proposed Cooling Reservoir System

Tampa Electric Company evaluated the alternatives of using either a cooling reservoir or mechanical draft cooling towers as the heat rejection system for the proposed Polk Power Station project. Tampa Electric Company selected the cooling reservoir alternative as the proposed system for the project based on a combination of environmental and engineering/economic considerations as well as the existing characteristics of the site. The proposed reservoir will be constructed in an area which has been mined for phosphate and currently consists of water-filled mine cuts between rows of spoil piles. Locating the reservoir in this area offers several advantages. First, the mined-out area will be required to be reclaimed even without the proposed reservoir use; therefore, the costs associated with the reservoir development for the most part represent reclamation costs which would be required in any case. Second, constructing the reservoir in the mined-out lands allows the reservoir to be primarily a below-grade water body. As a below-grade facility, some

of the needed makeup water will be provided by surficial aquifer groundwater seepage, reducing the use of groundwater pumped from the Floridan aquifer for makeup.

Further, the cooling reservoir alternative reduces the need to discharge cooling water blowdown and treated wastewaters from the site to surface water bodies. Treated process wastewaters, except from the CG facilities, will be discharged to the cooling reservoir for reuse as the recirculating water which again reduces the use of pumped groundwater for cooling water makeup. The normal operating level of water in the reservoir will be approximately 136 ft-NGVD, with an outfall control structure designed to allow for continuous blowdown discharges as well as to control stormwater discharges from the reservoir. Based on this design, the cooling reservoir will have storage capacity to detain direct rainfall on and runoff to the reservoir to reduce peak runoff flows during storm events and to maintain mass flow contributions to the Little Payne Creek system. Based on the outfall control structure design, discharges from the cooling reservoir will be approximately 3.1 MGD on a daily average basis. Further, based on the estimated water quality in the reservoir, the discharged water will not require treatment and will not result in adverse impacts to water quality and quantity conditions in the receiving water body, Little Payne Creek.

The estimated costs for site development and construction of the cooling reservoir are approximately \$8.9 million. However, if the mined-out area for the reservoir was not used for this proposed project use, the area would still need to be reclaimed in compliance with FDNR reclamation regulations. The estimated costs for these agency-required reclamation activities would be approximately \$4.2 million. Therefore, the net estimated costs for developing the mined-out area for the proposed cooling reservoir versus required, standard reclamation of the area are approximately \$4.7 million. Also, the proposed cooling reservoir will require less electrical power to operate than the alternative cooling tower system which equates to additional cost savings for the proposed reservoir.

8.3.3.2 Alternative Cooling Tower System

The alternative cooling system would involve the use of mechanical draft cooling towers. In a mechanical draft cooling tower system, cooling water is pumped from the cooling tower basin through the condenser to condense the turbine exhaust steam. This heated water is returned to the cooling tower where it is distributed over the tower fill and allowed to cascade down through the tower. Large fans pull air through the tower; heat exchange occurs by evaporation and convection. Cooling tower water evaporation losses would be replaced by makeup water pumped from the Floridan aquifer. Based on the anticipated Floridan aquifer water quality, treatment of makeup water would be required to allow approximately 15 cycles of concentration. The 15 cycles were selected to minimize groundwater withdrawals. Blowdown (i.e., discharge) from the cooling tower system would be required on a routine basis to maintain adequate water quality in the tower for efficient performance. This blowdown water would not meet Florida Class III surface water quality standards or groundwater quality standards. Therefore, the blowdown water would require extensive treatment prior to reuse and/or discharge from the site. Additional land area on the site would be required for the treatment of the cooling tower makeup and blowdown waters and for the disposal of sludge and solid wastes generated by these water treatment systems.

The drift from cooling towers at 15 cycles of concentration would have a high TDS and would contribute to particulate loading to ambient air quality. The drift would also have potential terrestrial ecology impacts.

Based on Tampa Electric Company's evaluations, the alternative cooling tower system was considered to have greater environmental impacts than the proposed cooling reservoir system. Wastes from the required treatment systems for the cooling tower makeup and blowdown waters would require the development of additional landfill areas on the site or consume offsite landfill capacities if the wastes were shipped offsite for disposal. The use of cooling towers would also involve potential environmental impacts associated with drift from the towers.

The estimated costs for the cooling tower equipment, equipment foundations, and associated water treatment facilities are approximately \$19.2 million. As discussed previously, the construction costs for the cooling reservoir are approximately \$8.9 million; however, the mined-out area for the proposed cooling reservoir would still need to be reclaimed at an estimated cost of \$4.2 million to meet agency requirements, if the cooling tower alternative was used for the project. Therefore, the cooling tower alternative would require approximately \$14.5 million more in expenditures than the proposed cooling reservoir.

Based on these evaluations, the use of the cooling tower system alternative for the Polk Power Station versus the proposed cooling reservoir would result in increased environmental issues and potential impacts and significantly higher costs for the facility construction, operation, and maintenance. Thus, the cooling tower alternative offered no environmental or economic advantages compared to the proposed cooling system and was not considered a reasonable alternative for the proposed project.

8.3.4 BIOLOGICAL FOULING CONTROL ALTERNATIVES

Periodic biocide treatment of recirculating cooling water is necessary to control biological fouling of condensers, associated piping, and related equipment. Potential biofouling control alternatives include:

- Chlorination,
- Sodium bromination,
- Ozonation,
- Ultraviolet radiation, and
- Mechanical cleaning.

8.3.4.1 Proposed Biofouling Control Method

For the Polk Power Station project, chlorination using sodium hypochlorite, gaseous chlorine, or bromine chloride is the proposed method for biocide treatment of recirculating cooling water withdrawn from and returned to the cooling reservoir. Chlorination is the most widely used and environmentally-accepted biocide treatment method in the electric utility industry. When dissolved in water, chlorine hydrolyzes to form hypochloric and hypochlorous acids which are effective biocides. Biological control is achieved by periodically adding sufficient chlorine (i.e., termed shocking) to the recirculating water intake stream to provide a residual chlorine concentration which kills micro-organisms. The total residual chlorine concentration (i.e., free plus combined residuals) is maintained long enough in the system to kill the micro-organisms within the recirculating water condenser, piping, and equipment.

Based on extensive, demonstrated experience in power plant operations, the use of chlorine as a biocide can be effectively managed to minimize residual chlorine concentrations in the cooling reservoir. Also, given the large volume of water in the reservoir, any residual chlorine in the recirculating water discharge to the cooling reservoir will be quickly dissipated or *consumed* within the reservoir shortly after discharge. Therefore, residual chlorine concentrations in the cooling reservoir and proposed discharges from the reservoir will be below state and federal water quality

standards and have no environmental impacts on groundwater and surface water resources in the vicinity of the Polk Power Station site.

8.3.4.2 Potential Alternative Biofouling Control Methods

Based on operational experience and testing programs, potential, non-chlorine biofouling control alternatives are considered less favorable than the proposed chlorination method primarily due to cost-effectiveness and operational efficiency factors. The uses of sodium bromide and ozone as biocides involve significantly higher operational costs than chlorine, especially in the treatment of such large water volumes as recirculating cooling water for power plants. Ultraviolet radiation also involves higher operational costs and has operational deficiencies since this alternative is relatively ineffective in treating water with suspended particles. Mechanical cleaning is ineffective in cleaning remote portions of the cooling system equipment and destroying micro-organisms suspended in the water.

Based on these considerations, these potential alternatives offer no environmental, operational, or cost-effectiveness advantages relative to the proposed chlorination method for biofouling control. Further, the use of chlorination has been widely demonstrated as a cost-effective, environmentally acceptable, and operationally efficient method for biofouling control within the power industry. Thus, Tampa Electric Company has selected chlorination as the proposed control method for the Polk Power Station.

8.3.5 COOLING WATER MAKEUP/PROCESS WATER SOURCE ALTERNATIVES

8.3.5.1 Proposed Water Sources

The proposed Polk Power Station project involves the use of a combination of sources for makeup water for the cooling reservoir to replace water primarily lost through net evaporation and for water quality management purposes. The proposed makeup water sources include:

- Direct rainfall on the reservoir;
- Direct stormwater runoff from surrounding and internal earthen berms;
- Treated stormwater runoff from areas associated with industrialized activities (e.g., coal and slag storage, power block, and fuel oil storage areas);
- Treated process wastewaters (except CG process waters);
- Treated domestic wastewaters;
- Net seepage from the surficial aquifer; and
- Groundwater pumped from the Floridan aquifer.

The proposed uses of all of these sources of cooling makeup water are focused on the objective of maximizing the reuse and recycling of water in order to minimize the use of groundwater withdrawals from the Floridan aquifer to provide cooling water makeup. According to current engineering designs and analyses, groundwater from the Floridan aquifer will be withdrawn and provided directly to the cooling reservoir at an estimated annual average rate of 5.0 MGD and a peak rate of 6.5 MGD to maintain normal operational water levels of approximately 136 ft-NGVD in the reservoir after full build-out of the proposed facilities. In addition, groundwater withdrawals from the Floridan aquifer for process, service, and potable uses are estimated to be approximately 1.6 MGD on an annual average basis and approximately 2.8 MGD on a maximum basis. Thus, for the proposed project, the total estimated groundwater withdrawals for cooling water makeup and other plant uses are approximately 6.6 MGD on an annual average basis under normal operating conditions at full build-out of the project (i.e., 1,150 MW) and a peak of 9.3 MGD.

Most of the groundwater for process uses will be treated prior to use in order to provide water with adequate high quality to meet required process water uses (e.g., boiler makeup, pump seals, and non-chemical cleaning). As discussed in Section 3.5, an R.O. system is proposed to treat the Floridan aquifer water, based on the relatively high quality of the water needed for process water uses and Tampa Electric Company's objectives to maximize the reuse of treated wastewaters and, in turn, minimize groundwater withdrawals.

8.3.5.2 Potential Alternative Water Sources

Potential alternative sources of cooling water makeup and process water to either replace or supplement the proposed Floridan aquifer groundwater withdrawals include:

- Groundwater withdrawn from the intermediate aquifer;
- Groundwater withdrawn from the deep, lower Floridan aquifer (i.e., highly mineralized water);
- Stormwater runoff from all or a larger portion of the site;
- Surface water from streams; and
- Public water supply/wastewater treatment systems.

The potential alternative of groundwater withdrawals from the intermediate aquifer at the proposed site does not provide environmental advantages compared to proposed withdrawals from the Floridan aquifer and potentially some disadvantages since many of the domestic water supply wells within the site vicinity are located in this aquifer. Further, the productivity of this aquifer is much lower than the Floridan aquifer; therefore, the extent of any potential aquifer drawdown impacts would be greater than those for the Floridan aquifer. Therefore, the intermediate aquifer was not considered a reasonable alternative for the required water supplies for the proposed project.

The potential alternative of withdrawing groundwater to supply all or some portion of the needed cooling water makeup and process water from the deep, lower

Floridan aquifer was considered by Tampa Electric Company. Water from this deep unit of the Floridan aquifer is highly mineralized and would require extensive treatment prior to use for potable, industrial process, and cooling makeup water purposes. Without pre-treatment, the use of this highly mineralized water would create significant operational and maintenance problems in process water systems and, if provided directly to the cooling reservoir for makeup water, would have adverse water quality impacts in the surficial aquifer due to groundwater seepage from the reservoir and from discharges from the reservoir. Therefore, use of groundwater from the deep, mineralized unit of the Floridan aquifer for process water or cooling water makeup would require extensive and costly pre-treatment compared to the proposed use of low mineralized water from the upper Floridan aquifer system. Such extensive treatment would also create additional volumes of brine or sludge wastes which, in turn, would require additional onsite or offsite disposal areas. Based on these facts, Tampa Electric Company did not consider the potential use of groundwater from the deep Floridan aquifer as a reasonable alternative to the proposed project.

In order to minimize groundwater withdrawals, Tampa Electric Company also considered the potential alternative of collecting and using stormwater runoff from all or a larger portion of the Polk Power Station site to supplement process water and cooling water makeup needs. This potential alternative would involve diverting some volume of the stormwater runoff to the Payne Creek, Little Payne Creek, and/or South Prong Alafia River drainage basins. The collected stormwater runoff from these drainage basins would be directed to the cooling reservoir in order to potentially reduce the need for groundwater withdrawals. However, based on the reclamation requirements of FDNR and SWFWMD to maintain hydrologic conditions relatively similar to pre-mining conditions in terms of the rate and volume of stormwater runoff, the incorporation of this potential alternative into the proposed project would not meet these regulatory reclamation requirements. Therefore, the potential alternative of collecting additional stormwater from the site area was not considered a reasonable alternative.

Withdrawals or diversions of surface water from the nearby Payne Creek, Little Payne Creek, and South Prong Alafia River systems were also considered as potential sources for process and cooling water makeup. However, due to the periodic low-flow conditions in these streams, the withdrawal of water for the proposed project use was not feasible and/or would create significant adverse environmental impacts on these stream systems. Thus, the potential alternative of using surface water sources for facility water needs was not considered reasonable for the proposed project.

Other potential alternative sources of cooling makeup and/or process water would be from public water supply or wastewater treatment systems. However, the nearest public systems are located over 10 miles from the site. Therefore, these alternatives were not considered reasonable at this time.

8.3.6 COOLING RESERVOIR WATER DISCHARGE ALTERNATIVES

8.3.6.1 Proposed Discharge System

The proposed Polk Power Station project has been designed to maximize the recycling and reuse of water in order to minimize groundwater withdrawals and water discharges. Except for the CG process waters, the treated wastewaters from other plant processes and systems will be routed to the cooling reservoir for reuse in the recirculating water cooling system. Discharges from the cooling reservoir are estimated to be approximately 3.1 MGD on an annual average basis to the Little Payne Creek drainage system. During storm events, discharges from the reservoir will be greater. However, the discharges of primarily excess stormwater will be managed and controlled to reduce peak flows from the reservoir and, in turn, downstream flooding conditions compared to pre-mining conditions and to satisfy FDNR and SWFWMD requirements for mass flow contributions.

8.3.6.2 Potential Alternative Discharge Systems

Potential alternatives for discharges from the cooling reservoir would include:

- Discharge to Payne Creek or South Prong Alafia River surface water systems,
- Deep well injection of discharge water, and
- Zero discharge from the cooling reservoir.

The first potential alternative would involve the discharge of water from the cooling reservoir directly to the Payne Creek or South Prong Alafia River systems. The Payne Creek and South Prong Alafia River drainage systems in the vicinity of the site have been significantly impacted by phosphate mining activities similar to the Little Payne Creek system, the proposed receiving water body. Direct discharges to these creeks from the cooling reservoir and plant site area would not meet FDNR requirements to reclaim drainage basins of mined areas to pre-mining conditions. Therefore, since the use of these other surface water drainage systems does not meet regulatory requirements and offers no environmental advantages, these potential discharge alternatives were not considered reasonable.

Another potential discharge alternative would involve disposing of the cooling reservoir discharge water in a deep injection well. This well would need to be at least 24 inches in diameter and at least 3,000 to 4,000 ft deep to reach deep strata that are capable of receiving adequate quantities of the discharge water. This potential discharge alternative would avoid any water quality or quantity concerns associated with the proposed discharge plan to the Little Payne Creek system. However, the injection well alternative would be costly to construct and would require extensive studies even to demonstrate its engineering feasibility. Therefore, this potential alternative was not considered reasonable for further analysis.

If the project were designed to have zero discharge from the cooling reservoir, potential environmental concerns with any discharges would be eliminated. The implementation of this zero-discharge alternative may be feasible by increasing the heights of the earthen berms surrounding the cooling reservoir to provide sufficient water storage capacity under all foreseen and unforeseen situations and providing water treatment facilities to ensure water quality in the reservoir does not exceed applicable groundwater and surface water standards. The specific height of berms required would be difficult to determine since the design must consider all, even unforeseen, future situations. Another means of implementing this zero discharge alternative would be to subject the potential discharge water or water within the reservoir to extensive treatment which would produce a concentrated solid waste. This solid waste would then need to be disposed in a landfill facility on- or offsite.

Both of these methods of potentially achieving the zero discharge alternative would involve significantly higher construction and operating costs compared to the proposed project. In addition, the technical feasibility of being able to demonstrate that zero discharges would occur under all future situations may not be possible. Based on these issues and the fact that the proposed discharge plan for the Polk Power Station project is expected to have minimal environmental impacts, the potential zero discharge alternative was not considered reasonable.

8.3.7 WASTEWATER CONTROL AND TREATMENT ALTERNATIVES

8.3.7.1 Sanitary Wastewater System Alternatives

The following potential alternatives were evaluated for treatment of the 10,500 GPD of sanitary wastewater generated from the proposed Polk Power Station project:

- Onsite package treatment system,
- Septic systems, and
- Offsite publicly owned treatment works (POTW).

Proposed Treatment System

The proposed onsite package treatment system is a prefabricated outdoor module which treats sanitary wastes through continuous aeration, sedimentation and biodegradation, filtration, and chlorination of the effluent prior to discharge to the cooling reservoir. The treatment process will generate sludge which will be dewatered and hauled offsite by a licensed contractor for disposal.

Potential Alternative Systems

The septic tank alternative is a relatively low-cost alternative. For this alternative, the onsite soils must have a satisfactory absorption rate without interference from groundwater or impervious strata. The septic system alternative is viable at the Polk Power Station site, but offers no environmental advantages compared to the proposed treatment system.

Offsite treatment involves directing the sanitary wastes by pipeline to the nearest POTW. The closest POTWs which may have sufficient capacity to accept the project sanitary wastewaters are located more than 10 miles from the Polk Power Station site (i.e., Mulberry or Fort Meade). The costs for the required pipeline from the site to these facilities and associated equipment would be extremely high and significantly exceed the costs for the proposed onsite treatment system. Also, construction of the pipeline may result in certain environmental impacts. Based on these considerations, the proposed onsite treatment system was considered as the only reasonable alternative for sanitary wastewater treatment.

8.3.7.2 Process Wastewater Treatment Alternatives

Proposed Treatment Systems

For the proposed Polk Power Station project, process wastewaters, except for process water from the CG facilities, and stormwater runoff from industrial activity areas of the site will be appropriately treated and routed to the cooling reservoir for reuse in the recirculating water cooling system. Sources of these process wastewaters include boiler blowdown, non-chemical cleaning water, and other low-volume, intermittent streams such as plant drains and laboratory wastes. Sources of stormwater runoff industrial activity areas include the coal, slag, fuel oil, and wastewater treatment sludge storage areas and the immediate power block areas. The proposed treatment systems for these wastewaters and stormwaters include a combination of sedimentation, oil/water separation, neutralization/oxidation, clarification, chemical restabilization, and polishing filtration. The treated waters will have acceptable quality for reuse in the cooling reservoir and their discharge to the reservoir will not create any significant adverse environmental impacts.

Potential Alternative Systems

Potential alternatives to the proposed process wastewater treatment system which were considered included:

- Discharge of treated wastewater directly offsite,
- Disposal of wastewater by deep well injection, and
- Zero liquid discharge treatment.

The discharge of treated wastewater directly to offsite surface waters (i.e., Little Payne Creek, Payne Creek, or South Prong Alafia River) rather than the proposed discharge to the cooling reservoir would create the need for additional groundwater makeup withdrawals by approximately 0.5 MGD to maintain the normal operating water level in the reservoir. Also, since the treated wastewater may not meet all Florida Class III water quality standards, the direct discharge of the wastewater to the smaller streams (i.e., Little Payne Creek and Payne Creek) in the site vicinity would not be feasible or permissible. These smaller streams do not have sufficient

flow volumes to allow for mixing in compliance with the state standards. The South Prong Alafia River may have sufficient flow to allow for mixing; however, discharge of wastewater to the river offers no environmental advantages compared to the proposed discharge to the cooling reservoir since the water volume in the reservoir is greater than the river flow. Also, construction of a discharge pipeline to the South Prong Alafia River would involve higher costs than the proposed discharge plan.

As discussed previously for the cooling reservoir discharge alternatives, the potential alternative of disposing the treated wastewater in a deep injection well would involve construction of a 3,000 to 4,000-ft deep well to reach suitable strata for receiving the water. Again, the injection well alternative would be significantly more costly than the proposed discharge plan and would require extensive studies to demonstrate the feasibility of the alternative. Therefore, this potential alternative was not considered reasonable.

The final wastewater disposal alternative would involve the construction and operation of additional treatment facilities to reduce the wastewater to a solid waste or sludge with no liquid discharge. This alternative would eliminate any concerns associated with the quality of the treated wastewater in the cooling reservoir. However, the disposal of the solid waste or sludge would require additional land area for storage on the site or in an offsite landfill facility. Further, the construction and operation of such treatment facilities would involve significantly higher costs than the proposed plan.

Thus, these potential alternatives for wastewater disposal offered no significant environmental advantages compared to the proposed treatment and discharge system, and in most cases, would involve significantly higher costs and certain technical uncertainties.

8.3.7.3 Coal Gasification Process Water Handling Alternatives

The chemical and physical characteristics of process water from the gasification facilities depends on the composition of the coal used in the facilities. As a demonstration project, a variety of coals will be tested and used in the gasification facilities. Therefore, it is difficult to predict the specific quality of the process water generated in the gasification facilities at this time. Based on this consideration, the proposed gasification process water will be contained and processed in a separate system. The gasification process waters will be handled and recycled within the process, to the extent possible. The proposed handling system for the gasification process water will have no liquid discharges and after concentration, will create a brine which will be stored in a lined area on the site. At this time, no other alternatives were considered reasonable for the handling of the gasification process waters.

During and after the demonstration period for the IGCC unit, Tampa Electric Company will develop operational data on the quality of the gasification process water and examine other possible handling and treatment methods for this water. If these future operational testing data demonstrate that the gasification process water will meet applicable water quality standards after certain treatment and not adversely affect the reservoir operations, Tampa Electric Company may request appropriate regulatory approvals to discharge these process waters to the cooling reservoir.

8.3.7.4 Chemical Cleaning Wastewater Disposal Alternatives

The HRSG tubes will require pre-operational and periodic chemical cleaning to remove scale and corrosion and restore heat transfer surfaces. Wastewater produced by this chemical cleaning will be collected and removed by a licensed contractor for offsite treatment and disposal. This proposed disposal method was considered better environmentally than any other potential alternative.

8.3.8 BY-PRODUCT DISPOSAL ALTERNATIVES

For the proposed Polk Power Station project, the slag, sulfur, and H_2SO_4 by-products will be temporarily stored on the site and marketed and sold for offsite use. The proposed temporary slag storage area will be lined with a synthetic material or other materials with similar low-permeability characteristics and have a stormwater runoff collection system. The sulfur and H_2SO_4 will be temporarily stored in tanks or specifically designed rail cars.

Other potential alternatives for disposal of these by-products would be the provision of permanent storage facilities on the site or disposal in offsite landfill facilities. These potential alternatives would involve the commitment of much larger land areas, onsite or offsite, for storage of these by-products than the proposed disposal plans. These alternatives would also not take advantage of potential economic advantages resulting from the sale of these commercially useful by-products. Based on these facts, these potential alternatives were not considered reasonable.

8.3.9 ASSOCIATED FACILITIES CORRIDOR ALTERNATIVES

The proposed Polk Power Station project will include several associated, linear facilities: electric transmission lines, railroad spur, natural gas pipeline, and potentially, fuel oil pipeline. The proximity of the site to existing linear facilities was a key consideration in selecting the proposed Polk Power Station site. Due to the site's proximity to existing facilities, most of the proposed corridors for new linear facilities are located completely within the boundaries of the site and no other alternative routes for these onsite corridors were considered by Tampa Electric Company to be needed or reasonable. The following describes the associated, linear facilities for the proposed project.

8.3.9.1 Transmission Lines

Two transmission line corridors, each containing two 230-kV circuits, will be needed to connect the Polk Power Station to the regional power grid. One of these corridors will connect the onsite substation to the existing Tampa Electric Company Hardee-Pebbledale 230-kV transmission line. The right-of-way for existing Hardee-Pebbledale line is located within the Polk Power Station site along the northeast boundary of the site. Therefore, the proposed transmission line corridor is located completely within the site boundaries and no other alternative corridor route was considered to be reasonable or needed to minimize environmental effects.

The other proposed transmission line corridor for the Polk Power Station will connect the onsite substation to the existing Tampa Electric Company Mines-Pebbledale 230-kV transmission line located to the north of the site at a point west of the unincorporated community of Bradley Junction. This proposed transmission line corridor will run west from the onsite substation to SR 37. This portion of the corridor will be 400 ft wide and is located entirely within the Polk Power Station site boundaries. The proposed centerline of the corridor will turn north at SR 37 at a point approximately 1,500 ft north of Bethlehem Road. The proposed corridor will traverse north along SR 37, and then turn northwest at a point south of Bradley Junction in order to connect to the existing circuit while avoiding this community.

The corridor width along SR 37 is 0.5 mile and is increased to 1 mile southwest of Bradley Junction to allow flexibility in routing the line around mined areas and phosphate clay settling ponds, and to avoid the existing community. The total length of this transmission line corridor is approximately 5.2 miles, including approximately 0.75 mile on the Polk Power Station site.

In addition to the proposed corridor route, Tampa Electric Company considered a potential alternative corridor which would run south on SR 37 to SR 674 and west to the Polk/Hillsborough County line. The alternative corridor would then run north along the county line to the existing Mines-Pebbledale transmission line. This alternative corridor was significantly longer than the proposed corridor and would potentially impact more wetland and residential areas along the county line. Based on these findings, this alternative was not considered reasonable compared to the proposed corridor.

8.3.9.2 Natural Gas Pipeline

Natural gas will be used as the primary fuel for the stand-alone CT and CC units planned for the Polk Power Station. Natural gas will be delivered to the site via a pipeline from the existing or future natural gas transmission system in the region. FGT has existing gas transmission pipelines in the vicinity and crossing the western tract of the site. FGT is also currently proposing certain additions to and expansions of its system in the site vicinity such as a new metering station at the intersection of SR 37 and CR 630 within the Polk Power Station site and a new pipeline between its St. Petersburg and Sarasota laterals, which would be located primarily along CR 39 in Hillsborough County, approximately 5.5 miles to the west of the site. Other natural gas transmission companies are also considering developing new systems in the region.

At the current time, Tampa Electric Company is evaluating the various alternatives to supply natural gas to the Polk Power Station. Therefore, specific interconnection points to the existing or planned future gas transmission system in the site area and,

in turn, the proposed pipeline route or alternative routes to the Polk Power Station site have not been determined at this time.

8.3.9.3 Fuel Oil Pipeline

Initially, No. 2 fuel oil will be used as a primary fuel for the stand-alone advanced CT unit planned for the Polk Power Station, which will be integrated with the CG and HRSG/ST facilities to form the IGCC unit. Fuel oil will be delivered to the site by tanker truck and/or rail. This will occur during the first year of operation, after which conversion to IGCC will have been completed. After this conversion, based on current fuel cost considerations, Tampa Electric Company anticipates that fuel oil will serve primarily as a backup fuel for the IGCC and stand-alone CT and CC units.

GATX is currently proposing to construct a new fuel oil pipeline in the site region. The proposed pipeline would parallel Fort Green Road and the CSX Railroad located adjacent to the eastern boundary of the Polk Power Station site. When constructed, fuel oil could be delivered to the site via a pipeline from the proposed GATX pipeline to the onsite fuel oil storage tanks. The corridor for this supply pipeline would be located within the boundaries of the Polk Power Station site and, therefore, would not affect offsite land uses or resources. No other alternatives for the pipeline corridor route were considered reasonable.

8.3.9.4 Railroad Spur

Railroad access to the Polk Power Station will be provided by construction of a rail spur from the existing CSX Railroad line which runs along the east side of Fort Green Road adjacent to the eastern boundary of the site. This rail spur will be used for delivery of coal and certain equipment and materials to the site. Except for a short segment (i.e., approximately 200 ft) of the rail spur to cross Fort Green Road, the spur will be located within the boundaries of the Polk Power Station site. Therefore, any offsite impacts associated with the construction of this rail spur will be insignificant and no alternative routes were considered reasonable.

8.4 NO-ACTION ALTERNATIVE

The no-action alternative represents the situation in which the proposed Polk Power Station project would not be constructed and operated. Of course, if the proposed project were not constructed, all potential environmental impacts of the project would be avoided. To varying degrees, these potential impacts involve air quality, groundwater and surface water resources, wetland and ecological resources, and socioeconomic and transportation conditions. These potential impacts involve both potentially adverse and beneficial effects.

Under the no-action alternative, Tampa Electric Company would be unable to reliably meet the future electricity needs of its Customers beginning in 1995 when Polk Unit 1 is currently scheduled to be in-service. Further, without the proposed future units, Tampa Electric Company may be forced to implement a program of selective or rolling blackouts during periods of peak demand. Operating at LOLP levels which are detrimental to system reliability and with forced blackouts would present unacceptable conditions for an electric utility with the mandated obligation to provide reliable and cost-effective electric power to its Customers. The no-action alternative would also be inconsistent with the FPSC certification of the need for the proposed Polk Unit 1.

Finally, under the no-action alternative, DOE would not achieve its objective for the proposed IGCC demonstration project to demonstrate the efficient and environmentally acceptable use of the coal for electric power generation. Under this situation, DOE would cancel its agreement with Tampa Electric Company to provide \$120 million in potential funding for the demonstration project.

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Environmental Consulting & Technology, Inc. (ECT). 1990. Power Plant Site Selection Assessment Report. Gainesville/Tampa, FL.

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CHAPTER 9.0

POLK POWER STATION SITE RECLAMATION REQUIREMENTS

A majority of the land at the Polk Power Station project site has been mined to recover phosphate or disturbed due to mining related activities. Current mining of portions of the site lying west of SR 37 and north of SR 674 will continue into 1994. Due to these past and ongoing mining activities, more than 94 percent of the 4,348-acre site will be mined or disturbed by mining activities prior to Tampa Electric Company's use of the site for the Polk Power Station project.

Section 211, F.S., and Chapter 16C-16, F.A.C. prescribe the State of Florida requirements to reclaim lands mined for phosphate subsequent to July 1, 1975, commonly referred to as "mandatory lands." Reclamation of lands mined prior to July 1, 1975 is not mandatory; however, state severance tax-based funding is available to reimburse owners of certain "non-mandatory" lands for some or all of the cost of voluntary reclamation activities. Non-mandatory reclamation is governed by Section 378, F.S. and Chapter 16C-17, F.A.C. Both of these regulatory programs are administered by FDNR. The Polk County Phosphate Mining Ordinance 88-19 also prescribes the requirements for reclamation of mined lands in the county.

This chapter describes the reclamation status of the site, together with the procedures to be followed and applications to be filed to reclaim the site to accommodate the Polk Power Station project in accordance with FDNR rules. Because most of the site has been mined and because FDNR and Polk County are now an integral part of the SCA process (Section 403, F.S.), it is appropriate to incorporate these regulatory requirements into the SCA for the Polk Power Station project. The complete description of the reclamation plan and the completed FDNR forms are contained in the Conceptual Reclamation Plan Application submitted by Tampa Electric Company to FDNR as a separate document.

9.1 BACKGROUND OF SITE RECLAMATION REQUIREMENTS AND PLANS

9.1.1 RECLAMATION STATUS OF THE SITE

The Polk Power Station site consists of four separate types of land with respect to FDNR land reclamation regulations. These include: (1) lands disturbed prior to 1975; (2) lands disturbed prior to 1975 and re-mined subsequently; (3) lands mined subsequent to July 1975; and (4) lands not disturbed by phosphate mining. To simplify this description, the site has been subdivided into the parcels shown on Figure 9.1.1-1 and described in the following paragraphs.

9.1.1.1 American Cyanamid Old Lands (Parcel A)

Parcel A consists of lands owned by the American Cyanamid Company in Section 35, Township 31 South, Range 23 East. This property, totaling approximately 400 acres, is not subject to the mining lease agreement between IMC Fertilizer and American Cyanamid at the Haynsworth Mine. The parcel was mined prior to 1940 and is not eligible for reclamation funding through the FDNR Non-Mandatory Reclamation Trust Fund. Tampa Electric Company's proposed reclamation activities on this parcel will consist of minor grading to facilitate construction of the transmission line and a service road, regrassing of this area, and planting a 150 ft wide forested swath along the CR 630 and Fort Green Road rights-of-way in order to create a visual buffer for the main plant facilities. In the event the Polk Power Station project is not built, no additional reclamation work would be required on this parcel.

Tampa Electric Company proposes to use this parcel primarily as a buffer to the proposed facilities and to locate a transmission line from Fort Green Road into the plant site.

There are no mandatory reclamation requirements associated with this parcel.

9.1.1.2 American Cyanamid Old Lands (Parcel B)

American Cyanamid also owns approximately 127 acres in Section 2, Township 32 South, Range 23 East, referred to as Parcel B. This property is not subject to the

9.1.1-2

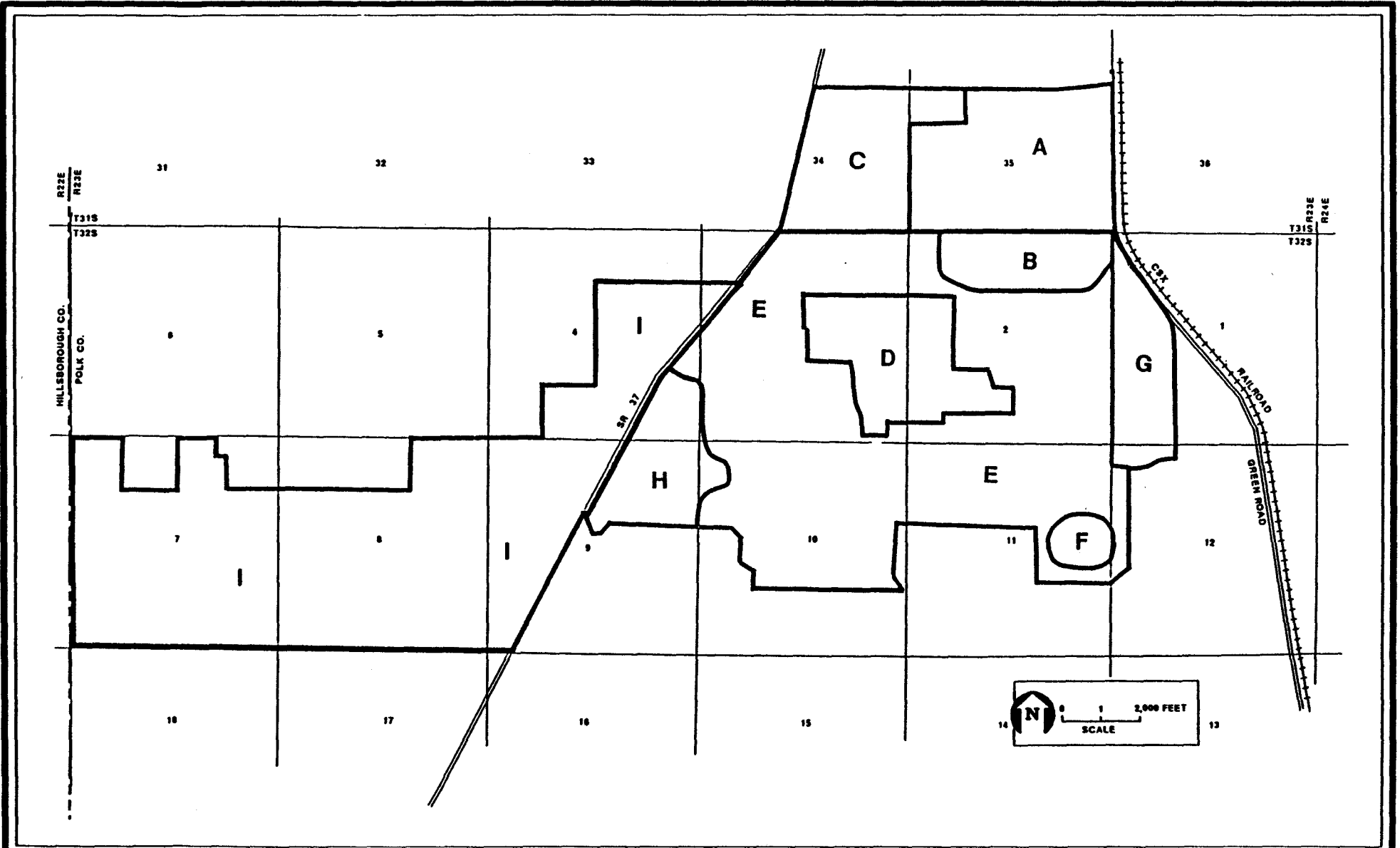


FIGURE 9.1.1-1.
RECLAMATION STATUS PARCELS ON POLK POWER STATION SITE

Sources: USGS, Duette NE, FL, Revised 1972. Baird, FL, Revised 1987. ECT, 1992.



**POLK
POWER
STATION**

mining lease agreement between IMC Fertilizer and American Cyanamid. The parcel was mined prior to 1940; however, it is not eligible for reclamation funding through the FDNR Non-Mandatory Reclamation Trust Fund. Four acres along the southern boundary of this parcel were disturbed by Agrico when the adjacent property was mined; this 4-acre area is addressed by Agrico's mandatory reclamation programs. Parcel B consists of a rectangular deep lake in an old mine cut which is nearly divided into two cells.

Tampa Electric Company proposes to use this land as part of the stormwater management system for the Polk Power Station. This will require only minor grading activities along the northwest and southeast corners of the lake to improve drainage into an out of the lake. These activities are included in the separate Conceptual Reclamation Plan Application. In the event the project is not constructed, no alternate reclamation plans will be needed since no mandatory reclamation obligation exists for this parcel, with the exception of the 4 acres disturbed by Agrico. These acres would be reclaimed in accordance with Agrico's existing approved plans.

9.1.1.3 American Cyanamid/IMC Fertilizer Land (Parcel C)

Parcel C consists of land owned by the American Cyanamid Company in Sections 34 and 35, Township 31 South, Range 23 East. This property, totalling 248 acres, is subject to a mining lease agreement between IMC Fertilizer and American Cyanamid. Although some of this land was mined prior to 1940, IMC Fertilizer re-mined this property during 1987-1991. Mandatory reclamation plans for this area have been approved by FDNR and the property has been reclaimed by grading overburden left at the site into upland pasture, lakes, and wetlands. This parcel has not been released from reclamation liability because the post-reclamation monitoring period has not expired.

Tampa Electric Company proposes to use this parcel primarily as a buffer area to the proposed plant facilities and the southern most lake and wetland area of the parcel as a part of the site stormwater management system. These changes will be

accomplished by grading an outlet swale to connect the reclaimed "C" shaped lake and wetland system on this parcel with the plant site stormwater drainage outlet to the south and the old mine cut lake located on Parcel B to the east. The re-graded swale will be revegetated to wetland vegetative conditions. The remainder of this parcel will not be affected by Tampa Electric Company's proposed plans. Some supplemental tree planting is proposed along SR 37 and CR 630 to provide a visual buffer for the main plant facilities.

It is anticipated the Tampa Electric Company will acquire this parcel before American Cyanamid and/or IMC Fertilizer are released from mandatory reclamation obligations triggered by IMC Fertilizer's re-mining of the property. An amendment to the approved IMC Fertilizer reclamation program will be required to accommodate Tampa Electric Company's proposed drainage system changes. In the event the project is not constructed, no alternate plans will be required because the site has already been reclaimed in accordance with IMC Fertilizer's approved program.

9.1.1.4 Agrico Land--Plant Site (Parcel D)

Parcel D consists of land owned by Agrico in Sections 2 and 3, Township 32 South, Range 23 East. This parcel, totalling approximately 300 acres, is an irregular-shaped parcel of unmined land surrounded by mined, but unreclaimed land. The FDNR mandatory reclamation liability for this parcel would be limited to minor grading and revegetation of areas disturbed in association with adjacent mining. These activities were performed by Agrico after 1975 and the parcel is subject to mandatory land reclamation requirements.

Tampa Electric Company proposes to locate the primary power plant facilities for the Polk Power Station on this parcel. Tampa Electric Company will acquire this property in its current condition and assume any reclamation liability associated with this land. In the event the project is not constructed, it is Tampa Electric Company's understanding that a modification to Agrico's approved conceptual plan and reclamation programs would be necessary prior to commencing reclamation. This

modification would be required in the event that Agrico's plans to develop above grade clay waste disposal facilities in this area have changed.

9.1.1.5 Agrico Land--Cooling Reservoir (Parcel E)

Parcel E consists of land owned by Agrico in Sections 1, 2, 3, 4, 10, 11, and 12, Township 32 South, Range 23 East. This parcel, totalling approximately 1,697 acres, is an irregular shaped parcel of mined, but unreclaimed, land which surrounds the proposed main plant facility site (Parcel D). All of this property was mined after 1975 by Agrico and is subject to the FDNR mandatory reclamation obligations.

For the proposed Polk Power Station, Tampa Electric Company will convert approximately half of this parcel into a primarily below-grade cooling water reservoir, as described in Section 3.5. The remainder will be reclaimed as wetland and upland systems. Tampa Electric Company will acquire this property in its current condition and assume all reclamation liability associated with this land. In the event the project is not constructed, it is Tampa Electric Company's understanding that a modification to Agrico's approved conceptual plan and reclamation programs would be necessary prior to commencing reclamation. This modification would be required in the event that Agrico no longer plans to develop above grade clay waste disposal facilities in this area.

9.1.1.6 Agrico Land--Eagle's Nest (Parcel F)

Parcel F consists of land owned by Agrico in Section 11, Township 32 South, Range 23 East. This parcel, totalling approximately 33 acres, is a circular shaped parcel of undisturbed land which once contained an eagle's nest (number PO-40). This abandoned eagle's nest is discussed in Section 2.3.6. Disturbance of this parcel by Agrico was prohibited by USFWS regulations. Accordingly, there is no mandatory reclamation obligations associated with this parcel. Tampa Electric Company will also not disturb this parcel for the Polk Power Station.

9.1.1.7 Agrico Land--Reclaimed Lake (Parcel G)

Parcel G consists of land owned by Agrico in Sections 1 and 12, Township 32 South, Range 23 East. This parcel, totalling approximately 142 acres, is a rectangular shaped reclaimed lake and adjacent uplands. All of this land was mined by Agrico after 1975 and reclaimed pursuant to Chapter 16C-16, F.A.C. Final release of the land from reclamation liability would otherwise be expected to occur during the review and processing of this SCA.

According to Tampa Electric Company's plans, this parcel will be connected to the old mine cut lake in Parcel B to complete the stormwater management system east of SR 37 and connecting plant site drainage to Little Payne Creek which is similar to pre-mining conditions. This will be accomplished by grading a swale between this parcel and Parcel B. The rail spur and access road from Fort Green Road will also be constructed on the northern end of this parcel. The lake in this parcel will also receive water discharged from the proposed cooling reservoir.

These changes will require a modification of Agrico's approved conceptual reclamation plan and program for this parcel. In the event the project is not constructed, no changes to Agrico's approved conceptual plan and reclamation program will be required for this parcel since it is already reclaimed.

9.1.1.8 Agrico Land--Southwest Buffer Area (Parcel H)

Parcel H consists of land owned by Agrico in Sections 3, 4, 9, and 10, Township 32 South, Range 23 East. This property, totalling approximately 190 acres, is an irregular shaped parcel of unmined land. The FDNR mandatory reclamation liability for this parcel will be limited to minor grading and revegetation of three corridors cleared for access to other mineable areas. These activities were performed by Agrico after 1975.

For the Polk Power Station, Tampa Electric Company will use this land only as a buffer area. No additional disturbance to this parcel will occur. Tampa Electric

Company will amend Agrico's conceptual plan and program for this parcel to reflect the fact that it was not mined and will not be used by Agrico to store clay wastes. These amendments will be identical to those required in the event the project is not built.

9.1.1.9 Agrico Land (Parcel I)

Parcel I consists of land owned by Agrico in Sections 3, 4, 7, 8, and 9, Township 32 South, Range 23 East. This property, totalling approximately 1,511 acres, is an irregular shaped parcel bordered by SR 674 on the south, SR 37 on the east, and the Hillsborough County line on the west. Agrico began mining this parcel in 1989 and projects mining to continue into 1994. When completed, Agrico will have mined approximately 1,056 acres of this parcel.

For the Polk Power Station project, Tampa Electric Company will use this land as a wildlife habitat/corridor system by reclaiming this land into wetlands and uplands. No plant facilities are planned for this parcel.

Tampa Electric Company will acquire this property prior to release from reclamation liability requirements of FDNR; therefore, the approved conceptual reclamation plans for this land will need to be amended. In the event the project is not built, it is Tampa Electric Company's understanding that this parcel would be reclaimed in accordance with Agrico's approved plans.

9.1.2 PROCEDURES TO AMEND APPROVED RECLAMATION PLANS AND PROGRAMS

The purchase by Tampa Electric Company of Agrico lands subject to the mandatory reclamation requirements of FDNR introduces an additional party or applicant into the normal implementation procedures for FDNR reclamation rules. Tampa Electric Company representatives, during the course of several meetings with FDNR staff, were provided with the following guidelines for submission of the necessary information for FDNR's review:

1. An individual Conceptual Reclamation Plan should be prepared addressing the specific aspects of the 4,348 acre Polk Power Station site in terms of pre-mining and post-reclamation hydrology, topography and land use. Since most pre-mining and post-reclamation comparisons of these aspects within FDNR Chapter 16C-16, F.A.C., apply only when considering the entire mine site and 523 acres of the site were mined prior to 1975 and are not within FDNR's jurisdiction, this plan would serve primarily as an information base for the project and provide details to be included in future FDNR program submittals.
2. Agrico, as the mine operator, would continue to share the responsibility for land reclamation with Tampa Electric Company even after the change in land ownership. The Agrico Conceptual Reclamation Plan (AGR-FG-CPF) would require the appropriate modification to reflect the proposed mine wide changes as the result of the Polk Power Station construction. This modification would be limited to the 3,573 acres of Agrico mandatory lands within the Polk Power Station site.
3. The portion of the American Cyanamid land (248 acres) under lease to IMC Fertilizer is included in the IMC Fertilizer Haynsworth Mine Conceptual Plan. The reclamation of this parcel is effectively complete and only minor changes would be involved because of the inclusion of this property into the Tampa Electric Company site plans. These changes, as envisioned, would require only an amendment to the approved Program [IMC-H-87(3)], not the Conceptual Plan.

4. Variance requests would be required on the basis that this industrial land use, while not prohibited by FDNR Chapter 16C-16, F.A.C., is not compatible with all the standards developed primarily for the reclamation of natural wildlife habitat and agricultural land uses.

The majority of Polk Power Station site (3,573 acres) is located within the boundary limits of Agrico's Fort Green Mine which is an active phosphate mining operation consisting of 31,906 total acres. The Fort Green Mine Conceptual Reclamation Plan was originally approved by the Governor and cabinet, sitting as the agency head of FDNR on April 6, 1982. Subsequent modifications were approved on July 19, 1983; February 18, 1986; February 11 and November 22, 1988; and May 14, 1991.

The Conceptual Reclamation Plan Application submitted to FDNR contains applications to modify the approved Fort Green Mine Conceptual Plan and incorporates all of the proposed changes described in this document. These applications include:

<u>Applicant</u>	<u>Acres Included</u>	<u>FDNR Form</u>
Tampa Electric Company	4,348*	No. 1
Agrico	31,906	No. 6
Tampa Electric Company	4,348†	No. 7

*Includes old lands for continuity.

†Variance requests.

Following approval of the applications, the individual programs within the application area would then be amended for consistency as shown in Table 9.1.2-1.

The total land use and cover distribution by FLUCCS code for the approved Agrico plan is summarized in Table 4.4.1-1 in Section 4.4.1 of this SCA. Also, the following maps, which are included in the conceptual plan application, are provided in Appendix 11.16 of this SCA:

- Location map,
- Mining operations status map,

Table 9.1.2-1. Acreages of Reclamation Program After Approval of Applications Related to Polk Power Station Site

Program I.D.	Tampa Electric Company Acres	Agrico Acres*
FG-SPA-1	595	
FG-SPA-2	442	
FG-PC-4	475	
FG-SRS-37	66	7
FG-83-2	1,071	119
FG-84-2	409	
FG-84-3	113	
FG-84-4	142	
FG-SP-15	33	573
FG-SP-16	231	14
IMC-87-3	248	

*Programs split by land exchange.

Source: ECT, 1992.

- Pre-mining topography and drainage,
- Pre-mining vegetation and land use,
- Existing vegetation and land use,
- Post-reclamation topography and drainage,
- Post-reclamation vegetation and land use, and
- Aerial photograph of the Polk Power Station site.

9.1.3 TAMPA ELECTRIC COMPANY RECLAMATION PLANS

The proposed Tampa Electric Company reclamation plan for the Polk Power Station project was designed with the following major objectives and criteria:

1. Re-establish watershed divides to the greatest extent possible in their pre-mining location and re-establish drainage basin runoff flow patterns to pre-mining conditions in accordance with applicable FDNR and SWFWMD requirements;
2. Increase the post-reclamation wetland acres above pre-mining conditions to provide an offset for not meeting the specific requirements of Chapter 16C-16.0051(5)(a), F.A.C., within the cooling reservoir, discussed in more detail in Section 9.1.4;
3. Create a contiguous system of wetlands and forested uplands where possible to provide for wildlife corridors between existing known systems at the site boundaries;
4. Create wetland and upland reclamation designs which provide or enhance wildlife habitat systems of primary importance to threatened and endangered species; and
5. Work in conjunction with Agrico to ensure that the overall objectives in terms of reclamation land use diversity to match pre-mining conditions were met on a mine wide basis including the specific requirements of Chapter 16C-16.0051(4), F.A.C.

The Tampa Electric Company reclamation plan as submitted will optimize all of these criteria within the constraints of the project location and operational requirements. Specific details of the final reclamation design, figures and tabular comparisons are provided in the Conceptual Reclamation Plan Application submitted to FDNR.

9.1.4 APPLICABLE FDNR RECLAMATION RULES

Chapter 16C-16, F.A.C. sets forth phosphate mine reclamation requirements of the State of Florida. Polk County's Phosphate Mining Ordinance 88-19 is generally consistent with FDNR reclamation requirements. Certain sections of these requirements were developed during normal rulemaking procedures with the obvious objective to restore lands mined for phosphate back to the uses which existed before mining, primarily agriculture and natural Florida landscape habitats.

Although the reclamation rules do not prohibit an industrial land use for reclaimed land, the lack of specific recognition of this option in the rule creates some difficulties in terms of compliance with all requirements. The most significant lack of rule flexibility occurs in the area of water body design to consider the construction of a cooling reservoir versus a lake.

Tampa Electric Company's proposed plans to fulfill each of the 12 reclamation and restoration standards contained in Chapter 16C-16.0051, F.A.C., are addressed in the following:

1. Safety--Tampa Electric Company will satisfy completely the requirements for site cleanup and structures.
2. Backfilling and Contouring--Tampa Electric Company will completely satisfy the requirement to grade all lands to a 4-ft horizontal to 1-ft vertical slope, or gentler, including the surrounding and interior berms of the cooling water reservoir.
3. Soil Zone--Tampa Electric Company does not control the ability to use topsoils on the site, as encouraged by this rule. However, all lands to be reclaimed by Tampa Electric Company will consist of re-graded overburden spoil, including topsoil. This growing medium has proven to be suitable based on phosphate industry experience.
4. Wetlands--Tampa Electric Company will satisfy completely the requirement to restore wetlands on an acre-for-acre, type-for-type basis. The acreage tabulations from the pre-mining vegetation and land use and the

post-reclamation land use and vegetation maps are summarized in Table 9.1.4-1 to demonstrate compliance with this requirement.

The overall increase in wetland acres does not include the contribution of the cooling reservoir edge, but is intended to augment these acres with high quality wetland acres separate from the reservoir.

5. Water bodies--Tampa Electric Company has optimized the design of artificially created water bodies which drain into Little Payne Creek, Payne Creek, and/or the South Prong Alafia River. In response to the FDNR's recommendation, Tampa Electric Company has designed the cooling water reservoir to maximize its thermal efficiency. With the exception of the cooling water reservoir, all other water bodies will be reclaimed to be consistent with health and safety practices, be modeled to maximize beneficial contributions within local drainage patterns, be graded to balance deep and shallow water and provide high ratios of various shoreline slopes, and be revegetated to provide aquatic and wetland wildlife habitat values.
- 5a. Annual Zone of Fluctuation--Tampa Electric Company will satisfy this requirement for reclaiming the equivalent of 25 percent of the total highwater surface area to an annual zone of fluctuation. Tampa Electric Company will intentionally not meet the requirement to hydrologically connect these wetlands to the cooling water reservoir because such a connection is not considered beneficial. Instead, Tampa Electric Company is proposing to reclaim an acreage outside of the reservoir equivalent to more than 25 percent of the highwater surface area of the cooling water reservoir (i.e., 727 acres at 136 ft-NGVD x 25 percent = 182 acres) as wetlands which will be connected to receiving streams. Tampa Electric Company will request FDNR approval of this plan as being preferable to hydrologically connecting these wetlands to the cooling water reservoir.
- 5b. Shallow Water Zone--Tampa Electric Company will design and grade a shallow water zone into the slopes of artificial waterbodies located on

**Table 9.1.4-1. Pre-Mining and Post-Reclamation Land Use and Vegetation Map
Acreage Tabulations**

Parcel/Type (FLUCCS Category)	Pre-Mining Acreage	Post- Reclamation Acreage	Difference
IMC Fertilizer herbaceous (640)	12	26	+ 14
IMC Fertilizer forested (610-630)	11	8	-3
Agrico herbaceous (640)	244	379	+ 135
Agrico forested (610-630)	265	312	+ 47
Subtotal herbaceous	256	405	+ 149
Subtotal forested	276	320	+ 44
TOTAL WETLANDS	532	725	+ 193

Source: ECT, 1992.

mandatory lands which drain into the South Prong Alafia River, Payne Creek, and Little Payne Creek. The proposed Tampa Electric Company cooling water reservoir will contain approximately 60 acres of shallow water zone which could be applied to this requirement of 143 acres (i.e., annual low water x 20 percent). Tampa Electric Company will apply for a variance from full compliance with this requirement in the Conceptual Reclamation Plan Application submitted to FDNR.

- 5c. Perimeter Greenbelt--Tampa Electric Company will design and vegetate a perimeter greenbelt of vegetation consisting of tree and shrub species indigenous to the area around each proposed lake in accordance with this requirement. Tampa Electric Company will not satisfy this requirement for the cooling water reservoir because the reservoir berm precludes the intent of the greenbelt under sub-section 2 of this rule. Tampa Electric Company plans to reclaim an additional 100 acres to forested conditions in compliance with the standards contained in Chapter 16C-16.051(9)(c), F.A.C. This acreage is based upon the fact that there are 35,000 ft of shoreline in the cooling water reservoir; application of a 120 ft wide perimeter greenbelt would result in reforestation of 100 acres.
6. Water Quality--Tampa Electric Company will comply with this requirement. Detailed descriptions of projected water quality in the cooling water reservoir and potential water quality impacts are provided in Chapters 3.0, 4.0, and 5.0 of this SCA.
7. Flooding and Drainage--Tampa Electric Company will take all reasonable steps to insure that its development will not cause offsite flooding and is providing hydrologic modeling results to document compliance with this standard. The 1991 pre-application review meetings identified the restoration of the original drainage pattern of the area as a significant issue to be resolved before FDNR staff could recommend approval of Tampa Electric Company's application. The proposed plans contained in the conceptual plan maps have responded to these concerns. The

following summarizes the proposed pre-mining and post-reclamation acreages within the three onsite drainage basins:

<u>Basin Name</u>	<u>Size of Basin</u>		<u>Percent Change in Size</u>
	<u>Pre-Mining</u>	<u>Post-Reclamation</u>	
South Prong Alafia River	816	801	-1.8
Payne Creek	716	710	-0.8
Little Payne Creek	2,816	2,837	0.7

According to Tampa Electric Company's plans, watershed boundaries will be re-established to match pre-mining locations and acreages.

8. Waste Disposal--Tampa Electric Company does not believe these standards apply to its plans.
9. Revegetation--Tampa Electric Company will meet or exceed all of these requirements.
10. Wildlife--Tampa Electric Company's proposed reclamation plan for the 1,511 acres of the site which lie west of SR 37 will provide exceptional habitat for wildlife. The mixture of wetlands and uplands proposed by Tampa Electric Company will be one of the largest single wildlife conservation reclamation areas in Florida, if not the largest. The plan includes the creation of a wildlife corridor between the headwater areas of Payne Creek and Little Manatee River and the South Prong Alafia River system. Ownership and controlled access by Tampa Electric Company will protect this habitat into the 21st Century.

Further, Tampa Electric Company is planning similar uses for the majority of the 775-acre American Cyanamid parcel. In fact, less than 1,000 acres of the entire site will be reclaimed to an industrial use including the cooling reservoir area; the remaining 78 percent of the project site will be buffer and wildlife habitat. Tampa Electric Company proposes that this

high percentage of wildlife habitat will provide appropriate mitigation and compensation for not meeting all the reclamation standards.

11. Time Schedule--Tampa Electric Company will meet reasonable time schedule requirements that are developed as part of this SCA and reclamation plan approval processes. Delays which have occurred in the reclamation of Agrico lands were necessary to meet the complex planning and permitting requirements for the overall Polk Power Station project.
12. Exceptions and Innovations--While Tampa Electric Company believes its project is innovative, it will not apply for release from any FDNR rules on this basis.

9.2 RELATIONSHIP OF PROPOSED PLANT AND ASSOCIATED FACILITIES TO RECLAMATION PLANS

9.2.1 PLANT AND ASSOCIATED FACILITIES LOCATIONS

The proposed plant facilities and site layout are described in Chapter 3.0. The proposed main plant structures with the exception of transmission line structures will not be constructed on mined lands and will not directly affect the proposed reclamation plans or FDNR reclamation rules except for the creation of a storm-water retention basin. Access roads and the railroad spur will be partially constructed on mined lands and the cooling reservoir will be constructed within mined lands to take advantage of the voids left after mining. The cooling reservoir design and water quality considerations are discussed in previous chapters of the SCA. The reservoir's proposed slopes and cover are consistent with FDNR requirements for safety and soil stabilization.

9.2.2 WETLANDS

Two wetland areas west of SR 37 have been previously permitted by USACE and FDER and mined in the phosphate mining operation. According to Tampa Electric Company's proposed plans, these systems will be restored in compliance with the conditions contained in the respective permits.

USACE has asserted jurisdictional authority over the majority of the existing mine excavation areas and certain other old mine pits and disturbed areas on the Polk Power Station site. A preapplication meeting held with USACE has provided assurance that the proposed wetland reclamation adjacent to the plant site will provide sufficient mitigation for the proposed filling activities. A Section 404 permit application to USACE is included in Appendix 11.1. SWFWMD has evaluated certain remnant disturbed wetlands proposed to be mitigated for in the context of the surface water management permit for the site.

Based on the lack of undisturbed wetlands within the proposed construction activity area, FDER did not require a binding wetland jurisdictional determination of the site (see Appendix 11.10). Wetland mitigation impacts will be evaluated by the FDER on the basis of comparing the existing Agrico reclamation plan to the proposed Tampa Electric Company plan in terms of wetland construction. The proposed Tampa Electric Company wetland mitigation plan matches the Agrico Plan on the basis of total wetland acres, type for type, and should satisfy this requirement.

All mitigation wetlands have been carefully designed to function effectively within the established watersheds, contribute beneficial water quality and quantity additions to receiving streams, and maximize wildlife habitat values through diversity.

9.2.3 WILDLIFE AND ENDANGERED SPECIES

No significant wildlife habitat will be lost or impacted by the construction and operation of the proposed plant and cooling reservoir. The cooling reservoir will contain high quality water and, similar to phosphate industry reservoirs, provide habitat for fish, reptiles, wading birds and many species of migratory water fowl.

A water subsidy through discharges from the reservoir and other proposed stormwater drainage changes will be provided to Little Payne Creek wetlands which have been hydrologically altered by past mining in the area. The wetland losses within the proposed cooling reservoir area will be mitigated through the creation of new wetlands in areas which were previously uplands subject to agricultural and silvacultural activities.

Reclaimed upland areas are proposed for reforestation in much higher densities than required by the FDNR in order to create wildlife corridors instead of open pasture.

9.3 RELEASE PROCEDURES

It is the intent of Tampa Electric Company to seek release from FDNR of individual logical reclamation units (LRU's) as the projects are completed and standards are satisfied. The specific boundaries of certain LRU's will need to be amended to incorporate the appropriate boundaries of the proposed construction activities in a more logical fashion.

9.4 FINANCIAL RESPONSIBILITY

It is Tampa Electric Company's understanding that until the reclamation requirements of the FDNR have been satisfied, Tampa Electric Company and Agrico will share the responsibility for the Agrico portion of the Polk Power Station site. IMC Fertilizer will share the same responsibility for their portion of the American Cyanamid property. FDNR assigns the primary responsibility for reclamation to the mine operator regardless of land ownership.

9.5 VARIANCES AND AMENDMENTS

An amendment/modification to the Agrico conceptual reclamation plan AGR-FG-CPF will be required to incorporate the proposed changes in the project site.

As part of this modification, a variance will be sought from Chapter 16C-16.0051(5), F.A.C., and Chapter 16C-16.0051(11)(b), F.A.C., reclamation standards for lake design and reclamation timing, respectively. The request for variance from these standards and supporting information for this request is provided in the Conceptual Reclamation Plan Application submitted to FDNR as a separate document.

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CHAPTER 10.0

COORDINATION

Various federal, state, regional, and local agencies were contacted by Tampa Electric Company to provide inputs for the Polk Power Station project. The general public and public organizations were also contacted regarding the project. Through these contacts, Tampa Electric Company obtained comments and inputs on the Environmental Licensing Plan of Study (POS) for the project, the applicable regulatory requirements of the various agencies, and key issues or concerns to be addressed in the licensing program. These agency and public contacts occurred throughout the approximately 18-month period of the licensing efforts prior to submission of this SCA.

Table 10.0.0-1 presents an overall listing of the agencies and public organizations which were contacted regarding the Polk Power Station project.

Table 10.0.0-1. Polk Power Station Agency and Public Organization Contacts

Date	Agency/ Organization	Purpose	Contact(s)
04/25- 26/90	DOE	Reasonableness review	DOE staff
05/16- 17/90	DOE	General meeting	DOE staff
05/25/90	DOE	General meeting	DOE staff
06/01/90	DOE	General meeting	DOE staff
06/11/90	DOE	Project review meeting	DOE staff
06/19/90	DOE	General meeting	DOE staff
08/15/90	DOE	General meeting	DOE staff
10/30/90	DOE	Scoping meeting	DOE staff
11/07/90	DOE	Discuss cooperative agreement	DOE staff
11/15/90	DOE	Discuss cooperative agreement	DOE staff
12/14/90	DOE	Review EIV	DOE staff
01/10/91	FDHR	Request listing of sites on Master Site File in project area	J. Erdmann- Maglievaz
01/14/91	Polk County	Discuss site selection assessment and plans for Polk Power Station	R. Jackson
01/23/91	Polk County	Discuss site selection and plans for Polk Power Station	D. Costello
01/23/91	Polk County	Discuss site selection and plans for Polk Power Station	N. Combee
01/23/91	Polk County	Discuss site selection and plans for Polk Power Station	R. Connors
01/23/91	Polk County	Discuss site selection and plans for Polk Power Station	M. Young
01/23/91	FDER	Discuss plans for Polk Power Station and ambient air monitoring program	B. Oven M. Linn T. Collins
01/23/91	FDNR	Discuss plans for Polk Power Station	V. Sharpe C. Albin S. Partney B. Murphy

Table 10.0.0-1. Polk Power Station Agency and Public Organization Contacts
(Continued, Page 2 of 5)

Date	Agency/ Organization	Purpose	Contact(s)
01/29/91	FDOT	Obtain traffic counts on roads in project area	J. Cranford
02/08/91	Polk County	Discuss land use and zoning	D. Martin and other staff
02/21/91	Polk County, Department of Development Coordination, and CFRPC	Submit and review POS	M. Bishop B. Sodt
02/21/91	SWFWMD	Submit and review POS	R. Viertel and other staff
02/22/91	FDER	Submit and review POS	B. Oven S. Palmer and other staff
02/22/91	FDNR	Submit and review POS	V. Sharpe and other staff
02/22/91	FDCA	Submit and review POS	P. Darst
03/04/91	EPA	Review POS	H. Mueller C. Hoberg and other staff
03/12/91	FPSC	Discuss site selection assessment and Siting Task Force results	Commissioners and staff
03/19/91	DOE	Sign cooperative agreement	DOE staff
03/28/91	FDER	Discuss standard operating procedures (SOP) for air monitoring	B. Blommel T. Collins
04/02/91	Polk County	Discuss land use and zoning	D. Martin and other staff
05/17/91	FDNR	Obtain pre-mining information	S. Partney and other staff
06/17/91	FDER	Discuss site selection and plans for Polk Power Station	C. Browner and staff
07/05/91	FDER	Discuss comments on POS	S. Palmer
07/17/91	Siting Task Force	Tour of Polk Power Station site	Siting Task Force members
08/06/91	FDER	Discuss comments on POS	S. Palmer and other staff

Table 10.0.0-1. Polk Power Station Agency and Public Organization Contacts
(Continued, Page 3 of 5)

Date	Agency/ Organization	Purpose	Contact(s)
08/13/91	FDER	Audit of ambient air quality monitoring program records	K. Colaw
08/13/91	FDER	First quarterly audit of air quality monitoring network	G. Carroll
08/13/91	DOE	Meeting with contractors	DOE staff
08/26/91	DOE	Meeting on strategy	DOE staff
09/04/91	Polk County	Discuss IGCC project at Polk Power Station	D. Costello
09/04/91	Polk County	Discuss IGCC project at Polk Power Station	N. Combee
09/04/91	Polk County	Discuss IGCC project at Polk Power Station	R. Connors
09/04/91	Polk County	Discuss IGCC project at Polk Power Station	M. Young
09/04/91	Polk County	Discuss IGCC project at Polk Power Station	L. Libertore
09/04/91	FPSC	Discuss IGCC project and DOE grant	Staff
09/05/91	FPSC	Filed Need Petition	Staff
09/09/91	FDER	Discuss water quality QA program	A. Tyndell J. Watts S. Palmer
09/11/91	FDNR	Discuss reclamation issues	J. Craft and other staff
09/20/91	Siting Task Force	Tour of Polk Power Station site	Siting Task Force members
09/30/91	FDNR	Review preliminary conceptual reclamation plan	V. Sharpe and other staff
10/16/91	FDER	Discuss water quality data validation	J. Watts
10/21/91	FDER	Discuss ambient air quality monitoring program audit results	D. Arbes K. Colaw D. Stuart
11/06/91	National Audubon Society	Discuss conceptual reclamation plans	R. Paul

Table 10.0.0-1. Polk Power Station Agency and Public Organization Contacts
(Continued, Page 4 of 5)

Date	Agency/ Organization	Purpose	Contact(s)
11/13/91	FDER	Audit of PACE Laboratories	K. Colaw
11/20/91	FPSC	Prehearing conference on Need Petition	FPSC Commis- sioners and staff
12/03/91	EPA and DOE	Discuss federal NEPA requirements and procedures for Polk Power Station	H. Mueller C. Hoberg M. Ghate B. Buvinger
12/03/91	FDER	Second quarterly audit of air quality mon- itoring network	G. Carroll
12/10/91	FPSC	Public hearing on need determination	FPSC commis- sioners
12/16/91	Polk County	Discuss CUP application requirements	D. Martin
01/08/92	Polk County	Discuss CUP application	D. Martin and other staff
01/17/92	Polk County	Pre-application meeting on CUP applica- tion	P. McLemore and other staff
01/30/92	FPSC	Special agenda vote on Need Petition	FPSC Commis- sioners and staff
02/17/92	FDNR	Discuss conceptual reclamation plan	V. Sharpe and other staff
02/19/92	FDER	Third quarterly audit of air quality moni- toring network	G. Carroll
03/06/92	USACE	Discuss wetland areas onsite	J. Bachelor
03/10/92	FDNR	Discuss hydrological analyses	V. Sharpe and other staff
03/16/92	Polk County	Impact review meeting on CUP applica- tion	P. McLemore and other staff
03/17/92	USACE	Site visit to review wetlands	J. Bachelor
03/18/92	SWFWMD	Review conceptual reclamation and stormwater management plans	W. Hartmann and other staff
03/30/92	FDER	Wetland jurisdiction discussions	T. Bell
04/01/92	Polk County	Discuss comments and responses for CUP application	C. Deardorf and other staff

Table 10.0.0-1. Polk Power Station Agency and Public Organization Contacts
(Continued, Page 5 of 5)

Date	Agency/ Organization	Purpose	Contact(s)
04/03/92	Polk County	Transportation pre-application meeting	K. Saggerman
04/30/92	Public meeting in Chicora	Discuss Polk Power Station project	Local citizens
05/06/92	FGFWFC	Discuss Polk Power Station project	T. King R. Coleman
05/06/92	Polk County	Discuss CUP conditions	D. Martin
05/07/92	Public meeting in Fort Meade	Discuss Polk Power Station project	Local citizens
05/12/92	Public meeting in Mulberry	Discuss Polk Power Station project	Local citizens
05/13/92	Polk County	Zoning Advisory Board meeting on CUP application	Zoning Advisory Board
05/19/92	Public meeting in Bartow	Discuss Polk Power Station project	Local citizens
05/29/92	FDER	Discuss BACT and air quality permitting issues	C. Fancy and other staff
06/02/92	Polk County	Board of County Commissioners meeting on CUP application	County Commis- sioners
06/03/92	USACE	Discuss wetland jurisdiction issues	R. Silver
06/09/92	FDNR	Discuss reclamation plans	J. Craft and other staff
07/15/92	DOE	Project review meeting and site tour	DOE staff
07/22/92	DOE	Discuss EIV/EIS for Polk Power Station and tour site	DOE staff and EIS contractor

Source: ECT, 1992.

APPENDIX 11.1

FEDERAL PERMIT APPLICATIONS

- 11.1.1 NATIONAL POLLUTANT DISCHARGE ELIMINATION
SYSTEM PERMIT APPLICATIONS**
- 11.1.2 JOINT APPLICATION FOR WORKS IN THE WATERS OF
FLORIDA**
- 11.1.3 PREVENTION OF SIGNIFICANT DETERIORATION PER-
MIT APPLICATION**

FORM 1 GENERAL		U.S. ENVIRONMENTAL PROTECTION AGENCY GENERAL INFORMATION <i>Consolidated Permits Program</i> (Read the "General Instructions" before starting.)		I. EPA I.D. NUMBER	
 GENERAL I. EPA I.D. NUMBER Not Yet Assigned III. FACILITY NAME Tampa Electric Company, Polk Power Station Project V. FACILITY MAILING ADDRESS P.O. Box 111 Tampa, Florida 33602-00111 State Road 37 and County Road 630 Polk County, Florida VI. FACILITY LOCATION		GENERAL INSTRUCTIONS		GENERAL INSTRUCTIONS	
		If a preprinted label has been provided, affix it in the designated space. Review the information carefully; if any of it is incorrect, cross through it and enter the correct data in the appropriate fill-in area below. Also, if any of the preprinted data is absent (the area to the left of the label space lists the information that should appear), please provide it in the proper fill-in area(s) below. If the label is complete and correct, you need not complete Items I, III, V, and VI (except VI-B which must be completed regardless). Complete all items if no label has been provided. Refer to the instructions for detailed item descriptions and for the legal authorizations under which this data is collected.			
II. POLLUTANT CHARACTERISTICS					
INSTRUCTIONS: Complete A through J to determine whether you need to submit any permit application forms to the EPA. If you answer "yes" to any questions, you must submit this form and the supplemental form listed in the parenthesis following the question. Mark "X" in the box in the third column if the supplemental form is attached. If you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activity is excluded from permit requirements; see Section C of the instructions. See also, Section D of the instructions for definitions of bold-faced terms.					
SPECIFIC QUESTIONS		MARK 'X'		SPECIFIC QUESTIONS	
		YES	NO	FORM ATTACHED	
A. Is this facility a publicly owned treatment works which results in a discharge to waters of the U.S.? (FORM 2A)			X		
C. Is this a facility which currently results in discharges to waters of the U.S. other than those described in A or B above? (FORM 2C)			X		
E. Does or will this facility treat, store, or dispose of hazardous wastes? (FORM 3)			X		
G. Do you or will you inject at this facility any produced water or other fluids which are brought to the surface in connection with conventional oil or natural gas production, inject fluids used for enhanced recovery of oil or natural gas, or inject fluids for storage of liquid hydrocarbons? (FORM 4)			X		
I. Is this facility a proposed stationary source which is one of the 28 industrial categories listed in the instructions and which will potentially emit 100 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)			X		
B. Does or will this facility (either existing or proposed) include a concentrated animal feeding operation or aquatic animal production facility which results in a discharge to waters of the U.S.? (FORM 2B)			X		
D. Is this a proposed facility (other than those described in A or B above) which will result in a discharge to waters of the U.S.? (FORM 2D)		X		X	
F. Do you or will you inject at this facility industrial or municipal effluent below the lowermost stratum containing, within one quarter mile of the well bore, underground sources of drinking water? (FORM 4)			X		
H. Do you or will you inject at this facility fluids for special processes such as mining of sulfur by the Frasch process, solution mining of minerals, in situ combustion of fossil fuel, or recovery of geothermal energy? (FORM 4)			X		
J. Is this facility a proposed stationary source which is NOT one of the 28 industrial categories listed in the instructions and which will potentially emit 250 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)		X			
III. NAME OF FACILITY					
1 SKIP POLK POWER STATION					
IV. FACILITY CONTACT					
A. NAME & TITLE (last, first, & title)			B. PHONE (area code & no.)		
2 AUTRY, A. SPENCER, DIRECTOR, ENV			813 228 4111		
V. FACILITY MAILING ADDRESS					
A. STREET OR P.O. BOX					
3 POST OFFICE BOX 111					
B. CITY OR TOWN				C. STATE	D. ZIP CODE
4 TAMPA				FL	33601-0111
VI. FACILITY LOCATION					
A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER					
5 STATE ROAD 37					
B. COUNTY NAME					
POLK					
C. CITY OR TOWN				D. STATE	E. ZIP CODE
6 NA				FL	33835

VII. SIC CODES (4-digit, in order of priority)

VIII. OPERATOR INFORMATION

C. STATUS OF OPERATOR (Enter the appropriate letter into the answer box; if "Other", specify.)				D. PHONE (area code & no.)			
F = FEDERAL	M = PUBLIC (other than federal or state)	P	(specify)	C	8 1 3	2 2 8	4 1 1 1
S = STATE	O = OTHER (specify)			A			
P = PRIVATE				AA	1A - 1B	1C - 1D	1E - 1F

F. CITY OR TOWN													G. STATE		H. ZIP CODE		IX. INDIAN LAND	
B T A M P A													F L		3 3 6 0 1		Is the facility located on Indian lands? ☐ YES ☒ NO	

X. EXISTING ENVIRONMENTAL PERMITS																					
A. NPDES (Discharges to Surface Water)										D. PSD (Air Emissions from Proposed Sources)											
C	T	I								C	T	I									
9	N		NONE							9	P		NONE								
13	16	17	18	-							13	16	17	18	-						
B. UIC (Underground Injection of Fluids)										E. OTHER (specify)											
C	T	I								C	T	I									
9	U		NONE							9			NONE								
13	16	17	18	-							13	16	17	18	-						
C. RCRA (Hazardous Wastes)										E. OTHER (specify)											
C	T	I								C	T	I									
9	R		NONE							9			NONE								
13	16	17	18	-							13	16	17	18	-						

XI. MAP

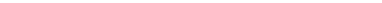
Attach to this application a topographic map of the area extending to at least one mile beyond property boundaries. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers and other surface water bodies in the map area. See instructions for precise requirements. See Figures 1 and 2

XII. NATURE OF BUSINESS (provide a brief description)

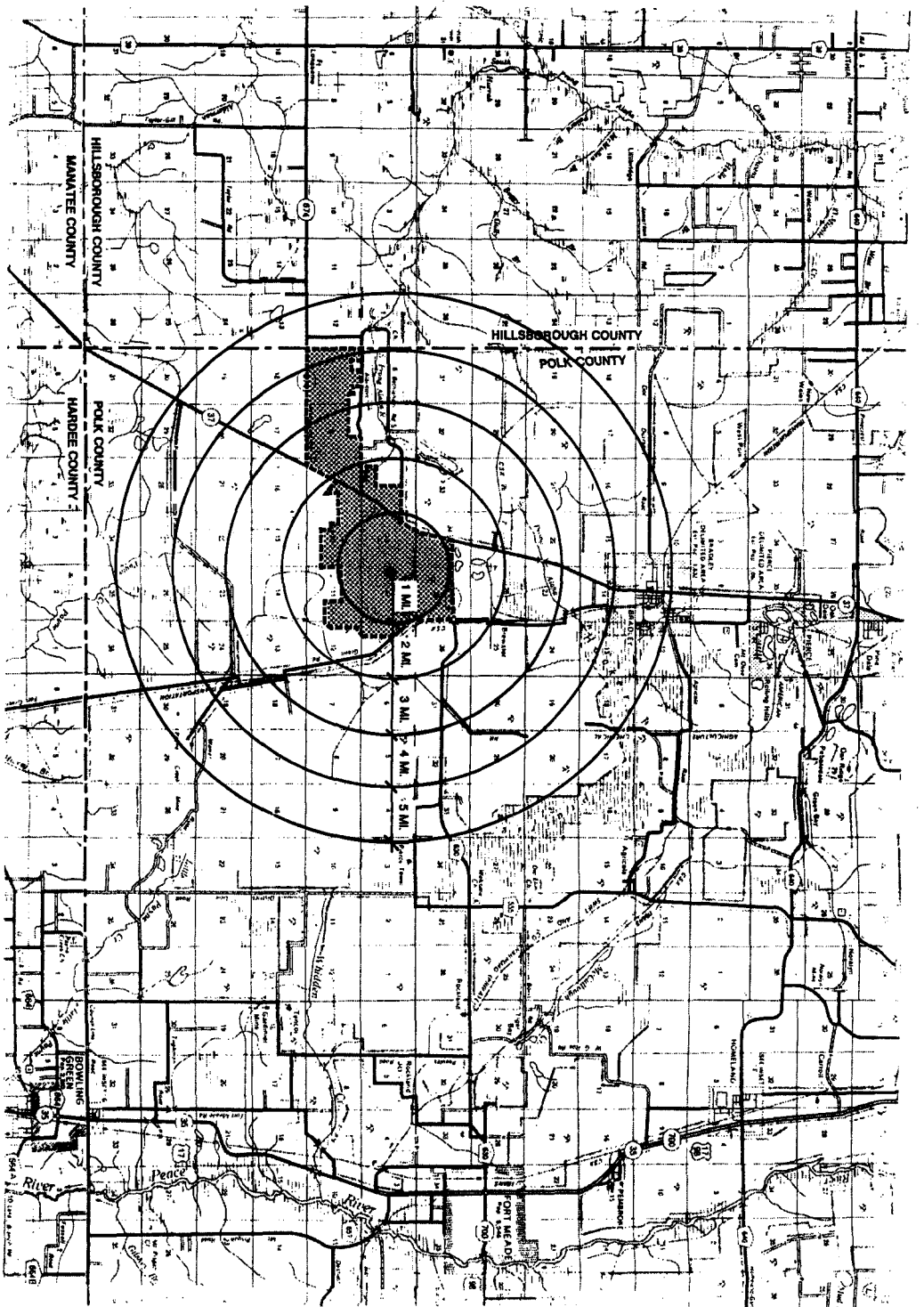
See attached description.

XIII. CERTIFICATION (see instructions)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME & OFFICIAL TITLE (type or print) Charles R. Black Vice President, Project Management	B. SIGNATURE 	C. DATE SIGNED July 30, 1992
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COMMENTS FOR OFFICIAL USE ONLY



LEGEND
POLK POWER STATION SITE



SCALE: 1" = 2 MILES



FIGURE 1.

5-MILE RADIUS OF THE POLK POWER STATION

Source: FDOT, 1987, 1988, ECT, 1992.



POLK
POWER
STATION

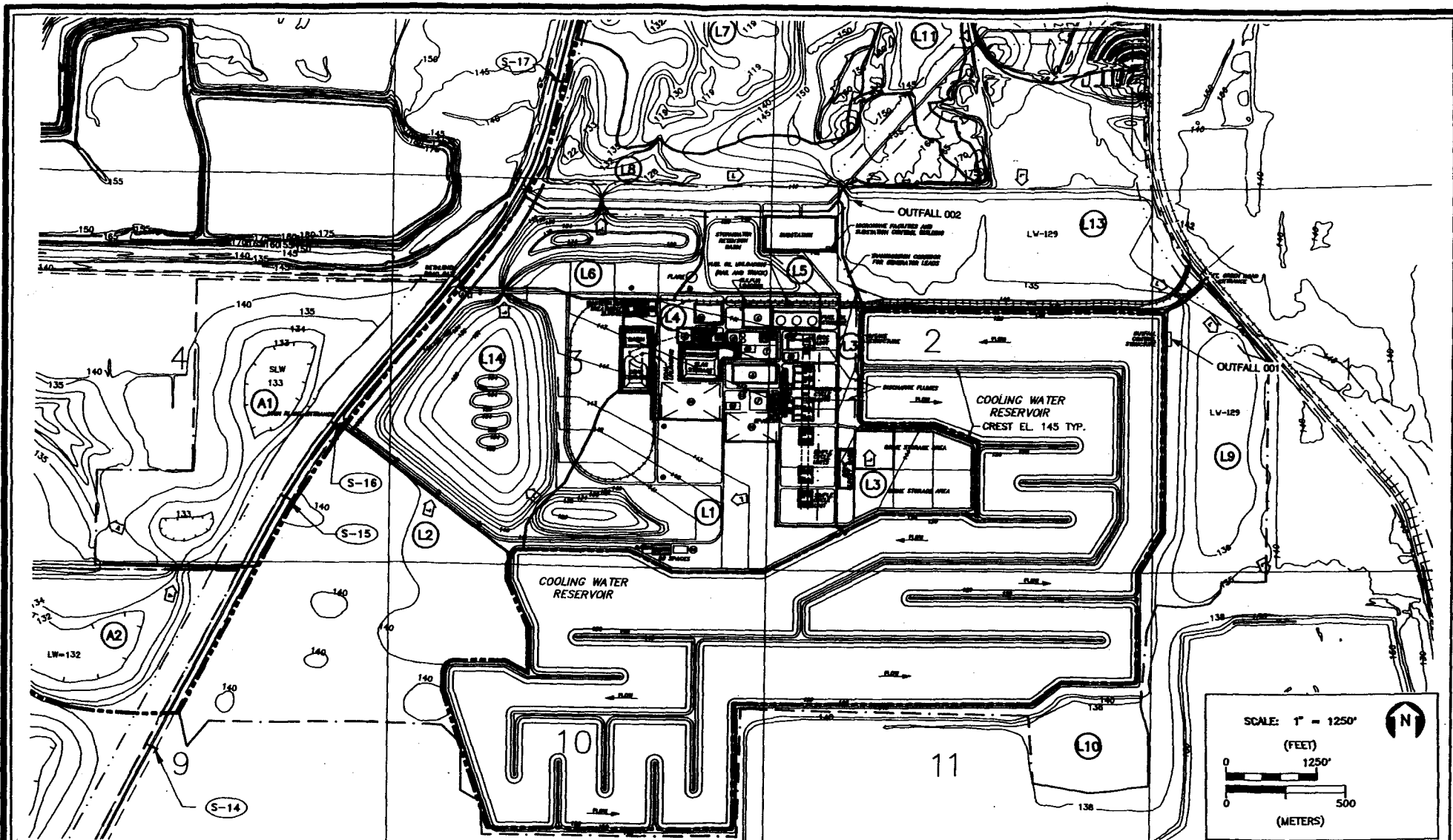


FIGURE 2.

SITE DRAINAGE PLAN AND OUTFALLS 001 AND 002

Source: ECT, 1992.



POLK
POWER
STATION

**TAMPA ELECTRIC COMPANY
POLK POWER STATION**

FORM 1--ITEM XII. NATURE OF BUSINESS

The Polk Power Station site consists of approximately 4,348 acres in southwest Polk County. The site is bordered by the Hillsborough County line along the western boundary; Fort Green Road [County Road (CR) 663] on the east; CR 630 and Bethlehem and Albritton Roads along the north; and State Road (SR) 674 and phosphate clay settling areas on the south. SR 37 bisects the property running in a southwest to northeast direction. The property to the east of SR 37 consists primarily of recently mined areas with water-filled mine cuts between over-burden spoil piles, recently reclaimed areas, and old mined and unreclaimed areas. The area to the west of SR 37 is currently being mined for phosphate matrix. These operations are scheduled to continue into 1994. Except for the approximately 775-acre tract south of CR 630 (Sections 34 and 35), the site has been part of the Agrico Fort Green Mine.

Southwest Polk County is relatively flat, with elevations generally ranging between 120 and 150 feet-National Geodetic Vertical Datum (ft-NGVD). The prevalent land use in the area is phosphate strip mining. The Polk Power Station site itself fits this description. The elevation of the plant site is approximately 140 ft-NGVD. More than 91 percent (i.e., approximately 3,970 acres) of the site has been or is proposed to be disturbed by phosphate mining activities prior to Tampa Electric Company's use of the site. Some of the mined-out areas will be developed into a cooling reservoir.

The proposed Polk Power Station project involves the phased construction and operation of electric generating units and associated facilities. The total generating capacity of the units at the site will be approximately 1,150 megawatts (MW). The generating units planned for the Polk Power Station will be developed at the site according to a phased schedule which matches Tampa Electric Company's forecasted growth in electricity demands beginning in 1995 and continuing into the year 2010.

The first generating facilities at the Polk Power Station site will be an integrated coal gasification combined cycle (IGCC) demonstration project developed by Tampa Electric Company and supported in part through funding from the U.S. Department of Energy (DOE) under the Clean Coal Technology Demonstration program. The IGCC unit will consist of a nominal net 150-MW advanced combustion turbine (CT), fueled by No. 2 fuel oil during the first year of operation in 1995. Heat recovery steam generator (HRSG), steam turbine (ST), and coal gasification (CG) facilities will be added and integrated with the advanced CT a year later to complete the nominal net 260-MW IGCC unit. After integration of these facilities, the IGCC unit will be fueled by coal-derived gas (i.e., called coal gas or syngas) which is produced in the CG facilities, with No. 2 fuel oil as a backup fuel. This IGCC unit will be known as Polk Unit 1. Tampa Electric Company's current Power Resource Plan indicates that later facilities will consist of two combined cycle (CC) generating units and six simple-cycle CTs fueled by natural gas with No. 2 fuel oil as the backup fuel.

Please type or print in the unshaded areas only		EPA ID Number (copy from Item 1 of Form 1)		Form Approved OMB No. 2040-0086 Approval expires 7-31-88	
Form 2D NPDES		EPA			
New Sources and New Dischargers Application for Permit to Discharge Process Wastewater					
I. Outfall Location					
For each outfall, list the latitude and longitude, and the name of the receiving water.					
Outfall Number (list)	Latitude			Longitude	
	Deg	Min	Sec	Deg	Min - Sec
001	27	43	41	82	38 20
	Unnamed reclaimed lake to unnamed canal to Little Payne Creek				
002	27	44	1	82	18 19
	Unnamed old mine cut to unnamed reclaimed lake to unnamed canal to Little Payne Creek (see Form 2F)				
II. Discharge Date (When do you expect to begin discharging?) 1996					
III. Flows, Sources of Pollution, and Treatment Technologies					
A. For each outfall, provide a description of (1) All operations contributing wastewater to the effluent, including process wastewater, sanitary wastewater, cooling water, and stormwater runoff; (2) The average flow contributed by each operation; and (3) The treatment received by the wastewater. Continue on additional sheets if necessary.					
Outfall Number	1. Operations Contributing Flow (list)			2. Average Flow (include units)	3. Treatment (Description or List Codes from Table 2D-1)
001	Cooling reservoir blowdown			3.10 MGD	1 - 0, 1 - U
	Contributing sources:				
	--Recirculating cooling water			355.70 MGD	--
	--Industrial wastewater treatment plant (IWT) effluent			0.44 MGD	2 - C, 1 - U, 1 - Q
	--Sanitary sewage treatment plant (STP) effluent			0.01 MGD	3 - A, 1 - U, 2 - F
	--Stormwater runoff from fuel storage/switchyard and CT/CC areas			0.08 MGD	1 - H
	--Groundwater makeup			4.91 MGD	--
	--Groundwater seepage (in)			0.28 MGD	--
	--Precipitation			2.97 MGD	--
	--Reverse osmosis concentrate			0.35 MGD	--
002	Stormwater from industrial activity			0.60 MGD	See Form 2F

C. Except for storm runoff, leaks, or spills, will any of the discharges described in item III-A be intermittent or seasonal?

☐ Yes (complete the following table) ☒ No (go to item IV)

Outfall Number	1. Frequency		2. Flow		
	a. Days Per Week <i>(specify average)</i>	b. Months Per Year <i>(specify average)</i>	a. Maximum Daily Flow Rate <i>(in mgd)</i>	b. Maximum Total Volume <i>(specify with units)</i>	c. Duration <i>(in days)</i>

IV. Production

If there is an applicable production-based effluent guideline or NSPS, for each outfall list the estimated level of production (projection of actual production level, not design), expressed in the terms and units used in the applicable effluent guideline or NSPS, for each of the first 3 years of operation. If production is likely to vary, you may also submit alternative estimates (attach a separate sheet). NA

Year	a. Quantity Per Day	b. Units of Measure	c. Operation, Product, Material, etc (specify)

A, and B: These items require you to report estimated amounts (*both concentration and mass*) of the pollutants to be discharged from each of your outfalls. Each part of this item addresses a different set of pollutants and should be completed in accordance with the specific instructions for that part. Data for each outfall should be on a separate page. Attach additional sheets of paper if necessary.

Each part of this item requests you to provide an estimated daily maximum and average for certain pollutants and the source of information. Data for all pollutants in Group A, for all outfalls, must be submitted unless waived by the permitting authority. For all outfalls, data for pollutants in Group B should be reported only for pollutants which you believe will be present or are limited directly by an effluent limitations guideline or NSPS or indirectly through limitations on an indicator pollutant.

CONTINUE ON REVERSE

CONTINUED FROM THE FRONT	EPA ID Number (copy from Item 1 of Form 1)	
C. Use the space below to list any of the pollutants listed in Table 2D-3 of the instructions which you know or have reason to believe will be discharged from any outfall. For every pollutant you list, briefly describe the reasons you believe it will be present.		
1. Pollutant	2. Reason for Discharge	
NA	NA	
VI. Engineering Report on Wastewater Treatment		
A. If there is any technical evaluation concerning your wastewater treatment, including engineering reports or pilot plant studies, check the appropriate box below. ☒ Report Available ☐ No Report		
B. Provide the name and location of any existing plant(s) which, to the best of your knowledge, resembles this production facility with respect to production processes, wastewater constituents, or wastewater treatments.		
Name TECO Power Services Hardee Power Station	Location Hardee County, Florida (The Hardee Power Station is a combined cycle generating facility built on reclaimed phosphate lands. Unlike the Hardee Power Station, Polk Power Station contains a coal gasification unit.)	

VII. Other Information (Optional)

Use the space below to expand upon any of the above questions or to bring to the attention of the reviewer any other information you feel should be considered in establishing permit limitations for the proposed facility. Attach additional sheets if necessary.

A preliminary Best Management Practices (BMP) plan is included as part of this NPDES application in anticipation of fulfilling the requirements of 40 CFR 122.44(K).

VIII. Certification

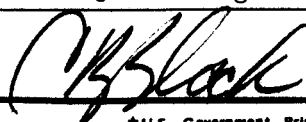
I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

A. Name and Official Title (type or print)

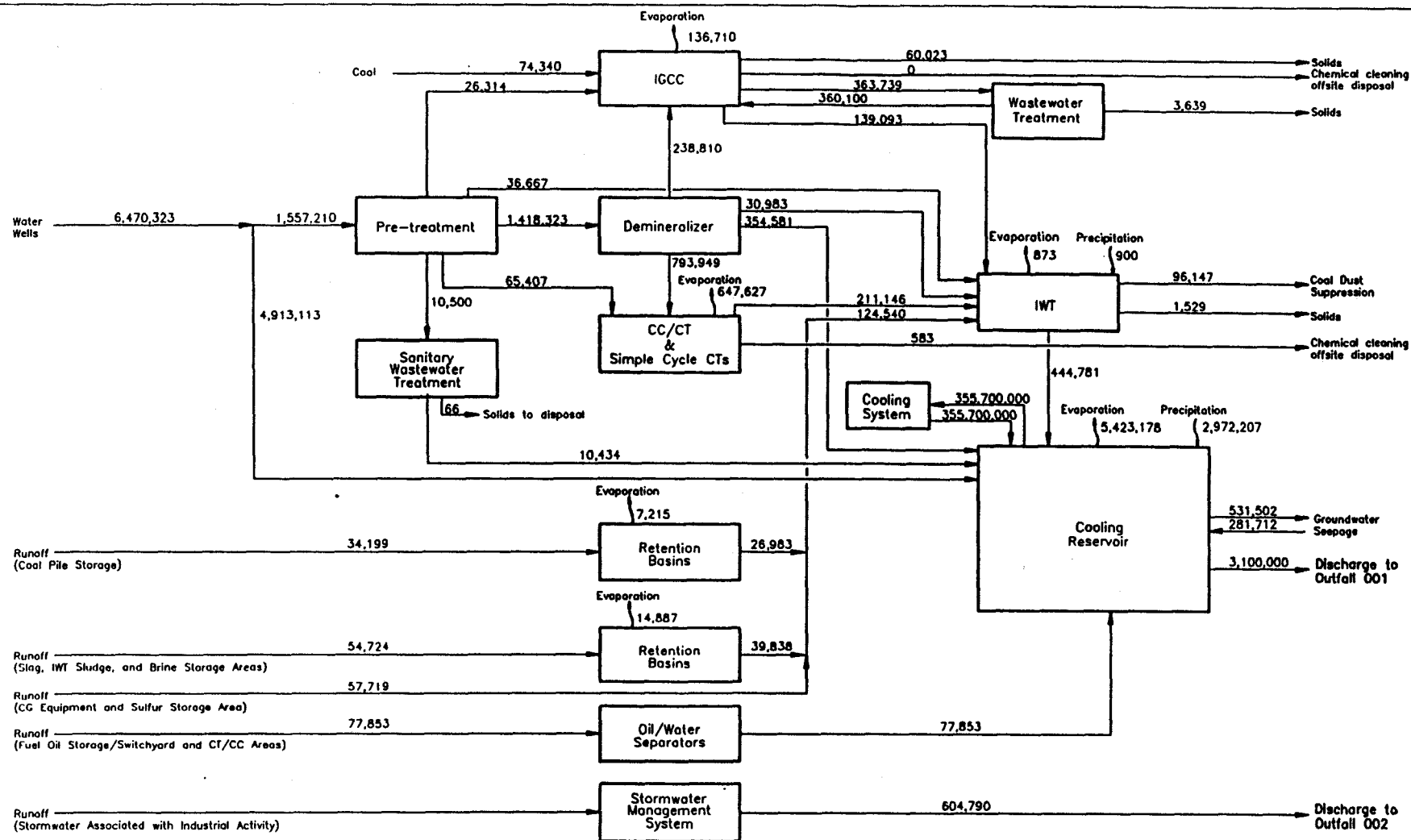
Charles R. Black
Vice President, Project Management

B. Phone No.

(813) 228-4111

C. Signature**D. Date Signed**

07/30/92



NOTE: ALL FLOW RATES IN GPD

FIGURE 1.

WATER MASS BALANCE, ANNUAL AVERAGE MAKEUP

Source: UE&C, 1992. ECT, 1992.



**POLK
POWER
STATION**

Table 1. Estimated Cooling Reservoir Discharge (Outfall 001) Effluent Water Quality

Parameter	Average Daily Concentration	Average Daily Mass (lb/day)	Source
Biochemical oxygen demand	1.3 mg/L	33.6	See note
Chemical oxygen demand	1.4 mg/L	36.2	
Total organic carbon	9.1 mg/L	235.4	
Total suspended solids	10 mg/L	258.7	
Flow	3.1 MGD	--	
Ammonia nitrogen	0.01 mg/L	0.3	
Temperature, winter	65 °C	--	
Temperature, summer	87 °C	--	
pH, units	6.6	--	
Aluminum	0.4 mg/L	10.3	
Antimony	0.009 mg/L	0.2	
Arsenic	0.001 mg/L	0.03	
Barium	0.001 mg/L	0.03	
Beryllium	0.0001 mg/L	0.003	
Cadmium	0.0006 mg/L	0.02	
Chloride	36.0 mg/L	931.3	
Chlorine	0.0004 mg/L	0.01	
Chromium	0.00004 mg/L	0.001	
Color, platinum-cobalt units	45	--	
Copper	0.003 mg/L	0.1	
Cyanide	0.000004 mg/L	0.0001	
Fecal coliform	0.8 mpn/100 mL	--	
Fluoride	1.1 mg/L	28.5	
Iron	0.9 mg/L	23.3	
Lead	0.001 mg/L	0.03	
Magnesium	30.2 mg/L	781.3	
Manganese	0.08 mg/L	2.1	
Mercury	0.000007 mg/L	0.0002	
Nickel	0.01 mg/L	0.3	
Nitrate	0.3 mg/L	7.8	
Oil and grease	0.2 mg/L	5.2	
Phosphate	0.6 mg/L	15.5	
Radioactivity, Radium 226	2.1 pCi/L	--	
Selenium	0.00005 mg/L	0.001	
Sulfate	114.6 mg/L	2,964.8	
Sulfide	0.65 mg/L	16.8	
Surfactants	0.086 mg/L	2.2	
Zinc	0.04 mg/L	1.0	

Note: All parameter data represent average concentration and mass loading estimates based on engineering studies (Source Code 1) and best professional estimates (Source Code 4).

MPN = most probable number.

**TAMPA ELECTRIC COMPANY
POLK POWER STATION**

**STORMWATER DISCHARGES ASSOCIATED WITH
INDUSTRIAL ACTIVITY FROM CONSTRUCTION SITE
40 CFR 126.26**

The following narrative description is submitted in compliance with the application requirements for operators of stormwater discharges associated with industrial activity from construction activities.

The following application requirements are addressed as outlined in 40 Code of Federal Regulations (CFR) 122.26:

- (i) Location (including location map) and nature of construction activity;
- (ii) Total site area and site area which is expected to undergo excavation;
- (iii) Proposed measures to control pollutants in stormwater discharges during construction and a description of applicable state and local erosion and sediment control requirements;
- (iv) A description of applicable state and local stormwater management controls and proposed measures to control pollutants in stormwater discharges following completion of construction activities;
- (v) Estimate of the site runoff coefficient, the quality of stormwater discharge and the nature of soil at the site, and the increase in impervious area following completion of construction activities; and
- (vi) Name of receiving water.

- (i) Location (including location map) and nature of construction activity.

RESPONSE

The Polk Power Station will be located on an approximately 4,348-acre site in southwest Polk County, Florida. Refer to Item XI of Form 1 for a site location map and approximate site boundaries.

The general site preparation and construction activities associated with the overall development of the project site will include the following:

- Clearing, grubbing, corridor preparation, and construction of the three access roads and rail spur to the main power plant facilities area;
- Construction of temporary berms within the cooling reservoir area to provide separate subareas for onsite storage of water from dewatering and stormwater runoff from other subareas under construction;
- Sequential dewatering of reservoir and reclaimed wetland subareas by pumping to other subareas and excavation and surrounding and internal berm construction activities in dewatered subareas of the reservoir;
- Construction of temporary runoff storage basins and drainage ditches to collect and route runoff to water storage subareas within the cooling reservoir area during grading, excavation, and construction activities;
- Clearing, grubbing, and cutting of main plant site area and filling the area with materials excavated from cooling reservoir area;
- Stabilizing, grading, and contouring main plant facilities area for construction of facilities foundations, interior roadways, and parking lots;
- Construction of areas for coal unloading, permanent stormwater retention basins, by-product (e.g., sulfur, slag) and fuel storage, brine treatment and storage, and wastewater treatment sludge storage;
- Performing groundwork, as necessary, for construction of facility footings and foundations, and underground electrical, water, and other utility piping systems;
- Development of substation, and on- and offsite transmission line rights-of-way; and
- Earthmoving, grading, and contouring for reclaimed wetland and upland areas and drainage systems.

Fill material will be provided from other areas on the site with the exception of some finishing foundation and bed support materials such as limerock, crushed rock ballast, and other materials which will be provided from regional, contracted sources.

(ii) Total site area and site area which is expected to undergo excavation.

RESPONSE

The Polk Power Station will be located on approximately 4,348 acres. The area of the site which is expected to undergo excavation for the purpose of constructing the power plant facilities includes approximately 3,200 acres. Refer to Form I, Item XI, Figure 2 for a plant layout.

(iii) Proposed measures to control pollutants in stormwater discharges during construction and a description of applicable state and local erosion and sediment control requirements.

RESPONSE

Stormwater discharges associated with construction activities will be managed in accordance with applicable regulations. All dewatering water from general site preparation activities will be collected, managed, and contained within the site boundaries by sequentially pumping or routing water to and from subareas within the site as the construction activities proceed. No offsite land or surface water body impacts are expected from the proposed dewatering activities.

The initial site preparation activities for the main plant site and cooling reservoir areas will involve establishing preliminary site access and clearing, grubbing, and initial earthwork activities in the plant site, access road, and rail spur areas. Temporary berms will be constructed within the mined-out reservoir area to establish three subareas for the sequential dewatering, water storage, and construction process for the cooling reservoir. Also, temporary stormwater runoff basins and drainage ditches will be developed, as needed, to route runoff to the onsite water storage subareas.

During normal rainfall conditions, stormwater runoff from areas under construction is expected to be contained within the dewatering storage subareas on the site. However, during extreme or cumulative storm events in excess of the 25-year, 24-hour rainfall event, some runoff may need to be discharged from these storage subareas to the Little Payne Creek system. In this event, the stormwater runoff will be initially detained within the storage subareas to allow for sediment settling and will be discharged through overflow swale(s) with appropriate controls and measures (e.g., straw bales and silt fences) to minimize transport of sediments offsite. Therefore, any stormwater runoff discharges are not expected to adversely impact offsite water bodies.

The surface water management system will be designed in accordance with the regulations and requirements of the Southwest Florida Water Management District (SWFWMD), which has been delegated authority under Chapter 17-25.090, Florida Administrative Code (F.A.C.). A comprehensive sedimentation and erosion control plan will be developed for the Polk Power Station in compliance with the regulatory requirements. The erosion control plan will prevent soil loss caused by stormwater runoff during project construction and operation. Both structural and non-structural (vegetative) erosion control measures will be designed, implemented, and properly maintained in accordance with best management practices.

The erosion and sedimentation control practices will include the following:

- Scheduling of activities to minimize the amount of disturbed area at any one time;
- Locating roads, railroad spurs, and parking areas on contour;
- Limiting construction traffic to access roads and areas to be graded and forbidding traffic in streams or drainage ditches;
- Compacting loose soil as soon as possible after excavation, grading, or filling;
- Using silt fences, straw bales, temporary rip-rap, etc., to minimize transport of sediment;

- The construction superintendent implementing the plan and ensuring that construction personnel are familiar with and adhere to the plan; and
- Managing runoff during construction and maintaining it on the site.

In addition to the erosion control practices described previously, Tampa Electric Company will employ various vegetative practices to control erosion and sedimentation, including permanent seeding of the cooling reservoir berms and swales.

Other erosion control structure practices will include, as necessary, the construction of temporary perimeter berms, rip-rap in potentially high-velocity areas, straw bales or other barriers, silt fences, diversionary berms or swales, and graveled road and railroad beds.

The construction plan is to direct nearly all stormwater under normal rainfall conditions into the cooling reservoir area and other mined-out areas on the site. The mine cuts, which are below-grade, will be capable of retaining a considerable amount of stormwater. This capacity will increase as the above-grade berm is constructed from the overburden.

In the event that small isolated sedimentation basins are required, these will be constructed by excavation. These basins will be cleaned out as needed.

Swales will be constructed for directing runoff around the construction site to the cooling reservoir or to sedimentation basins. These swales will be excavated, graded, and stabilized with gravel, sod, etc. The cross-sectional area of these swales will be designed such that erosional velocities are not reached.

Straw bale berms and silt fences will be constructed as needed. These barriers will be embedded (4 inches for bales and 8 inches for silt fences) into the soil to prevent washout. Steel rods or steel posts will be used as required to anchor these barriers.

If extreme or cumulative storm events in excess of the 25-year, 24-hour rainfall event occur during the construction activities, some stormwater runoff may need to be discharged offsite to the adjacent surface water body systems. The runoff will be initially detained within the cooling reservoir and mined-out areas or in sedimentation basins. Also, sediment transport associated with any discharges from these areas will be further controlled by use of appropriate measures such as straw bales and silt fences.

- (iv) **A description of applicable state and local stormwater management controls and proposed measures to control pollutants in stormwater discharges following completion of construction activities.**

RESPONSE

Similar to the pre-mining drainage conditions, the surface runoff from the Polk Power Station site will be drained into three watersheds: South Prong Alafia River, Payne Creek, and Little Payne Creek. Currently the proposed project site has been significantly altered by the phosphate mining activities. To alleviate the existing mining impacts and to minimize the potential hydrologic impact due to the proposed project, the Polk Power Station onsite drainage plan is designed to achieve the following objectives:

1. Comply with the Florida Department of Natural Resources' (FDNR's) reclamation regulation (Chapter 16C-16, F.A.C.);
2. Comply with SWFWMD's surface water regulations (Chapter 40D-4, F.A.C.);
3. Comply with the Florida Department of Environmental Regulation's (FDER's) stormwater management regulation (Chapter 17-25, F.A.C.);
4. Comply with the U.S. Environmental Protection Agency (EPA) regulation for stormwater discharges associated with industrial activities (40 CFR 122.26); and
5. Comply with state and federal regulations for surface water and groundwater standards.

The onsite master drainage plan is designed to detain at least the first inch of runoff from areas surrounding the plant site for water quality treatment. The drainage system will also provide sufficient storage and detention capacity for water quantity control so that the post-reclamation peak runoff rate will not exceed the pre-mining peak discharge for a design storm event (25-year, 24-hour event) in each of the three watersheds. The detention/storage capacity will be provided by stormwater detention basins and reclaimed wetland areas.

Although the onsite drainage pattern and watershed have been significantly altered by mining activities, the proposed project will restore the drainage basin boundaries to approximately (i.e., within 2 percent) pre-mining conditions for the three basins within the project site: South Prong Alafia River, Payne Creek, and Little Payne Creek. The onsite drainage for each watershed is described as follows.

South Prong Alafia River

The drainage basin boundary of South Prong Alafia River watershed within the project site will be restored to approximately its pre-mining location. The total drainage area after reclamation will be 801 acres compared to the pre-mining drainage area of 816 acres. According to FDNR's requirements, this mined area west of State Road (SR) 37 will be regraded and planted with vegetation to enhance wildlife habitats. Also, to comply with these requirements, the onsite reclamation plan will create approximately 216 acres of forested and non-forested wetland areas. The runoff from the reclaimed upland forest and pasture will not be associated with industrial activity and will sheet flow into two separate wetland areas (east and west) prior to offsite discharge. The wetlands will have a large surface area to significantly suppress the peak discharge and will allow for the settling and filtering of suspended material and removal of nutrients by plant uptake prior to offsite discharge. The stormwater from the eastern wetland will also be routed to a tributary of the South Prong Alafia via a vegetated swale. The stormwater from the western wetland will also be discharged into a small tributary of the South Prong Alafia River in the extreme northwestern corner of the site. This offsite discharge from this wetland will

be controlled by a fixed hydraulic structure to maintain the proper hydroperiod for the wetland.

Payne Creek

The drainage basin boundary of the Payne Creek watershed within the project site will be restored to approximately its pre-mining position. The total drainage area after reclamation will be 710 acres compared to the pre-mining drainage area of 716 acres. Similar to the South Prong Alafia River, the presently mined area will be reclaimed to contain 242 acres of wetlands and upland forests. The runoff from this reclaimed upland forest will not be associated with industrial activity and will sheet flow into the wetlands prior to offsite discharge. The substantial wetland areas will have flood control functions and provide water quality treatment. The discharge from the wetlands will drain southward across SR 674 through an existing culvert similar to pre-mining conditions. This offsite discharge will be routed to Payne Creek which runs along the western side of SR 37.

Little Payne Creek

The drainage basin boundary of the Little Payne Creek watershed within the project site will be restored to approximately its pre-mining position. The total drainage area after reclamation will be 2,837 acres, compared to a pre-mining drainage area of 2,816 acres. The power block and associated facilities, including the cooling reservoir, will be located within the Little Payne Creek basin. Mined-out areas in this basin will also be reclaimed upland and wetland areas.

The cooling water reservoir receives direct rainfall and runoff from its 778-acre area, including 727 acres of water surface area and 108 acres of interior berms and the inside slope of the exterior berm.

Stormwater runoff associated with industrial activities from the CG process area and sulfur storage area will be collected and routed to the industrial wastewater treatment (IWT) plant.

Runoff associated with industrial activity from CT/CC units, fuel oil storage area, and substation will be treated in an oil/water separator and then discharged into the cooling reservoir.

The runoff from coal pile, slag storage, active brine storage, and IWT sludge storage will be collected in retention basins to allow settling of the suspended solids then routed to the IWT for further treatment. A small portion of the treated water from the IWT will be used for dust suppression in the coal handling system, and the remainder will be discharged into the cooling water reservoir for reuse in the cooling system.

The total drainage area associated with industrial activities which ultimately discharges to the cooling reservoir is approximately 65 acres. In addition to recirculating cooling water and the IWT effluent, the cooling water receives other process waters described in Section 3.5. Blowdown from the cooling reservoir will be discharged to a reclaimed lake along the eastern edge of the cooling reservoir via a controlled structure (Outfall 001).

Two detention basins will be constructed to collect stormwater runoff from plant site areas not described above. The detention basins will provide water quantity and water quality treatment as required by SWFWMD. A 0.2-acre detention basin located south of the power block and adjacent to the northern berm of the cooling reservoir will receive runoff from the administration building, parking lot, and a small area in the immediate vicinity of the building. The total subbasin area is about 3 acres, and the detention basin will detain at least 1 inch of runoff from the area. The discharge from this detention basin will be drained via a control structure into a reclaimed wetland located east of SR 37 and west of the cooling reservoir (see Figure 2).

A 26-acre detention basin will be constructed to the north of the power block. This basin will receive stormwater runoff from 172 acres. This detention basin will detain

at least 1 inch of runoff prior to discharging into a second wetland area lying to the west of the basin and northwest of the main plant facilities (see Figure 2).

The runoff from the detention basins and other site areas to the west of the power block plant site and east of SR 37 will be drained into a wetland area to the west of the large detention basin. The discharge from this wetland will be routed north and then eastward via swales via Outfall 002 into the old mine-cut lake which also receives runoff from the northeastern portion of the project site. The total drainage area discharged to the old mine-cut lake is approximately 1,994 acres.

The discharge from the old mine-cut lake will be drained southward into an existing reclaimed lake located along the eastern edge of the proposed cooling water reservoir. The blowdown from the reservoir will also be routed into this existing reclaimed lake. The blowdown and stormwater runoff discharges from the reclaimed lake will be routed offsite through a swale and drain into Little Payne Creek system which runs along the west of Fort Green Road near the project area.

- (v) **Estimate of the site runoff coefficient, the quality of stormwater discharge and the nature of soil at the site, and the increase in impervious area following completion of construction activities.**

RESPONSE

The runoff coefficient for the Polk Power Station site for a 24-hour mean annual storm (4.5 inches) which has a return period of 2.33 years is estimated to be 0.62. For a 25-year, 24-hour (9 inches) storm event, the site runoff coefficient is estimated to be 0.78.

Stormwater management control will be executed to prohibit the discharge of stormwater which would cause or contribute to a violation of water quality standards. Table 1 includes estimated construction-related stormwater discharge water quality values.

Table 1. Estimated Construction Stormwater Discharge Water Quality

Parameter	Unit Measurement
Oil and grease, mg/L	5
Biochemical oxygen demand (BOD5), mg/L	2
Chemical oxygen demand (COD), mg/L	51
Total suspended solids (TSS), mg/L	100
Total Kjeldahl nitrogen, mg/L	1
Total phosphorus, mg/L	1
pH, units	6 to 8.5

Source: ECT, 1992.

During construction, fill material will be provided from other areas on the site with the exception of some finishing foundation and support materials such as limerock, crushed rock ballast, and other materials which will be provided from regional, contracted sources. The soil types situated on the Polk Power Station plant site include Smyrna-Myakka, Arents-Water, and Ona soils [U.S. Department of Agriculture (USDA), 1990]. These three soil types are described as follows. Seventeen other soil types occur across the site, but cover significantly less area.

The Smyrna-Myakka soil complex consists primarily of fine sands which cover broad areas of flatwoods. These soils are somewhat poorly drained with slopes that are smooth to concave at 0 to 2 percent. The water table within these soils is typically 0 to 1 foot below land surface (ft bls) for 1 to 4 months in most years. The Smyrna soils have an organic matter content of 1 to 5 percent, and the Myakka soils have an organic matter content of 2 to 5 percent (SCS, 1990). This soil complex has only a slight erosional risk.

The Arents-Water complex is a soil type resulting from mining activities. The Arents consists of piles (various slopes) of soil material and overburden that originally overlaid the phosphate matrix. The water part of this classification forms after the ore has been mined.

The Ona fine sands are also found in broad areas of flatwoods. The Ona soils are somewhat poorly drained with shallow slopes of 0 to 2 percent. The water table within this soil unit is typically 0 to 1 ft bls for 1 to 4 months in most years. The Ona sand has only a slight erosional risk.

Following completion of construction, the increase of impervious area at the Polk Power Station will be approximately 70 acres. Proposed measures to control pollutants in stormwater discharges following completion of construction activities is included in Section (iii).

(vi) Name of receiving water.

RESPONSE

During normal rainfall conditions, stormwater runoff from areas under construction will be contained within the dewatering storage subareas on the site. During extreme or cumulative storm events in excess of the 25-year, 24-hour rainfall event, some runoff may need to be discharged from the storage subareas to the Little Payne Creek system via the old-mine cut.

REFERENCES

Soil Conservation Service (SCS). 1990. (from SCA 2.3)

U.S. Department of Agriculture (USDA). 1990.

Please print or type in the unshaded areas only

**Form
2F
NPDES**



United States Environmental Protection Agency
Washington, DC 20460

Application for Permit to Discharge Storm Water Discharges Associated with Industrial Activity

Paperwork Reduction Act Notice

Public reporting burden for this application is estimated to average 28.6 hours per application, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate, any other aspect of this collection of information, or suggestions for improving this form, including suggestions which may increase or reduce this burden to: Chief, Information Policy Branch, PM-223, U.S. Environmental Protection Agency, 401 M St., SW, Washington, DC 20460, or Director, Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503.

I. Outfall Location

For each outfall, list the latitude and longitude of its location to the nearest 15 seconds and the name of the receiving water.

A. Outfall Number (list)	B. Latitude			C. Longitude			D. Receiving Water (name)
001*	27	43	41	82	38	20	Unnamed reclaimed lake to unnamed canal to Little Payne Creek
002	27	44	1	82	18	19	Unnamed old mine cut to unnamed reclaimed lake to unnamed canal to Little Payne Creek

II. Improvements

- A. Are you now required by any Federal, State, or local authority to meet any implementation schedule for the construction, upgrading or operation of wastewater treatment equipment or practices or any other environmental programs which may affect the discharges described in this application? This includes, but is not limited to, permit conditions, administrative or enforcement orders, enforcement compliance schedule letters, stipulations, court orders, and grant or loan conditions. No

[illegible]

- B. You may attach additional sheets describing any additional water pollution (or other environmental projects which may affect your discharges) you now have under way or which you plan. Indicate whether each program is now under way or planned, and indicate your actual or planned schedules for construction.

III. Site Drainage Map

Attach a site map showing topography (or indicating the outline of drainage areas served by the outfall(s) covered in the application if a topographic map is unavailable) depicting the facility including: each of its intake and discharge structures; the drainage area of each storm water outfall; paved areas and buildings within the drainage area of each storm water outfall, each known past or present areas used for outdoor storage or disposal of significant materials, each existing structural control measure to reduce pollutants in storm water runoff, materials loading and access areas, areas where pesticides, herbicides, soil conditioners and fertilizers are applied; each of its hazardous waste treatment, storage or disposal units (including each area not required to have a RCRA permit which is used for accumulating hazardous waste under 40 CFR 262.34); each well where fluids from the facility are injected underground; springs, and other surface water bodies which receive storm water discharges from the facility. See Figure 2 in Form 1

Continued from the Front

IV. Narrative Description of Pollutant Sources

A. For each outfall, provide an estimate of the area (include units) of impervious surfaces (including paved areas and building roofs) drained to the outfall, and an estimate of the total surface area drained by the outfall.

Outfall Number	Area of Impervious Surface (provide units)	Total Area Drained (provide units)	Outfall Number	Area of Impervious Surface (provide units)	Total Area Drained (provide units)
002	70 acres	1,000 acres			

B. Provide a narrative description of significant materials that are currently or in the past three years have been treated, stored or disposed in a manner to allow exposure to storm water; method of treatment, storage, or disposal; past and present materials management practices employed to minimize contact by these materials with storm water runoff; materials loading and access areas; and the location, manner, and frequency in which pesticides, herbicides, soil conditioners, and fertilizers are applied.

Outfall 002 will commence operation in 1995.

C. For each outfall, provide the location and a description of existing structural and nonstructural control measures to reduce pollutants in storm water runoff; and a description of the treatment the storm water receives, including the schedule and type of maintenance for control and treatment measures and the ultimate disposal of any solid or fluid wastes other than by discharge.

Outfall Number	Treatment	List Codes from Table 2F-1
002	See attached description	1 - U

V. Nonstormwater Discharges

A. I certify under penalty of law that the outfall(s) covered by this application have been tested or evaluated for the presence of nonstormwater discharges, and that all nonstormwater discharges from these outfall(s) are identified in either an accompanying Form 2C or Form 2E application for the outfall.

Name and Official Title (type or print) Charles R. Black Vice President, Project Management	Signature 	Date Signed 07/30/92
---	---	-------------------------

B. Provide a description of the method used, the date of any testing, and the onsite drainage points that were directly observed during a test.

See IV.B

VI. Significant Leaks or Spills

Provide existing information regarding the history of significant leaks or spills of toxic or hazardous pollutants at the facility in the last three years, including the approximate date and location of the spill or leak, and the type and amount of material released.

See IV.B

Continued from Page 2

VII. Discharge Information

A,B,C, & D: See instructions before proceeding. Complete one set of tables for each outfall. Annotate the outfall number in the space provided.

Tables VII-A, VII-B, and VII-C are included on separate sheets numbered VII-1 and VII-2.

E: Potential discharges not covered by analysis - is any toxic pollutant listed in table 2F-2, 2F-3 or 2F-4, a substance or a component of a substance which you currently use or manufacture as an intermediate or final product or byproduct?

☐ Yes (list all such pollutants below)☒ No (go to Section IX)**VIII. Biological Toxicity Testing Data**

Do you have any knowledge or reason to believe that any biological test for acute or chronic toxicity has been made on any of your discharges or on a receiving water in relation to your discharge within the last 3 years?

☐ Yes (list all such pollutants below)☒ No (go to Section IX)**IX. Contract Analysis Information**

Were any of the analysis reported in item VII performed by a contract laboratory or consulting firm?

☐ Yes (list the name, address, and telephone number of, and pollutants analyzed by, each such laboratory or firm below)☒ No (go to Section X)

A. Name	B. Address	C. Area Code & Phone No.	D. Pollutants Analyzed

X. Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

A. Name & Official Title (type or print) Charles R. Black Vice President, Project Management	B. Area Code and Phone No. (813) 228-4111
C. Signature 	D. Date Signed 07/30/92

VII. Discharge Information (Continued from page 3 of Form 2F)

Part A - You must provide the results of at least one analysis for every pollutant in this table. Complete one table for each outfall. See instructions for additional details.

Pollutant and CAS Number (if available)	Maximum Values (include units)		Average Values (include units)		Number of Storm Events Sampled	Sources of Pollutants
	Grab Sample Taken During First 20 Minutes	Flow-weighted Composite	Grab Sample Taken During First 20 Minutes	Flow-weighted Composite		
Oil and Grease		N/A				
Biological Oxygen Demand (BOD5)						
Chemical Oxygen Demand (COD)						
Total Suspended Solids (TSS)						
Total Nitrogen						
Total Phosphorus						
pH	Minimum	Maximum	Minimum	Maximum		

Part B - List each pollutant that is limited in an effluent guideline which the facility is subject to or any pollutant listed in the facility's NPDES permit for its process wastewater (if the facility is operating under an existing NPDES permit). Complete one table for each outfall. See the instructions for additional details and requirements.

[illegible]

[illegible]

**TAMPA ELECTRIC COMPANY
POLK POWER STATION**

FORM 2F--ITEM IV.C. OUTFALL 002 DESCRIPTION

Outfall 002 receives stormwater from approximately 70 acres of impervious area, including laydown areas, paved areas within the plant site, and enclosed raw material storage areas. This stormwater is routed to a 26-acre retention basin located north of the plant facilities. The discharge from this retention basin will combine with non-regulated runoff in the reclaimed wetlands area, for eventual discharge to the old mine cut area.

Outfall 002 does not receive any process discharge or stormwater which has come in contact with the coal pile, slag storage area, sludge disposal area, or other waste or by-product storage area. Stormwater from these areas receives pretreatment (e.g., oil/water separation, settling), as needed, and then is routed to the industrial wastewater treatment plant if additional treatment is necessary.

Two detention basins will be constructed to collect stormwater runoff from the plant site areas. The detention basins will provide water quantity and water quality treatment as required by SWFWMD.

A 0.2-acre detention basin located south of the facilities and adjacent to the northern berm of the cooling reservoir will receive runoff not associated with industrial activity from the administration building, parking lot, and a small area in the immediate vicinity of the building. The total subbasin area is about 3 acres, and the detention basin will detain at least 1 inch of runoff from the area. The discharge from this detention basin will be drained via a control structure into the reclaimed wetland located east of SR 37 and west of the cooling reservoir. Stormwater runoff from the railyard will also drain to the reclaimed wetland area located west of the power block. This reclaimed wetland will discharge to a second reclaimed wetland area located northwest of the power block.

Another 26-acre detention basin will be constructed to the north of the power block. This basin will receive stormwater runoff associated with industrial activity from 172 acres. This detention basin will detain at least 1 inch of runoff prior to discharging into the reclaimed wetland area lying northwest of the power block.

Ultimately, the runoff from the reclaimed wetland areas and site area will be routed north and then eastward via swales into the old mine-cut lake (Outfall 002) which will also receive runoff from the northeastern portion of the site. The discharge from the old mine-cut lake will be drained southward into an existing reclaimed lake located along the eastern edge of the proposed cooling water reservoir. The blowdown from the reservoir (Outfall 001) will also be routed into this existing reclaimed lake. The blowdown and stormwater runoff discharges from the reclaimed lake will be routed offsite through a swale and drain into Little Payne Creek system which runs along the west of Fort Green Road near the project area.

PRELIMINARY

BEST MANAGEMENT PRACTICES PLAN
TAMPA ELECTRIC COMPANY
POLK POWER STATION

Prepared for:



Tampa, Florida

Prepared by:



Environmental Consulting & Technology, Inc.

Gainesville, Florida

ECT No. 90-263-0409

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1.0 INTRODUCTION

Best Management Practices (BMPs) are measures to prevent or mitigate water pollution from sources ancillary to industrial manufacturing or treatment process. The purpose of BMPs is to prevent toxic pollutants or hazardous substances from damaging the aquatic environment.

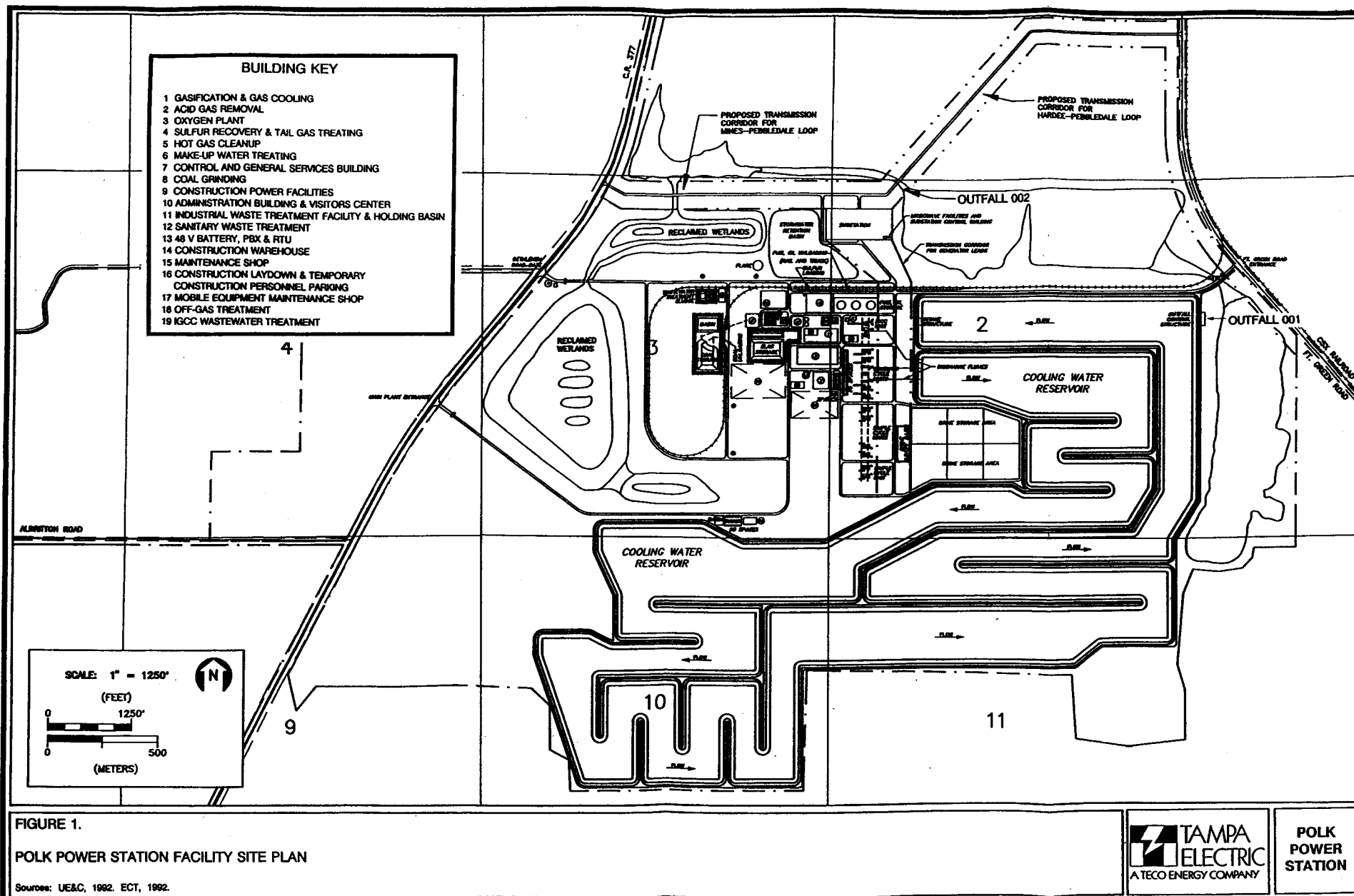
This Preliminary BMP Plan has been developed to satisfy the National Pollutant Discharge Elimination system (NPDES) Permit requirements for Tampa Electric Company Polk Power Station. This Preliminary BMP will be finalized within 6 months prior to commercial operation of Polk Unit No. 1 and will be implemented upon the start of commercial operation of Polk Unit No. 3. The BMP Plan will then be updated whenever there are significant operational or physical changes made at the facility.

This Preliminary BMP Plan provides an overview of potential programs and procedures which may contribute to the goal of minimizing potential inadvertent pollutant discharges to the Waters of the United States.

The Polk Power Station site consists of approximately 4,348 acres in southwest Polk County. The site is bordered by the Hillsborough County line along the western boundary; Fort Green Road [County Road (CR) 663] on the east; CR 630 and Bethlehem and Albritton Roads along the north; and State Road (SR) 674 and phosphate clay settling areas on the south. SR 37 bisects the property running in a southwest to northeast direction. The property to the east of SR 37 consists primarily of recently mined areas with water-filled mine cuts between over-burden spoil piles, recently reclaimed areas, and old mined and unreclaimed areas. The area to the west of SR 37 is currently being mined for phosphate matrix. These operations are scheduled to continue into 1994. Except for the approximately 775-acre tract south of CR 630 (Sections 34 and 35), the site has been part of the Agrico Fort Green Mine.

Southwest Polk County is relatively flat, with elevations generally ranging between 120 and 150 feet National Geodetic Vertical Datum (ft-NGVD). The prevalent land use in the area is phosphate strip mining. The Polk Power Station site itself fits this description. The elevation of the plant site is approximately 140 ft-NGVD. More than 91 percent (i.e., approximately 3,970 acres) of the site has been or is proposed to be disturbed by phosphate mining activities prior to Tampa Electric Company's use of the site. Some of the mined-out areas will be developed into a cooling reservoir.

The proposed Polk Power Station project involves the phased construction and operation of electric generating units and associated facilities. The total generating capacity of the units at the site will be approximately 1,150 megawatts (MW). The generating units planned for the Polk Power Station will be developed at the site according to a phased schedule which matches Tampa Electric Company's forecasted growth in electricity demands beginning in 1995 and continuing into the year 2010. The first generating facilities at the Polk Power Station site will be an integrated coal gasification combined cycle (IGCC) demonstration project developed by Tampa Electric Company and supported in part through funding from the U.S. Department of Energy (DOE) under the Clean Coal Technology Demonstration program. The IGCC unit will consist of a nominal net 150-MW advanced combustion turbine (CT), fueled by No. 2 fuel oil during the first year of operation in 1995. Heat recovery steam generator (HRSG), steam turbine (ST), and coal gasification (CG) facilities will be added and integrated with the advanced CT a year later to complete the nominal net 260-MW IGCC unit. After integration of these facilities, the IGCC unit will be fueled by coal-derived gas (i.e., called coal gas or syngas) which is produced in the CG facilities, with No. 2 fuel oil as a backup fuel. This IGCC unit will be known as Polk Unit 1. Tampa Electric Company's current Power Resource Plan indicates that later facilities will consist of two combined cycle (CC) generating units and six simple-cycle CTs fueled by natural gas with No. 2 fuel oil as the backup fuel. Figure 1 provides an illustration of the proposed Polk Power Station facilities.



2.0 BEST MANAGEMENT PRACTICES PLAN OBJECTIVES

The objective of the BMP Plan is to prevent or minimize the potential for the release of significant amounts of pollutants to the Waters of the United States from activities and areas which are ancillary to the operation of Polk Power Station. The term pollutant refers to any substances listed as toxic under Section 307(a)(1) of the Clean Water Act, oil, as defined by Section 311 of the Clean Water Act, and any substances listed as hazardous under Section 311 of the Clean Water Act.

The potential types of activities and areas addressed by this BMP Plan are described in the following sections.

2.1 RISK IDENTIFICATION AND ASSESSMENT

The following areas have been preliminarily identified as areas having the potential risk of discharging to Waters of the United States:

- Toxic substances storage areas;
- Oil storage areas;
- Hazardous materials storage areas;
- Material storage areas;
- In-plant transfer, process, and material handling areas;
- Loading and unloading facilities; and
- By-product industrial wastewater treatment (IWT) plant sludge and brine storage areas.

2.2 REPORTING OF BEST MANAGEMENT PRACTICES INCIDENTS

An incident reporting system will be in place at Polk Power Station to keep records of any incidents such as spills, leaks, and runoffs which would result in improper discharge to the Waters of the United States. This system of documentation will be developed for the purpose of minimizing discharge reoccurrence, expediting cleanup activities, and complying with applicable regulations.

The incident reporting system includes notification of a discharge to appropriate plant personnel to begin immediate action; formal written reports for review and evaluation by plant management; and notification to the Tampa Electric Company Environmental Planning Department. The Environmental Planning Department will in turn notify the appropriate governmental agencies.

2.3 MATERIAL COMPATIBILITY

Chemical substances, both hazardous and nonhazardous, are identified and controlled through a variety of programs.

A Material Safety Data Sheets (MSDS) source program will be developed for the facility. The program assures compliance with applicable federal regulations and Florida Statutes, and is intended to provide all plant personnel with handling and disposal information of all chemical and materials used in the plant.

The MSDS contain information concerning the known and suspected health risks associated with the product; proper precautions and safe handling practices; and emergency procedures for spills, fires, disposal, and first aid. The MSDS will be grouped in the following categories:

Abrasives	Fine slag	Reagents
Absorbants	Fire control products	Reagent atomic standards
Acids	Fuels and additives	Refractory
Adhesives	Gases	Sealants
Antifreeze	Gasket material	Slag
Asphalt product	Gasoline	Smoke sticks
Biocides	Herbicides	Solvents
Brine	Insulating materials	Static eliminators
Cleaners contact	IWT sludge	Surfactants
Cleaners general	Lime	Sulfur
Cleaners skin	Lubricants	Water and wastewater treatments
Concrete and masonry	Metals and alloys	Welding electrodes
Desiccants	Paint and coatings	Wood products
Electrolytes	Pesticides	
Epoxy and resins	Preservatives	

Prior to purchasing materials for the plant, an MSDS will be obtained from the manufacturer or vendor for review. This information can identify any potential dangers to employees, as well as directions for storage and spill procedures and fire prevention.

2.4 GOOD HOUSEKEEPING

It is Tampa Electric Company's policy to maintain a clean and orderly work environment. This policy will be reflected in a variety of programs, plant personnel inspections, system/unit operating guidelines, and training programs for the Polk Power Station. The practices and procedures covered by these programs ensure that any spills or leaks will be detected and cleaned up promptly.

2.5 PREVENTIVE MAINTENANCE

The Polk Power Station will develop a preventive maintenance program prior to the start of commercial operations. This preventive maintenance program involves inspection and testing of plant equipment and systems to uncover conditions which could cause breakdowns or failures resulting in significant discharges of pollutants to surface waters. The program prevents breakdowns and failures by routine adjustment, repair, or replacement of items. The preventive maintenance program includes record systems for scheduling inspections and corrective actions. The criteria for formal equipment inspection is determined by analyzing the short- and long-term effects that the equipment breakdown will have on electrical generation, personnel safety, regulatory requirements, and economic and historical data.

2.6 INSPECTIONS AND RECORDS

Visual inspections of plant facilities, systems, tanks, pipelines, and storage areas will be conducted on a regular basis. Plant operations personnel will be required to make routine rounds or patrols of various areas of the power plant as part of their job responsibility. While on these rounds, they will look for any unusual conditions, faulty equipment operations, leaks, spills, or other problems which are causing, or potentially could cause, an environmental incident. Any leaks or spills observed, or

deterioration of equipment which could contribute to an incident will be reported and investigated. Visual inspections will be performed at a frequency consistent with maintenance, operational, and regulatory requirements.

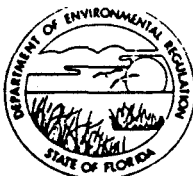
2.7 SECURITY

Security at the Polk Power Station will be provided by a hired guard service. Guards will be onsite 24 hours a day, 7 days a week to secure and control access to the station. A guard is stationed at station entrances to clear both employees and visitors.

Guards will be required to write reports of observed abnormalities detailing incidents of fire, explosion, threats, assaults, vandalism, property damage, intrusion, theft, or similar security matters.

2.8 EMPLOYEE TRAINING

Polk Power Station will provide training for its employees. New employee orientation will include a general safety training course and an environmental training course. The courses will cover hazardous materials handling and disposal, and fire safety. In addition, power plant operations personnel will receive instructions on the safety-related aspects of all operating systems to ensure that they are well educated on the potential safety and environmental impacts of the systems for which they are responsible. Specialty training will be provided to plant personnel in support of specific training needs. A training program regarding hazardous waste and hazardous materials handling will be conducted annually for the plant personnel engaged in the handling of hazardous materials in accordance with the provisions of 40 Code of Federal Regulations 26.



Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

DER Form #	17-312.900(1)
Form Title	Joint Ap. for Works in the Waters of Florida
Effective Date	October 30, 1991
DER Application No.	(Filed in by DER)

Joint Application for Works in the Waters of Florida

Department of the Army (Corps)/Florida Department of Environmental Regulation (DER/
Department of Natural Resources (DNR)/Delegated Water Management District (Delegated WMD)

Type or Print Legibly

Corps Application Number (official use only)	DER Application Number (official use only)						
1. Applicant's Name and Address Name <u>Tampa Electric Company</u> Last Name, First name (If Individual); Corporate Name; Name of Govt. Agency Street <u>Post Office Box 111</u> City <u>Tampa</u> State <u>Florida</u> Zip <u>33601-0111</u> Telephone (<u>813</u>) <u>228-4111</u> (Day) () (Night)							
2. Name, Address, Zip Code, Telephone Number and Title of Applicant's Authorized Agent Name <u>A. Spencer Autry, Director of Environmental</u> Last Name, First Name Corporate Name; Name of Govt. Agency <u>Tampa Electric Company</u> Street <u>Post Office Box 111</u> City <u>Tampa</u> State <u>Florida</u> Zip <u>33601-0111</u> Telephone (<u>813</u>) <u>228-4111</u> (Day) () (Night)							
3. Name of Waterway at Work Site: <u>Little Payne Creek</u>							
4. Street, Road or Other Location of Work <u>State Road 37, County Road 630, Fort Green Road (see Figure 1)</u> Incorporated City or Town <u>near Bradley Junction</u> Section <u>34 and 35</u> Township <u>31 South</u> Range <u>23 East</u> Section <u>1,2,3,4,9,10,11, and 12</u> Township <u>32 South</u> Range <u>23 East</u> Section _____ Township _____ Range _____ County(ies) <u>Polk</u> Coordinates in Center of Project: <table border="1"><tr><td colspan="2">Federal Projects Only: _____ x _____ y</td></tr><tr><td>Latitude <u>27</u> ° <u>43</u> ' <u>30</u> "</td><td>Longitude <u>81</u> ° <u>59</u> ' <u>0</u> "</td></tr><tr><td>Lot <u>N/A</u> Block _____ Subd _____</td><td>Plat Bk _____ Pg _____</td></tr></table> Directions to Locate Site: <u>Approximately 12 miles south of Highway 60 in Mulberry, on the east side of State Road 37 (approximately 4 miles south of Bradley Junction, see Figure 1)</u>		Federal Projects Only: _____ x _____ y		Latitude <u>27</u> ° <u>43</u> ' <u>30</u> "	Longitude <u>81</u> ° <u>59</u> ' <u>0</u> "	Lot <u>N/A</u> Block _____ Subd _____	Plat Bk _____ Pg _____
Federal Projects Only: _____ x _____ y							
Latitude <u>27</u> ° <u>43</u> ' <u>30</u> "	Longitude <u>81</u> ° <u>59</u> ' <u>0</u> "						
Lot <u>N/A</u> Block _____ Subd _____	Plat Bk _____ Pg _____						
5. Names, Addresses, and Zip Codes of Adjacent Property Owners Whose Property Also Adjoins the Water (Excluding Applicant). Show Numbers or Names of These Owners on Plan Views. If More Than Six (6) Owners Adjoin the Project, You May Be Required to Publish a Public Notice for the DER. <table><tr><td>1. <u>Agrico Chemical Company</u> <u>Post Office Box 1110</u> <u>Mulberry, Florida 33689</u></td><td>2. <u>American Cyanamid Company</u> <u>Post Office Box 5290</u> <u>Lakeland, Florida 33807</u></td><td>3. <u>Guy A. Lamb</u> <u>723 Northeast 7th Street</u> <u>Fort Meade, Florida 33841</u></td></tr><tr><td>4. <u>Seminole Fertilizer, Inc.</u> <u>Post Office Box 471</u> <u>Bartow, Florida 33830</u></td><td>5. _____</td><td>6. _____</td></tr></table>		1. <u>Agrico Chemical Company</u> <u>Post Office Box 1110</u> <u>Mulberry, Florida 33689</u>	2. <u>American Cyanamid Company</u> <u>Post Office Box 5290</u> <u>Lakeland, Florida 33807</u>	3. <u>Guy A. Lamb</u> <u>723 Northeast 7th Street</u> <u>Fort Meade, Florida 33841</u>	4. <u>Seminole Fertilizer, Inc.</u> <u>Post Office Box 471</u> <u>Bartow, Florida 33830</u>	5. _____	6. _____
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6. Proposed Use (Check one or more as applicable) Private Single Family ☐ Multi Family ☐
 Public ☐ Commercial ☒ New Work ☐ Alteration of Existing Works ☐ Maintenance ☐ Other (Explain) _____

7. Desired Permit Duration (see Fee Schedule)
 5 Yr ☒ 10 Yr ☐ Other (Specify) _____

8. General Permit or Exemption Requested
 DER General Permit FAC Rule 17-312. _____ DER Exemption FAC Rule 17-312. _____ Section 403. _____ F.S.

9. Total Extent of Work in Jurisdictional Open Waters or Wetlands: (Use additional sheets and provide complete breakdown of each category if more space is needed.)

a. Within Corps Jurisdiction:
 Fill: 11,025,471 Sq. Ft. 253.11 Acres 3,550,075 Cu. Yds.
 Excavation: N/A Sq. Ft. N/A Acres N/A Cu. Yds.

b. Within DER Jurisdiction:
 Fill: N/A Sq. Ft. _____ Acres _____ Cu. Yds.
 Excavation: N/A Sq. Ft. _____ Acres _____ Cu. Yds.
 Excavation Waterward of MHW N/A cu. yds. (Information needed for DNR)

c. DER Jurisdictional Area Severed (Area Landward of Fill Structures which will be Severed):
N/A Sq. Ft. _____ Acres

d. DER Jurisdictional Area Created (New Excavation from Uplands, Exclusive of Mitigation):
N/A Sq. Ft. _____ Acres

e. Docks, Piers, and Over Water Structures:
 Total Number of Slips N/A Total Number of Mooring Pilings _____
 Length _____ Width _____ Height above MHW _____
 Length _____ Width _____ Height above MHW _____
 Number of Finger Piers _____ Length _____ Width _____ Height _____
 Number of Finger Piers _____ Length _____ Width _____ Height _____
 Total area of structure over waters & wetlands _____ sq. ft.
 Use of structure _____

Will the docking facility provide:	No	Yes	Number
Liveaboard Slips	☐	☐	_____
Fueling Facilities	☐	☐	_____
Sewage Pump-out Facilities	☐	☐	_____
Other Supplies or Services Required for Boating (Excluding refreshments, bait and tackle)	☐	☐	_____

f. Seawall length N/A ft. Seawall material _____
 Riprap revetment length _____ ft. Slope _____ H: _____ V _____ Toe width _____ ft.
 Riprap at toe of seawall length _____ ft. Slope _____ H: _____ V _____ Toe width _____ ft.
 Size of riprap _____
 Type of riprap or seawall material _____

g. Other (See Item 10).

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10. Description of Work (be specific; use additional sheets as necessary).

See Attachment A, Response to Item 10.

11. Turbidity, Erosion, and Sedimentation Controls Proposed:

Existing mine cuts to be dewatered prior to commencement of grading activities. A silt screen will be erected upstream of the point of offsite discharge (see Figure 5, Sheet 9 of 13, and Attachment A, Response to Item 10).

12. Date Activity is Proposed to Commence December 1993 ; to be Completed January 1997
Total Time Required to Construct _____

13. Previous Applications for this Project have been:	DER No.	Corps No.
A. Denied (date) _____	_____	_____
B. Issued (date) <u>April 20, 1990</u>	<u>531620259</u>	<u>89IPC-20202 06/29/90</u>
C. Other (please explain) _____	_____	<u>20223 08/30/89</u>

Differentiate between existing work and proposed work on the drawings.

14. Certification. Application is hereby made for a permit or permits to authorize the activities described herein.

A. I Certify That: (Please check appropriate space)

- I am the record owner ☐ ; lessee ☐ , or the record easement holder ☐ of the property on which the proposed project is to be undertaken, as described in the attached legal document.
- I am not ☒ the record owner, lessee, or record easement holder of the property on which the proposed project is to be undertaken, as described in the attached legal document, but I will have, before undertaking the proposed work, the requisite property interest. (Please explain what the interest will be and how it will be acquired.)

Attach legal description of property or copy of deed to the property on which project is to occur (must be provided)
(See Attachment B)

B. I understand I may have to provide any additional information/data that may be necessary to provide reasonable assurance or evidence that the proposed project will comply with the applicable State Water Quality Standards or other environmental standards both before construction and after the project is completed.

C. In addition, I agree to provide entry to the project site for inspectors with proper identification or documents as required by law from the environmental agencies for the purpose of inspecting the site. Further, I agree to provide entry to the project site for such inspectors to monitor permitted work, if a permit is granted.

D. This is a Joint Application and is not a Joint Permit. I hereby acknowledge the obligation and responsibility for obtaining all of the required state, federal or local permits before commencement of construction. I also understand that before commencement of this proposed project, I must be granted separate permits or authorizations from the U.S. Corps of Engineers, the U.S. Coast Guard, the Department of Environmental Regulation, the Delegated Water Management District (where applicable), and the Department of Natural Resources, as necessary.

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Effective Date	October 30, 1991
DER Application No.	(Filed in by DER)

E. I am familiar with the information contained in this application, and that to the best of my knowledge and belief, such information is true, complete and accurate. I further certify that I possess the authority to undertake the proposed activities or am acting as the duly authorized agent of the applicant. I understand that knowingly making any false statement or representation in this application is a violation of Section 403.161, F.S. and Chapter 837, F.S.

A. Spencer Autry

Typed/Printed Name of Applicant or Agent

Director, Environmental

(Corporate Title if applicable)



Signature of Applicant or Agent

July 24, 1992

Date

AN AGENT MAY SIGN ABOVE IF APPLICANT COMPLETES THE FOLLOWING:

I hereby designate and authorize the agent listed above to act on my behalf as my agent in the processing of this permit application and to furnish on request, supplemental information in support of the application.

Charles R. Black

Typed/Printed Name of Applicant

Vice President, Project Management

(Corporate Title if applicable)



Signature of Applicant

July 24, 1992

Date

15. **For your information:** Section 370.034, Florida Statutes, requires that all dredge and fill equipment owned, used, leased, rented or operated in the state shall be registered with the Department of Natural Resources. Before selecting your contractor or equipment you may wish to determine if this requirement has been met. For further information, contact the Chief of the Bureau of Saltwater Licenses and Permits, Department of Natural Resources, 3900 Commonwealth Boulevard, Tallahassee, Florida 32399. Telephone No. (904) 487-3122. **This is not a requirement for a permit from the Department of Environmental Regulation.**

18 U.S.C. Section 1001 provides that, Whoever, in any manner within the jurisdiction of any department or agency of The United States knowingly and willfully falsifies, conceals, or covers up by any trick, scheme, or device a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statement or entry, shall be fined not more than \$10,000 or imprisoned not more than five years, or both.

16. Please submit this completed form, with attached drawings and the complete DER processing fee (see Fee Schedule in Rule 17-4.050, F.A.C., copy attached) to the appropriate DER or Delegated WMD office with jurisdiction over the project site.

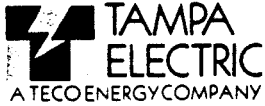


To Whom It May Concern:

Tampa Electric Company intends to acquire all lands designated in this application for the Polk Power Station and its associated facilities prior to the commencement of construction. This land will be used for construction of these facilities as described in the application.

Charles R. Black
Vice President
Project Management

/wp78



To Whom It May Concern:

Please be advised that A. Spencer Autry, Director of Environmental, is the authorized representative of Tampa Electric Company concerning matters with which this permit application deals.

Sincerely,

Charles R. Black
Vice President
Project Management

/Permit2

ATTACHMENT A
RESPONSE TO ITEM 10

With this application Tampa Electric Company seeks permission to place fill within and recontour heavily disturbed wetlands and open water areas which have formed subsequent to phosphate mining activities on the proposed Polk Power Station property (see Figures 1, 2, 3, 4, and 5).

Existing, unreclaimed mine cuts on the property will be incorporated into a cooling reservoir, a stormwater retention pond and wetland enhancement areas (see Figures 2, 3, 4, and 5). Areas proposed for fill placement are either currently unvegetated or are narrow littoral zones vegetated with a dominance of invasive cattail (Typha sp.). Approximately 211.78 acres of this wetland type will be filled for the construction of a series of containment berms for the cooling reservoir, transmission line, and the power plant (see Table 1).

Elsewhere within the Polk Power Station site, isolated disturbed wetlands, which have either formed subsequent to clearing and earthmoving activities or are relict systems, will be displaced for the construction of a functional and practical power plant. These freshwater wetlands are also typically dominated by nuisance species of vegetation including groundsel bush (Baccharis halmifolia), primrose willow (Ludwigia peruviana), Carolina willow (Salix caroliniana) and cattail. More desirable species found within these wetlands included red maple (Acer rubrum), laurel oak (Quercus laurifolia), water oak (Quercus nigra), dahoon holly (Ilex cassine), buttonbush (Cephalanthus occidentalis), sand cordgrass (Spartina bakeri), pickerelweed (Pontederia cordata), softrush (Juncus effusus), arrowhead (Sagittaria lancifolia), Virginia chain fern (Woodwardia virginica), redroot (Lacnantes caroliniana) and goldenrod (Solidago fistulosa). Approximately 41.33 acres of this habitat will be displaced for the construction of the plant site.

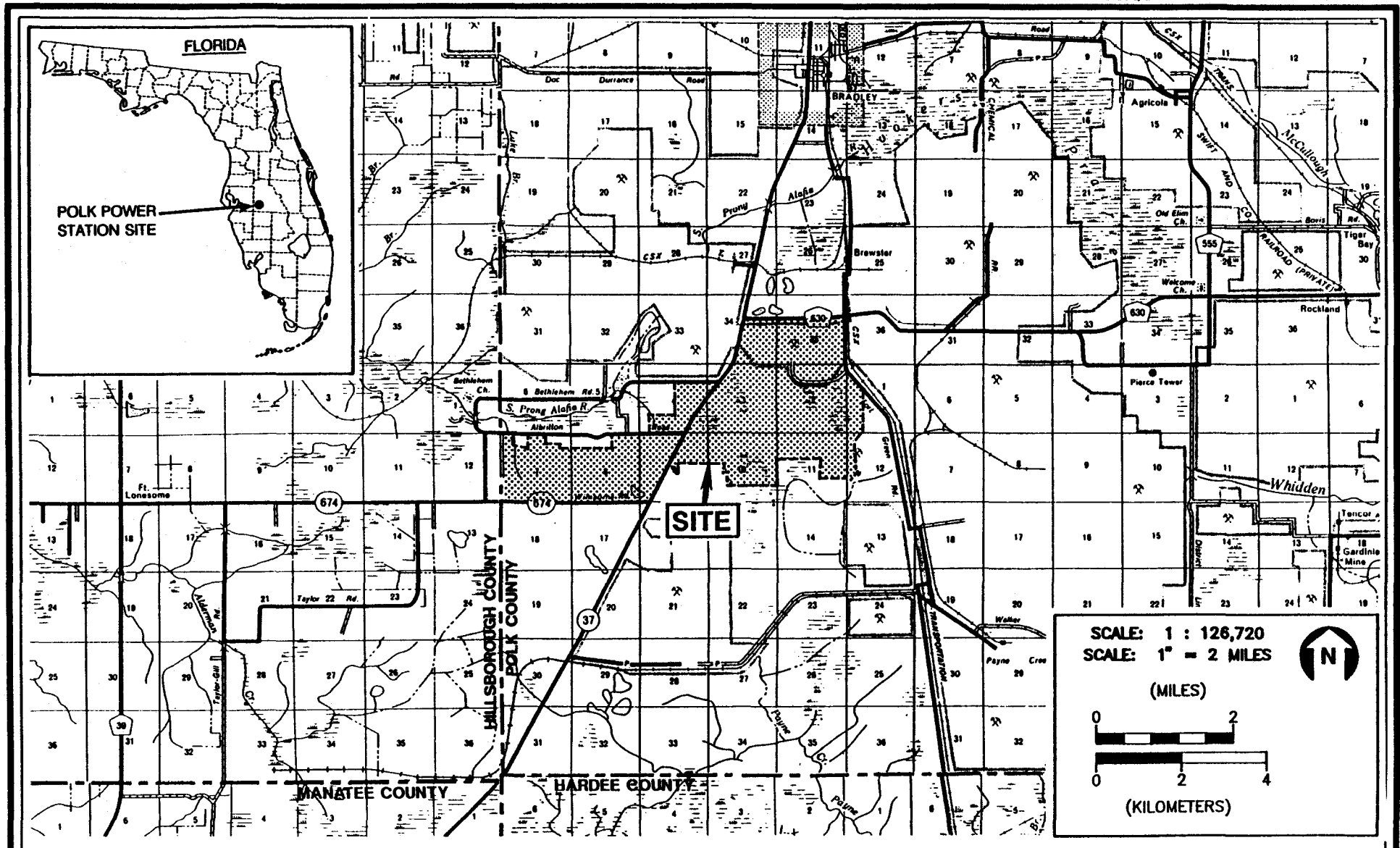


FIGURE 1.
SITE LOCATION MAP
DREDGE AND FILL PERMIT APPLICATION

Sources: FDOT Maps., Hillsborough Co., Polk Co., Manatee Co., Hardee Co.; ECT, 1992.

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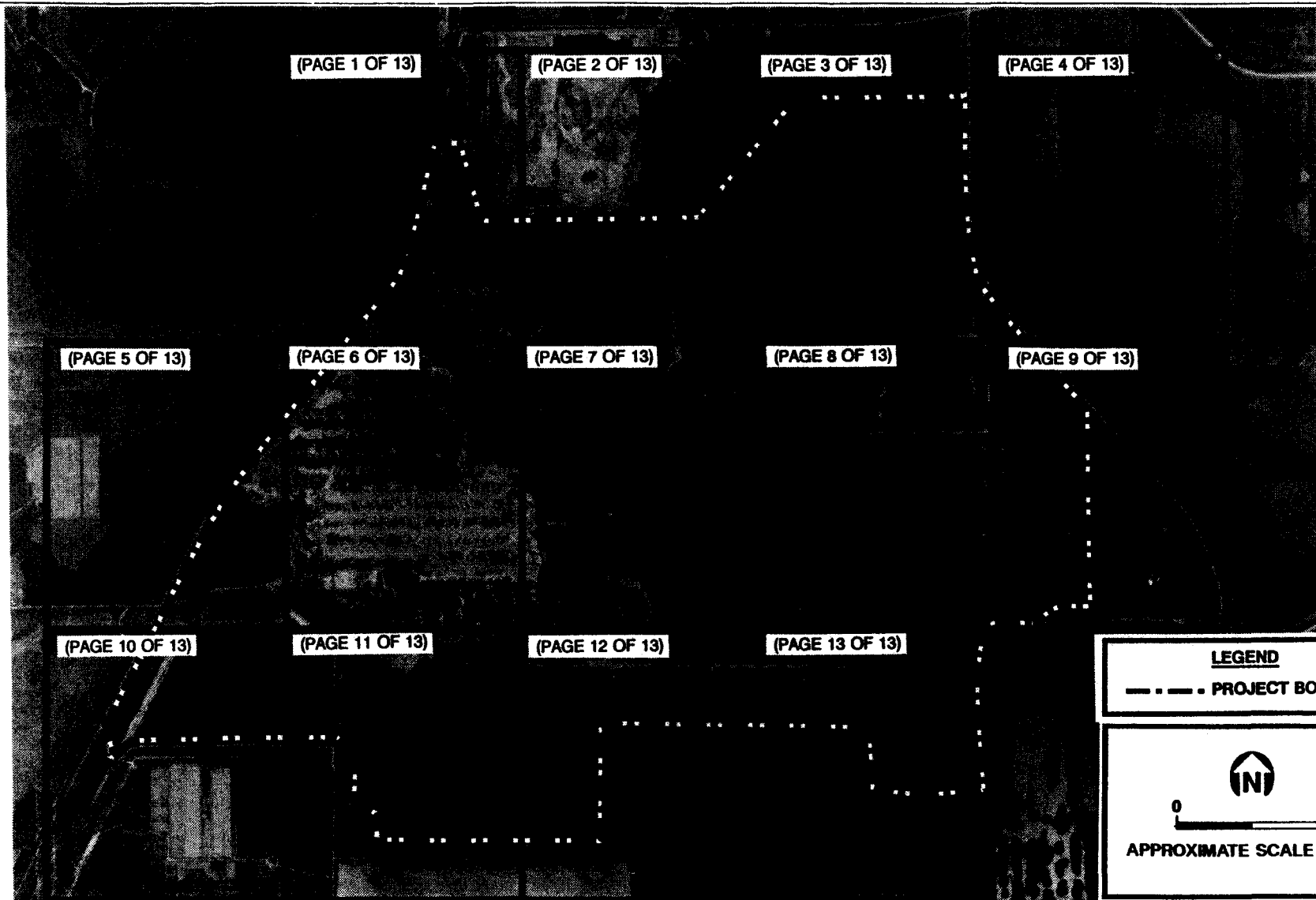
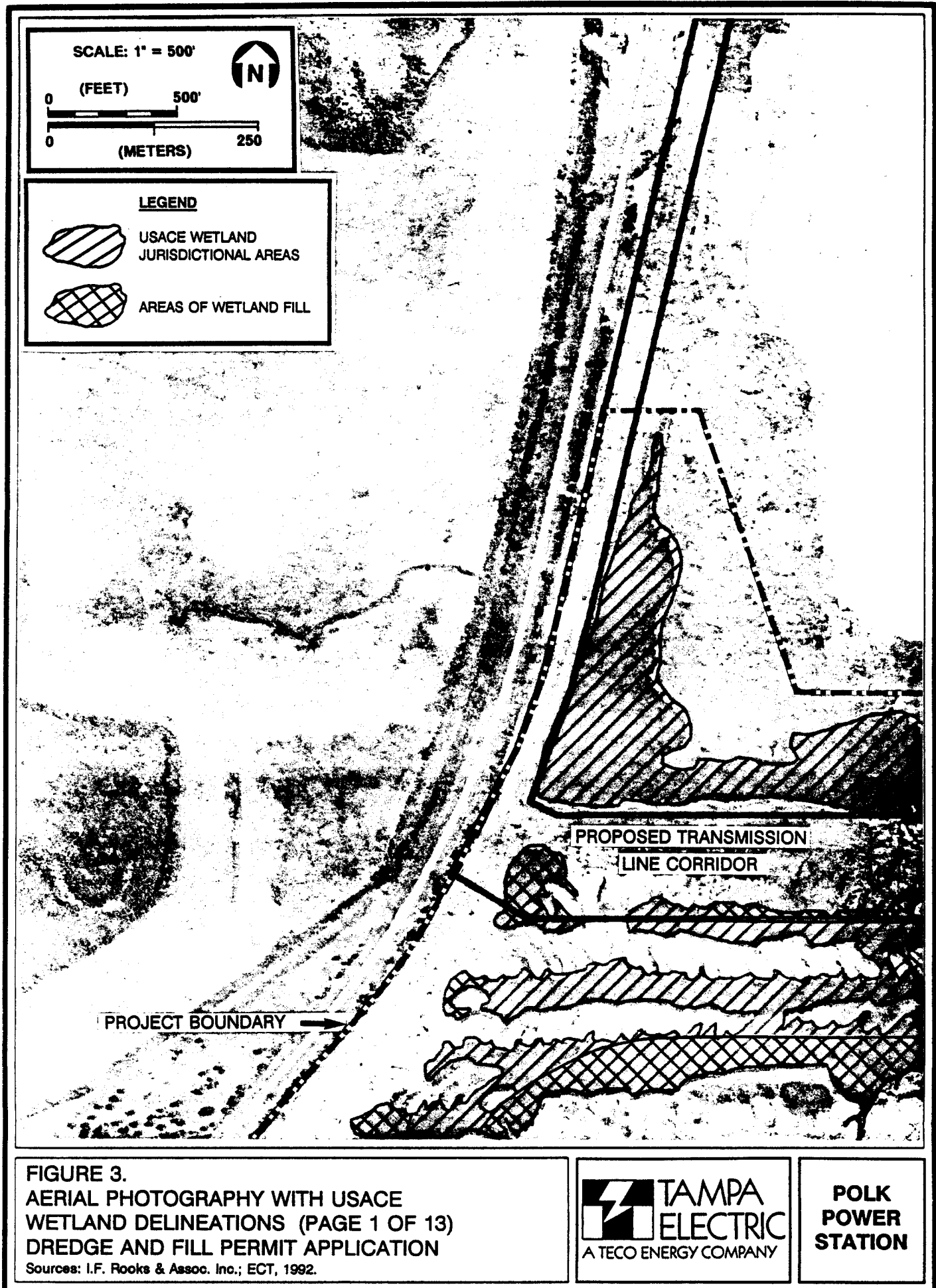


FIGURE 2.
KEY MAP FOR AERIAL PHOTOGRAPHS, POST-RECLAMATION TOPOGRAPHY AND
POST-RECLAMATION VEGETATION
DREDGE AND FILL PERMIT APPLICATION

Sources: I.F. Fooks & Assoc. Inc.; ECT, 1992.

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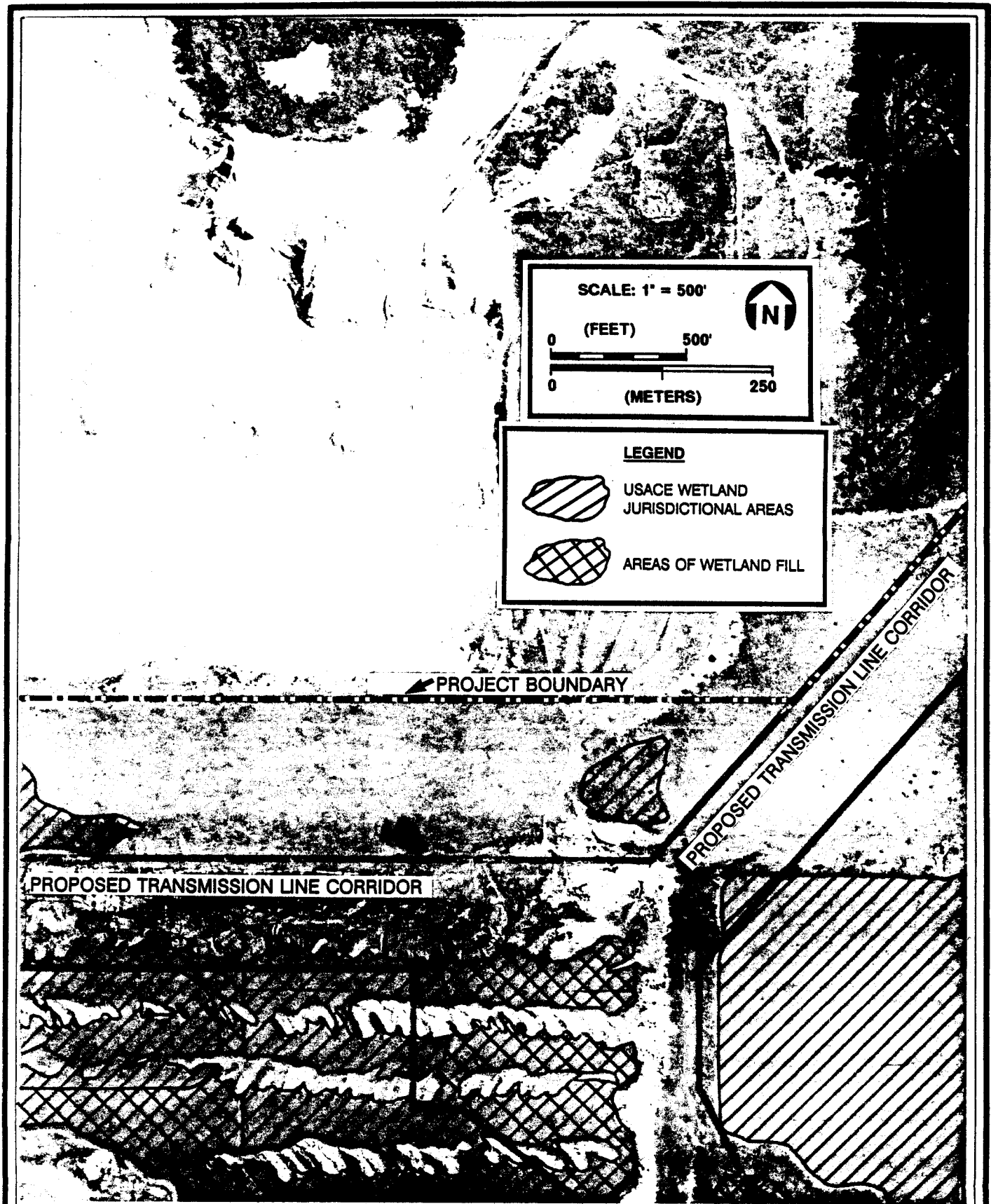


FIGURE 3.
AERIAL PHOTOGRAPHY WITH USACE
WETLAND DELINEATIONS (PAGE 2 OF 13)
DREDGE AND FILL PERMIT APPLICATION
 Sources: I.F. Rooks & Assoc. Inc.; ECT, 1992.

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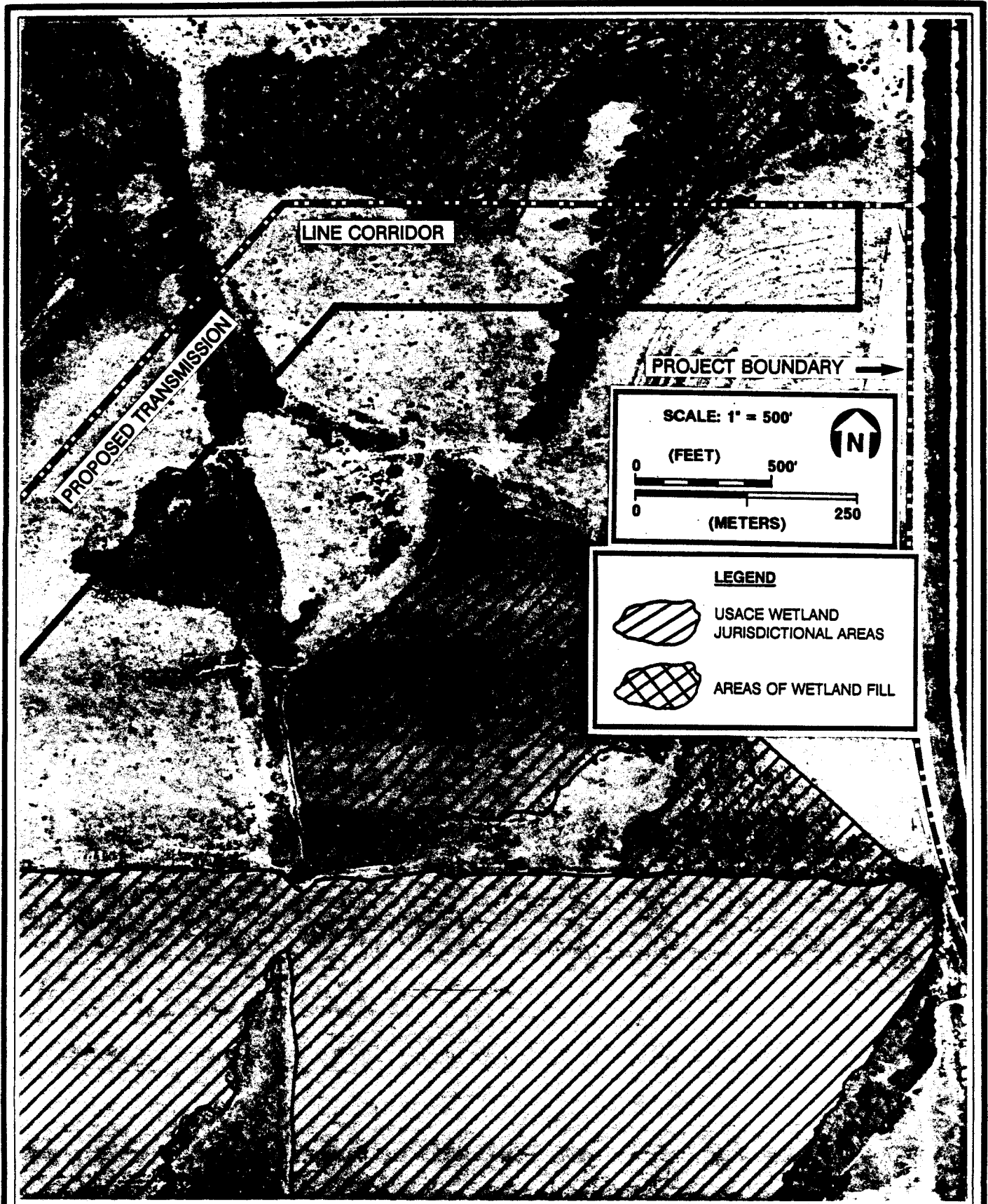


FIGURE 3.
AERIAL PHOTOGRAPHY WITH USACE
WETLAND DELINEATIONS (PAGE 3 OF 13)
DREDGE AND FILL PERMIT APPLICATION
 Sources: I.F. Rooks & Assoc. Inc.; ECT, 1992.

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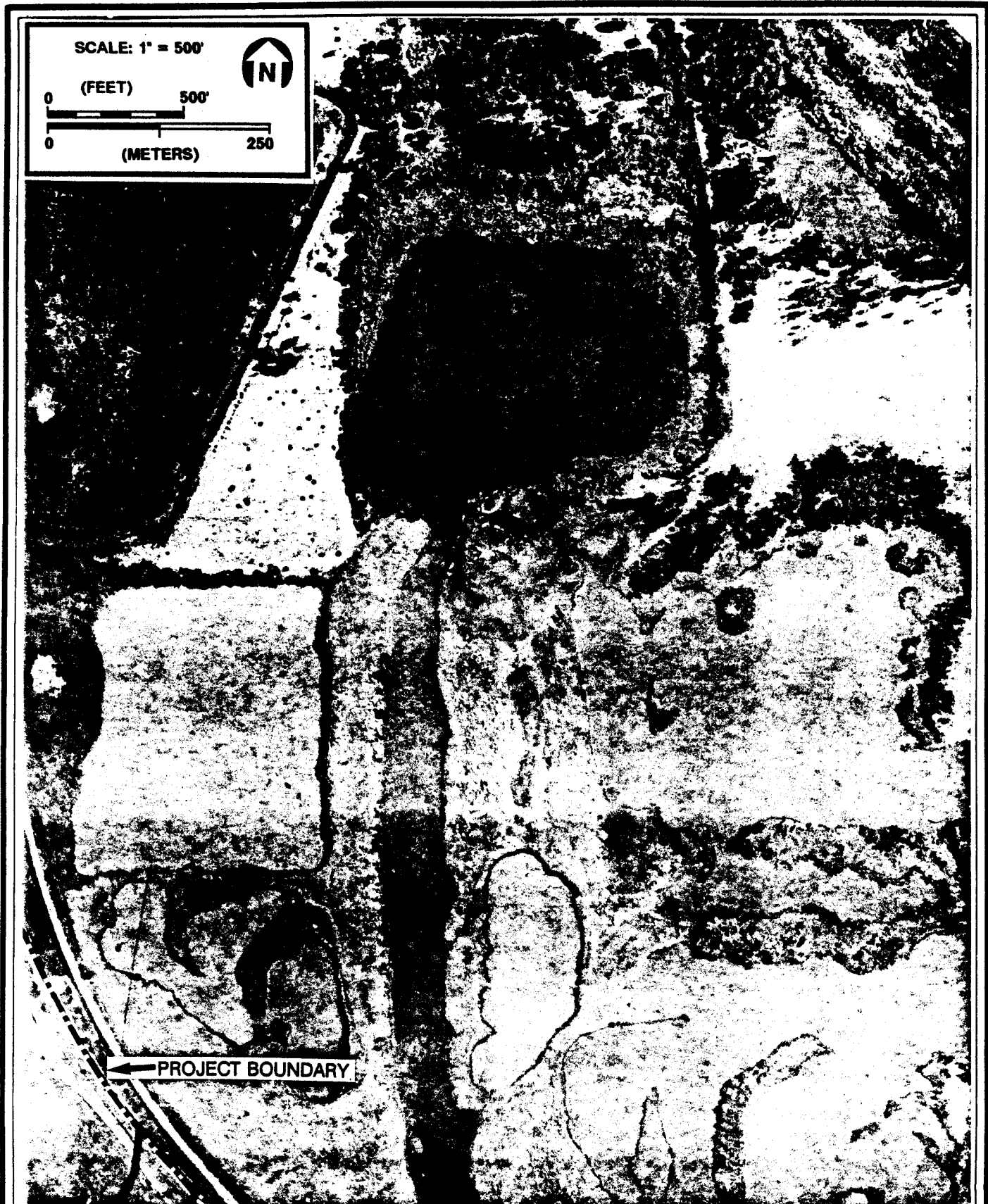
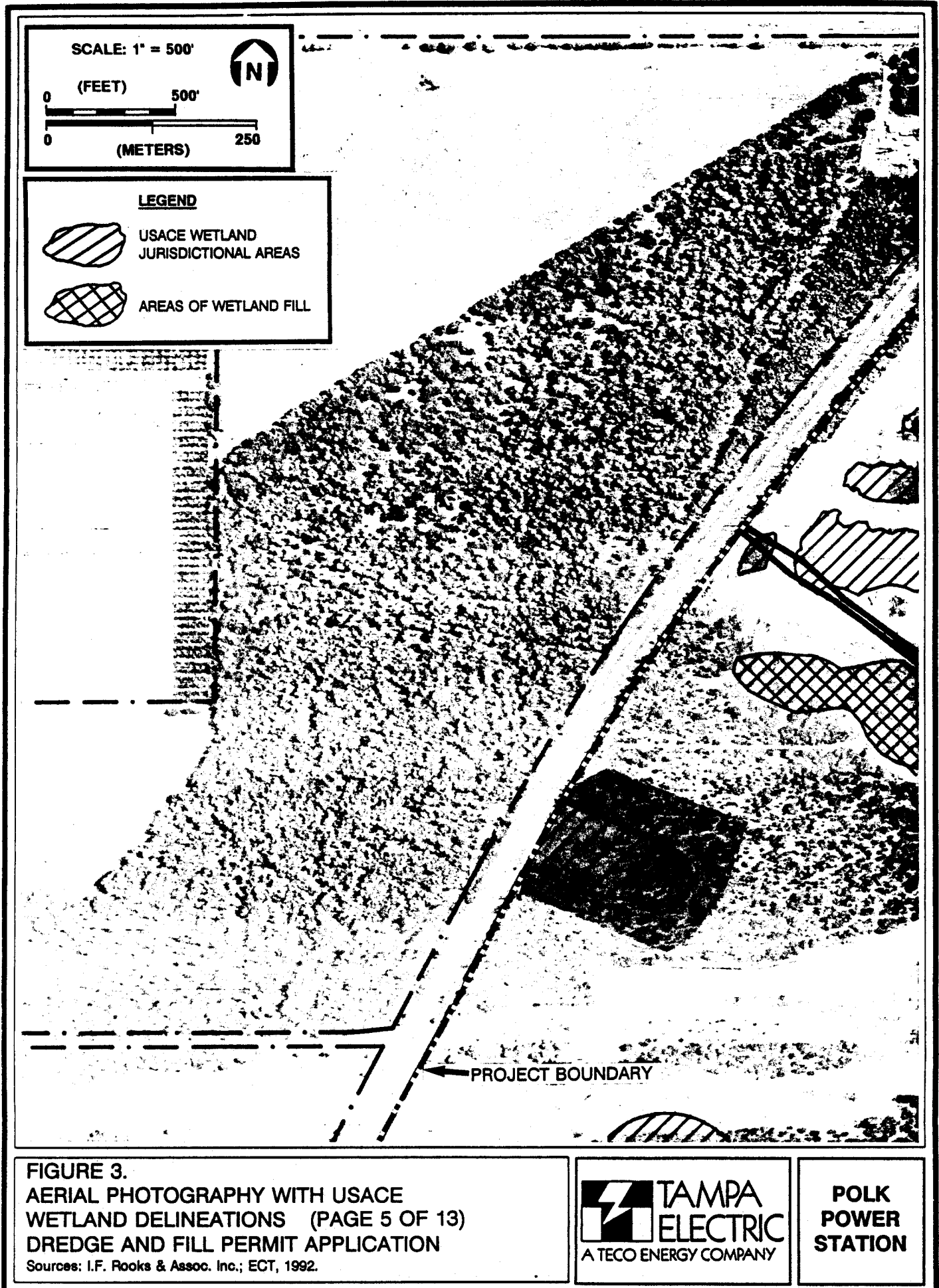


FIGURE 3.
AERIAL PHOTOGRAPHY WITH USACE
WETLAND DELINEATIONS (PAGE 4 OF 13)
DREDGE AND FILL PERMIT APPLICATION
Sources: I.F. Rooks & Assoc. Inc.; ECT, 1992.

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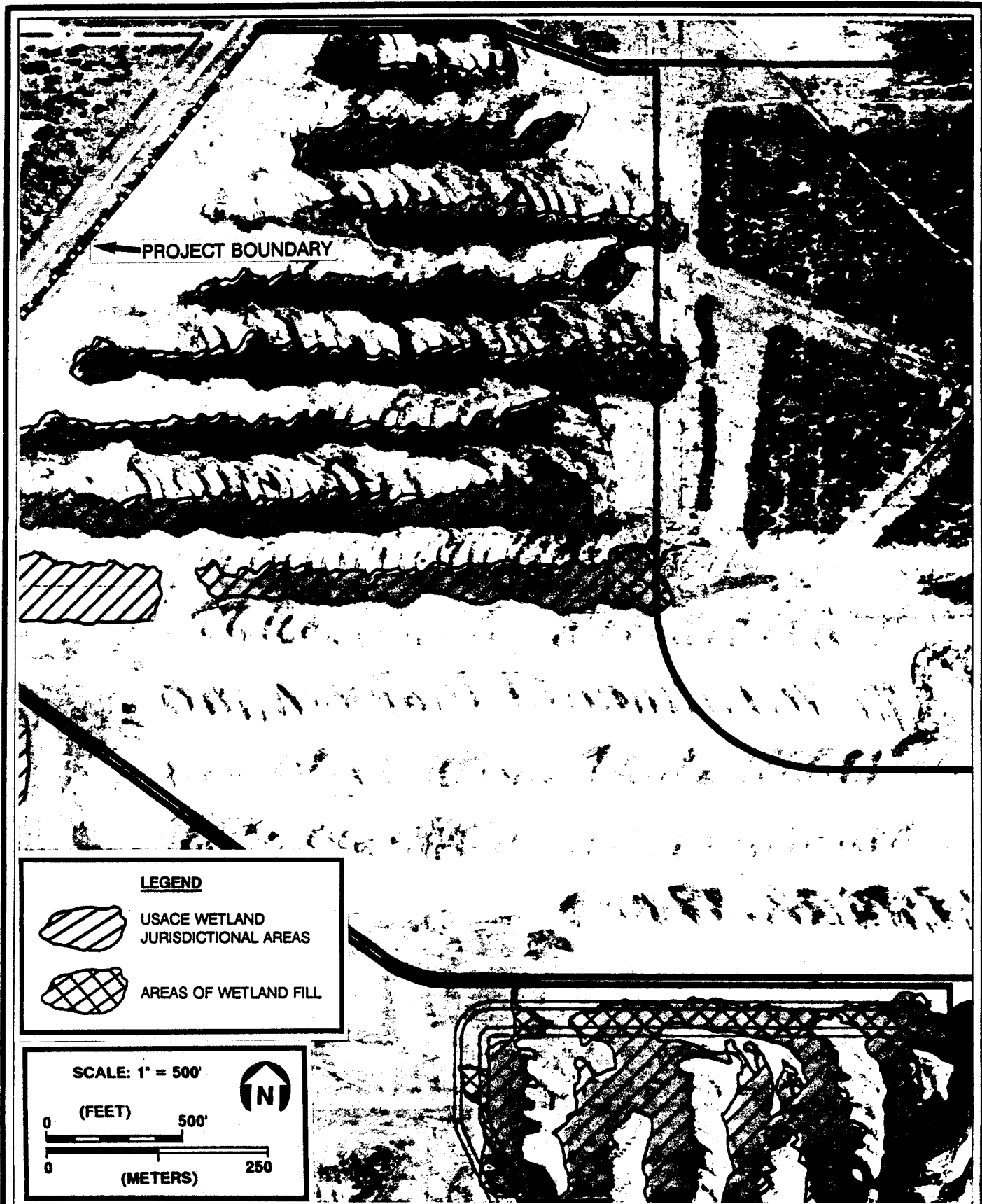


FIGURE 3.
AERIAL PHOTOGRAPHY WITH USACE
WETLAND DELINEATIONS (PAGE 6 OF 13)
DREDGE AND FILL PERMIT APPLICATION
 Sources: I.F. Rocks & Assoc. Inc.; ECT, 1992.

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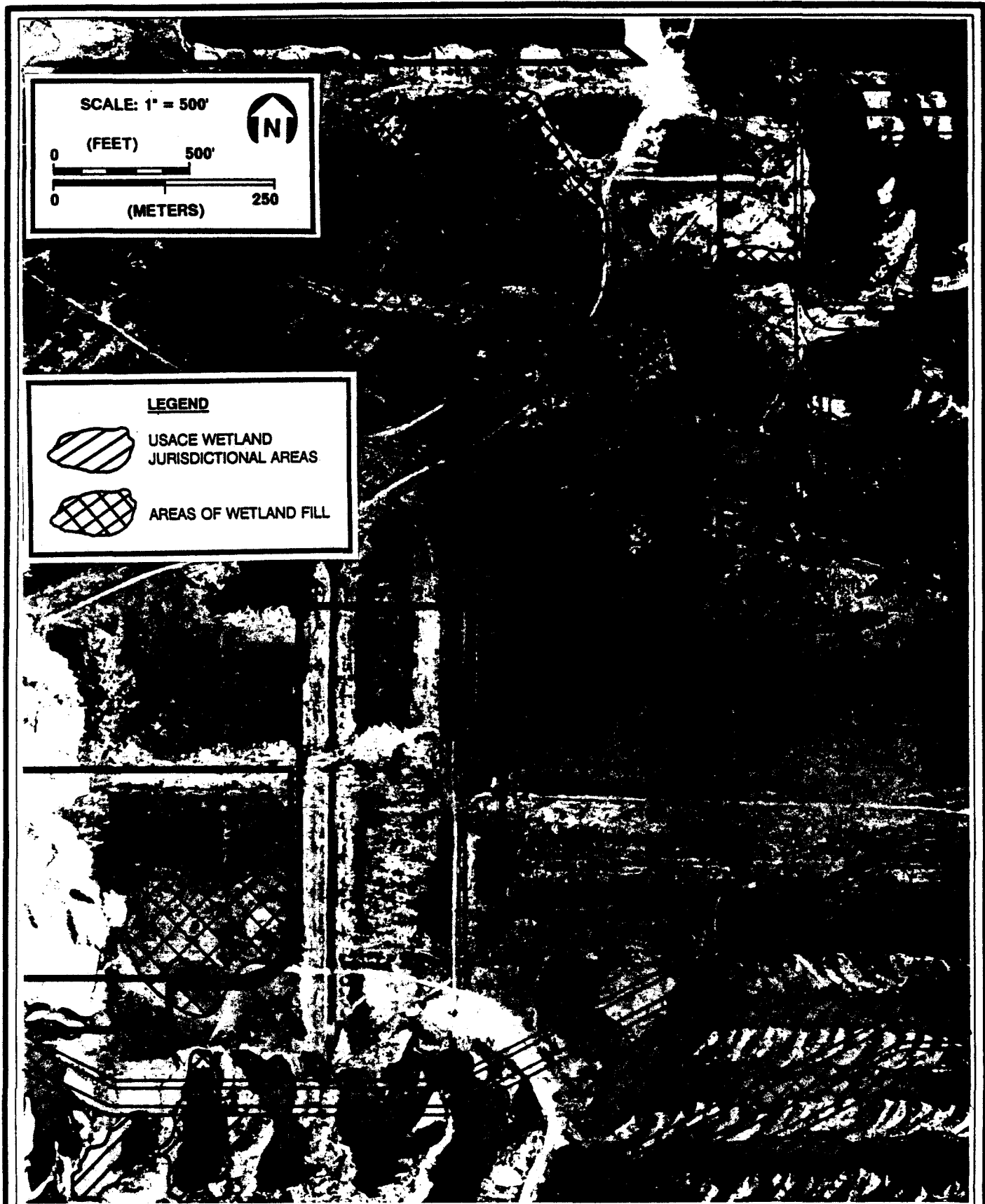


FIGURE 3.
AERIAL PHOTOGRAPHY WITH USACE
WETLAND DELINEATIONS (PAGE 7 OF 13)
DREDGE AND FILL PERMIT APPLICATION

Sources: I.F. Rooks & Assoc. Inc.; ECT, 1992.

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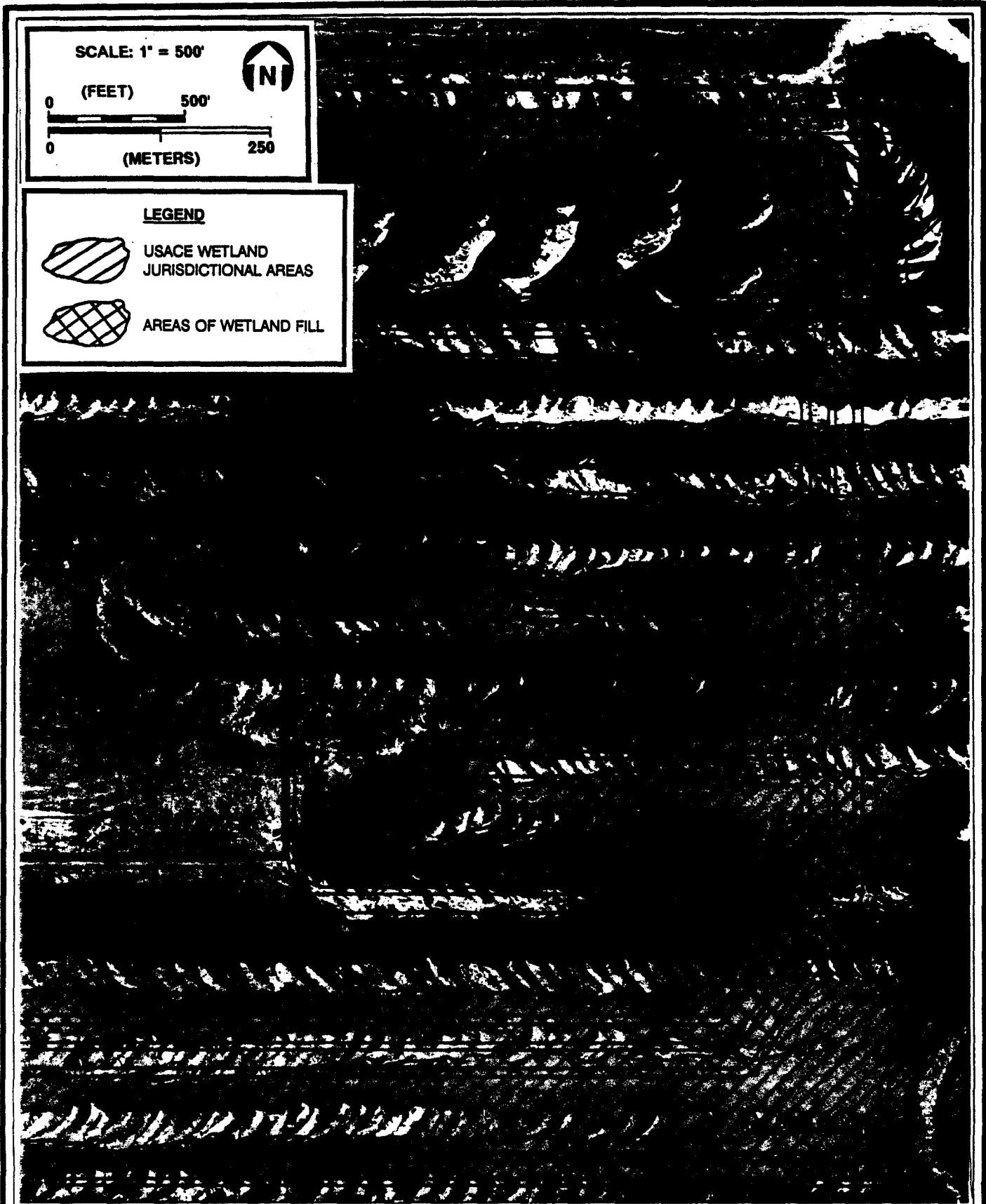


FIGURE 3.
AERIAL PHOTOGRAPHY WITH USACE
WETLAND DELINEATIONS (PAGE 8 OF 13)
DREDGE AND FILL PERMIT APPLICATION

Sources: I.F. Rocks & Assoc. Inc.; ECT, 1992.

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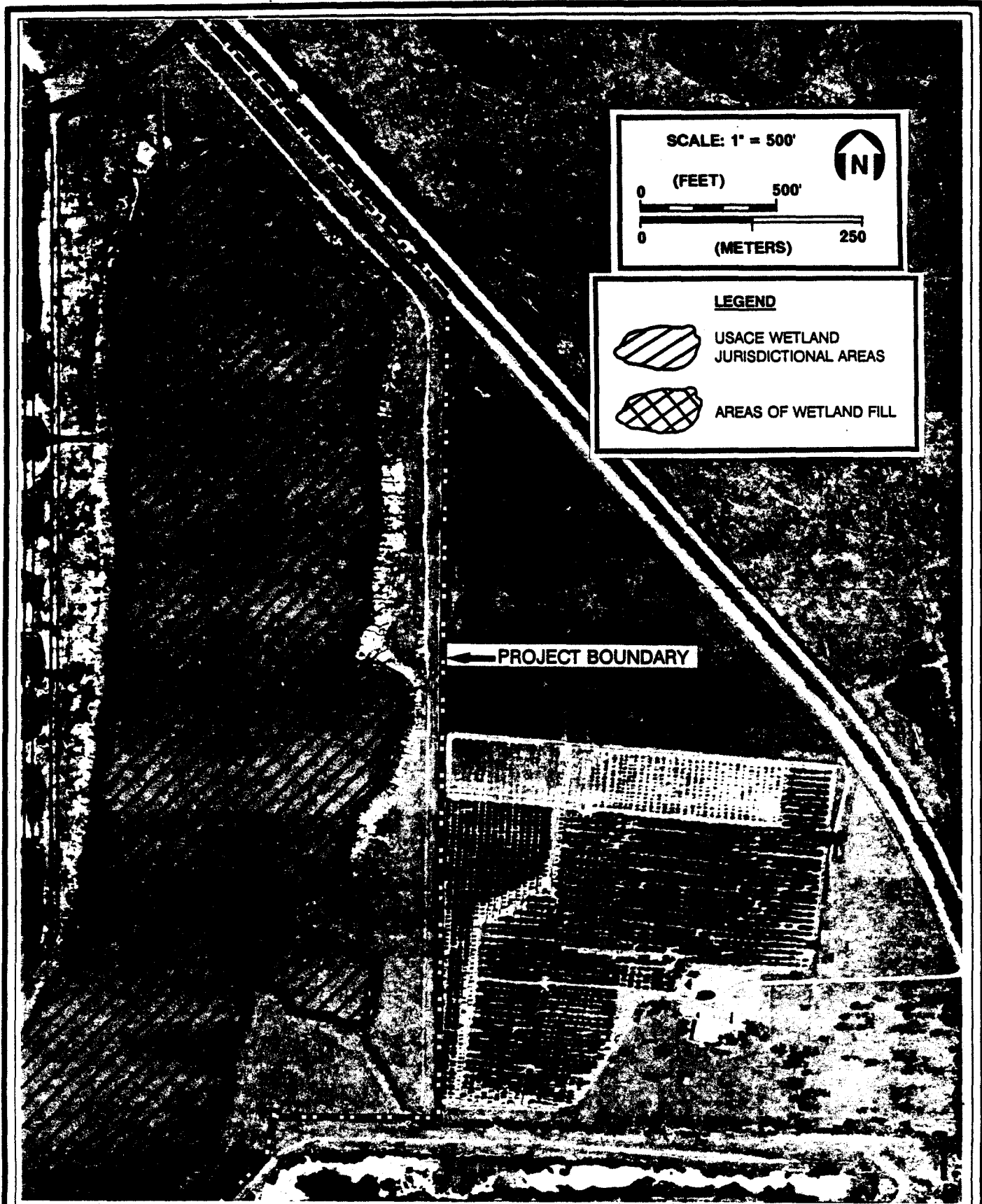


FIGURE 3.
AERIAL PHOTOGRAPHY WITH USACE
WETLAND DELINEATIONS (PAGE 9 OF 13)
DREDGE AND FILL PERMIT APPLICATION

Sources: I.F. Rooks & Assoc. Inc.; ECT, 1992.

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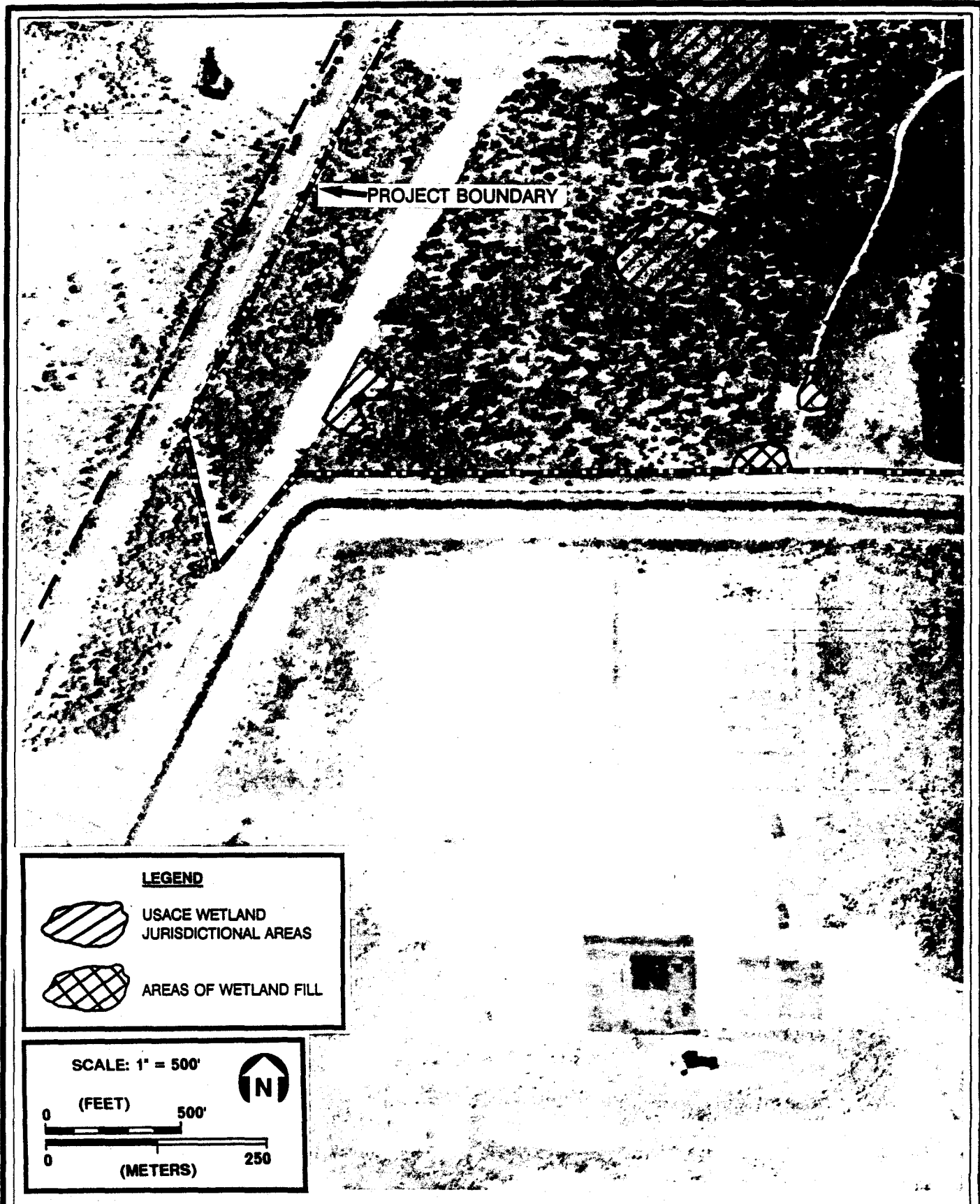


FIGURE 3.
AERIAL PHOTOGRAPHY WITH USACE
WETLAND DELINEATIONS (PAGE 10 OF 13)
DREDGE AND FILL PERMIT APPLICATION

Sources: I.F. Rooks & Assoc. Inc.; ECT, 1992.

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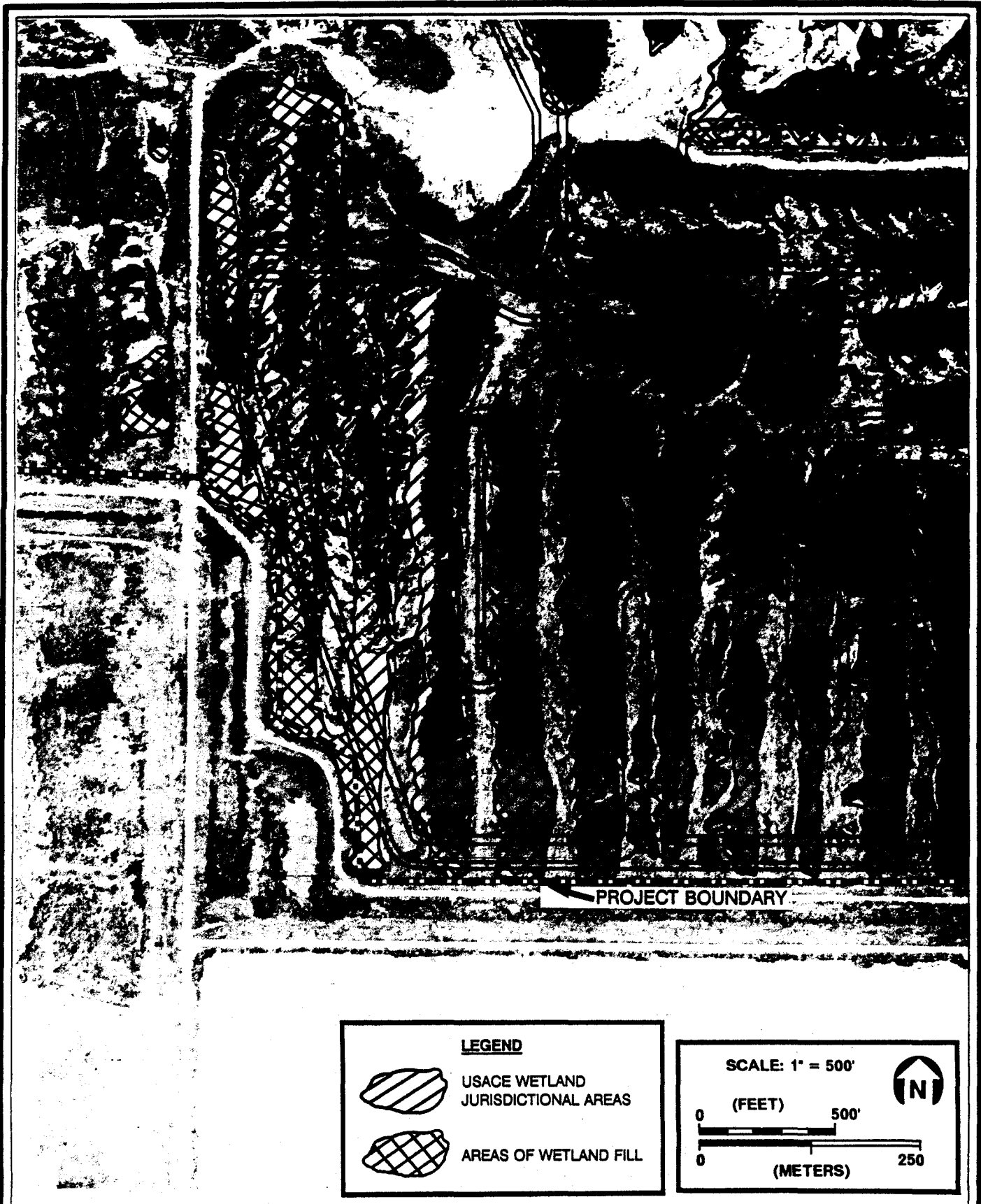


FIGURE 3.
AERIAL PHOTOGRAPHY WITH USACE
WETLAND DELINEATIONS (PAGE 11 OF 13)
DREDGE AND FILL PERMIT APPLICATION

Sources: I.F. Rooks & Assoc. Inc.; ECT, 1992.

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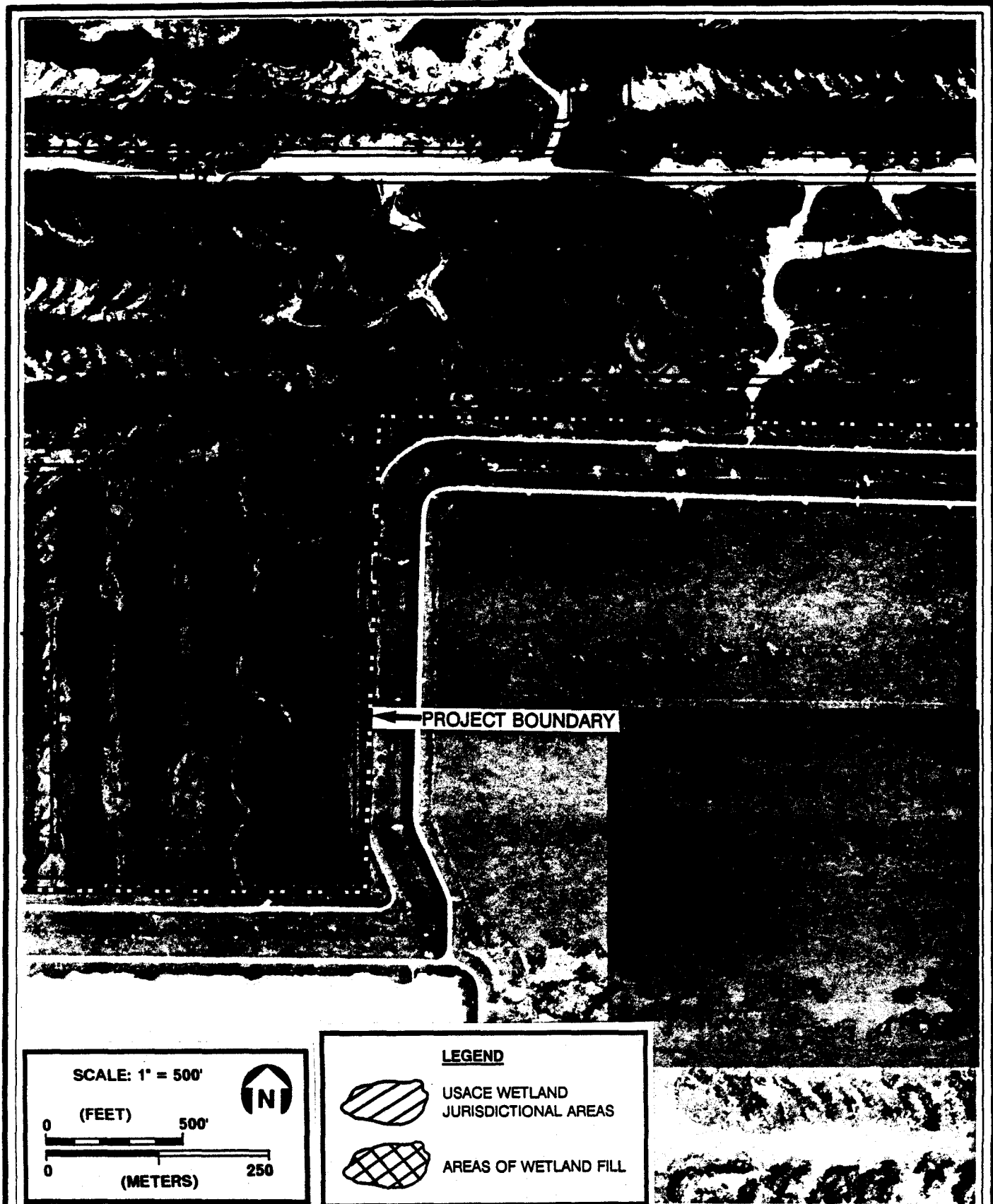


FIGURE 3.
AERIAL PHOTOGRAPHY WITH USACE
WETLAND DELINEATIONS (PAGE 12 OF 13)
DREDGE AND FILL PERMIT APPLICATION

Sources: I.F. Rooks & Assoc. Inc.; ECT, 1992.

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FIGURE 3.
AERIAL PHOTOGRAPHY WITH USACE
WETLAND DELINEATIONS (PAGE 13 OF 13)
DREDGE AND FILL PERMIT APPLICATION
 Sources: I.F. Rooks & Assoc. Inc.; ECT, 1992.

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Source: ECT, 1992.



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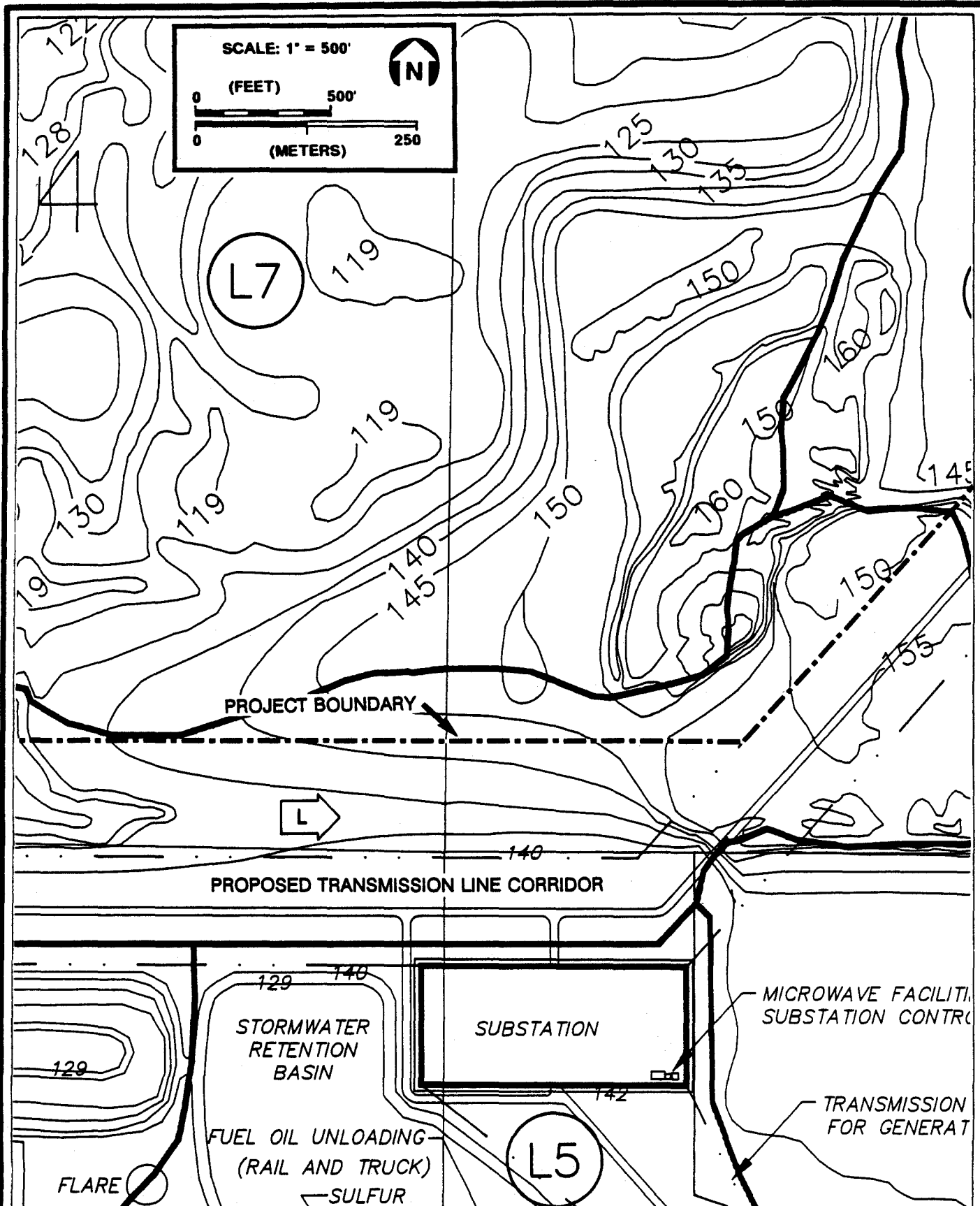


FIGURE 4.
POST-RECLAMATION TOPOGRAPHY (PAGE 2 OF 13)
DREDGE AND FILL PERMIT APPLICATION

Source: ECT, 1992.

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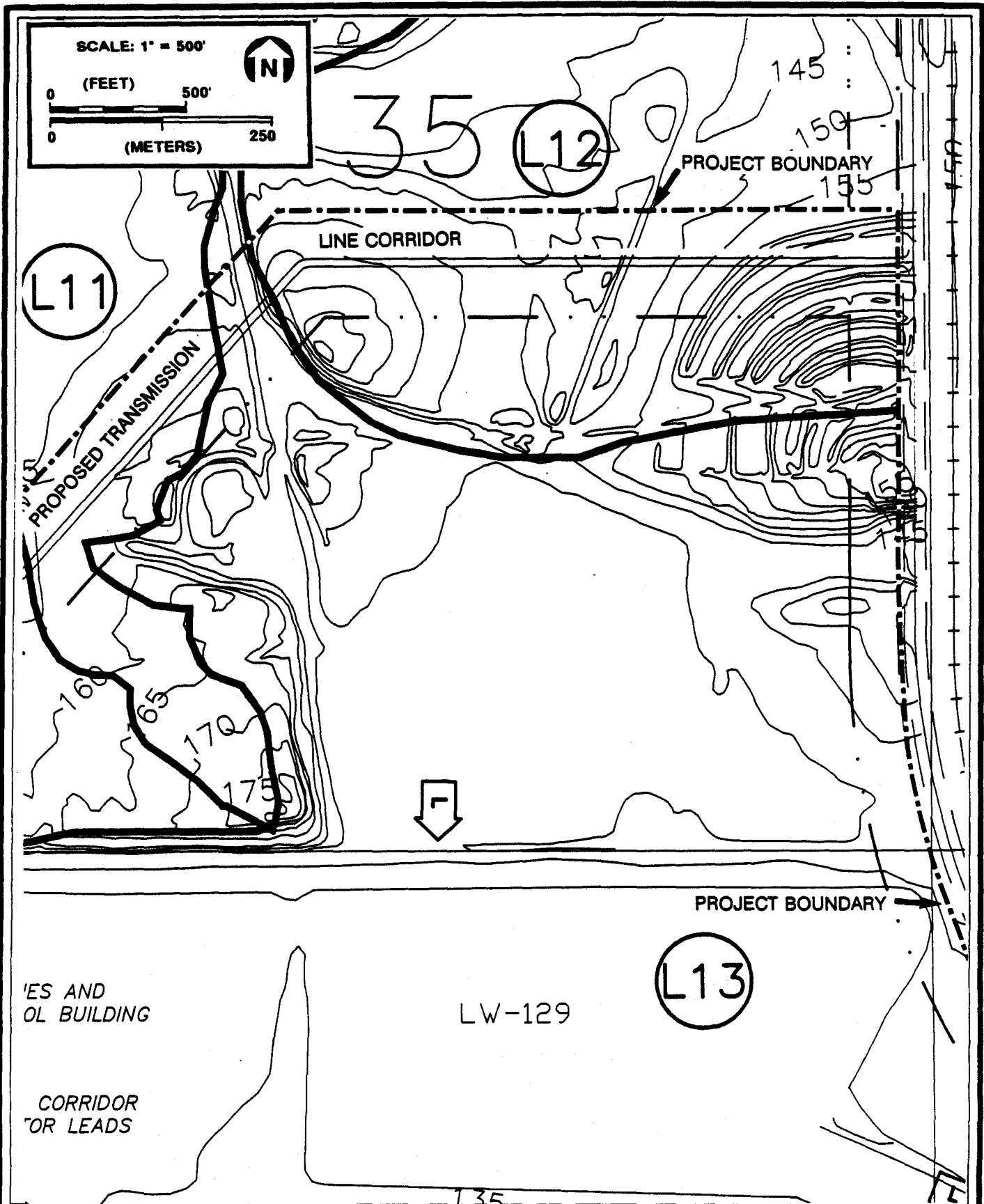


FIGURE 4.
POST-RECLAMATION TOPOGRAPHY (PAGE 3 OF 13)
DREDGE AND FILL PERMIT APPLICATION

Source: ECT, 1992.



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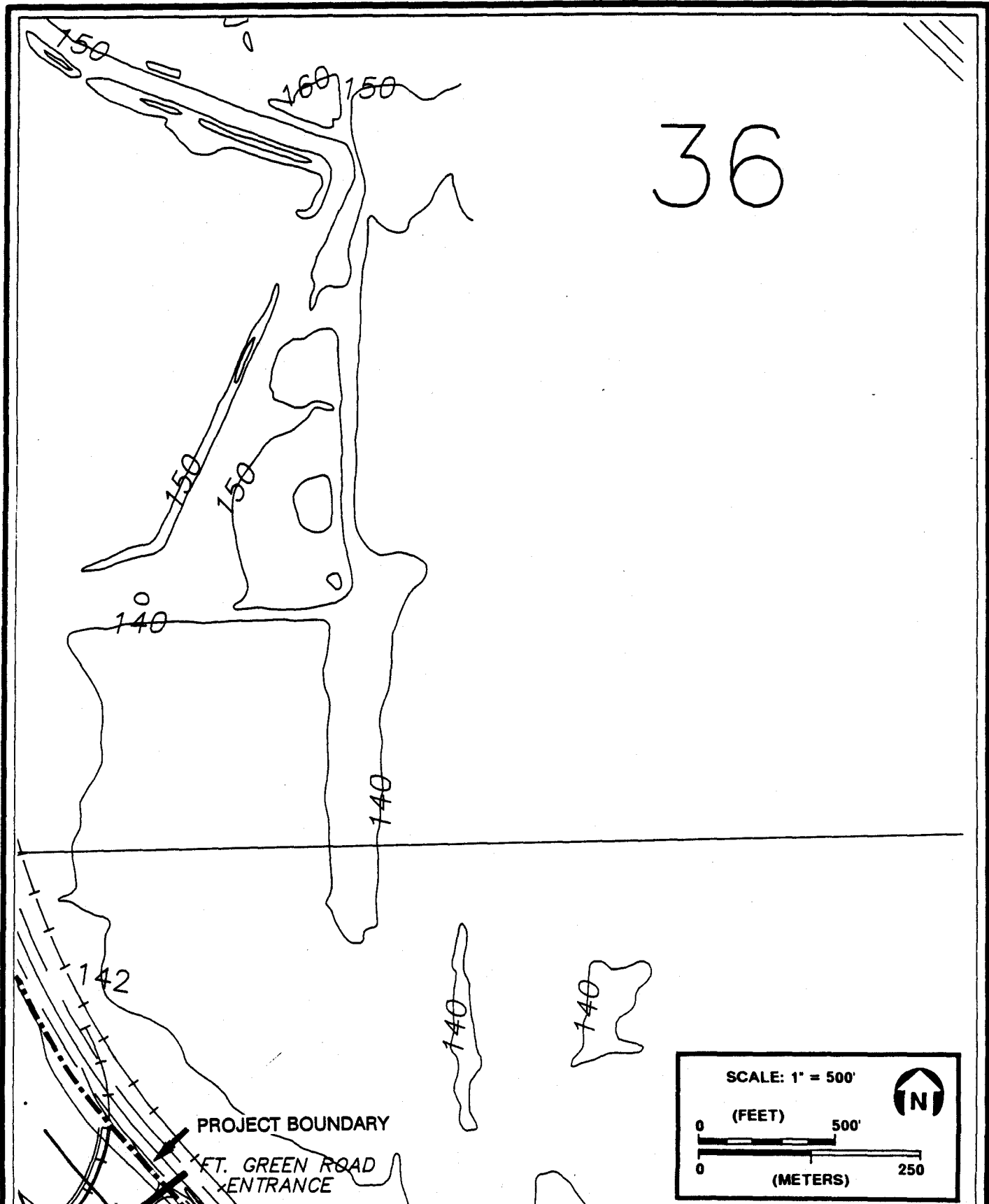


FIGURE 4.
POST-RECLAMATION TOPOGRAPHY (PAGE 4 OF 13)
DREDGE AND FILL PERMIT APPLICATION

Source: ECT, 1992.

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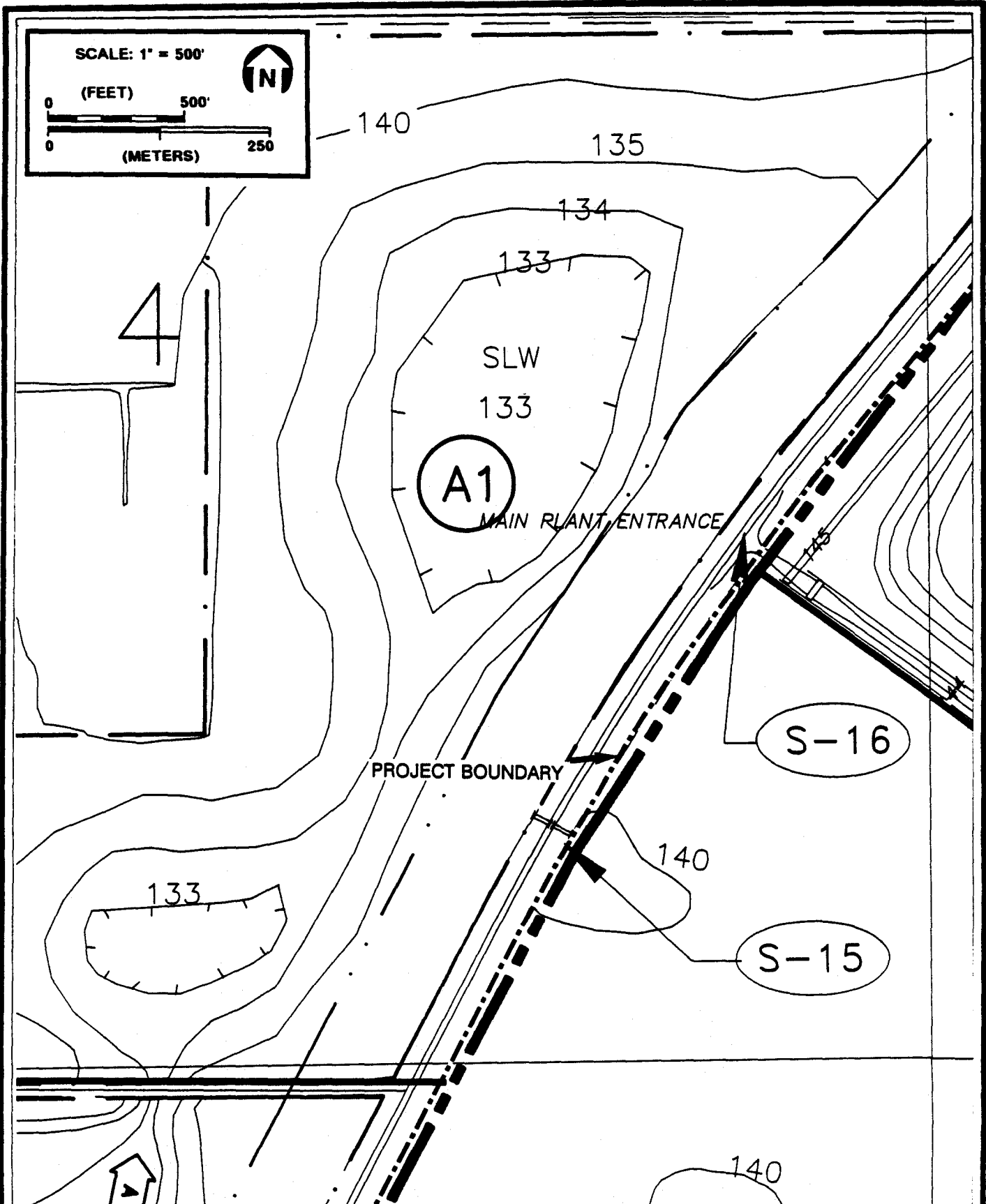


FIGURE 4.
POST-RECLAMATION TOPOGRAPHY (PAGE 5 OF 13)
DREDGE AND FILL PERMIT APPLICATION

Source: ECT, 1992.

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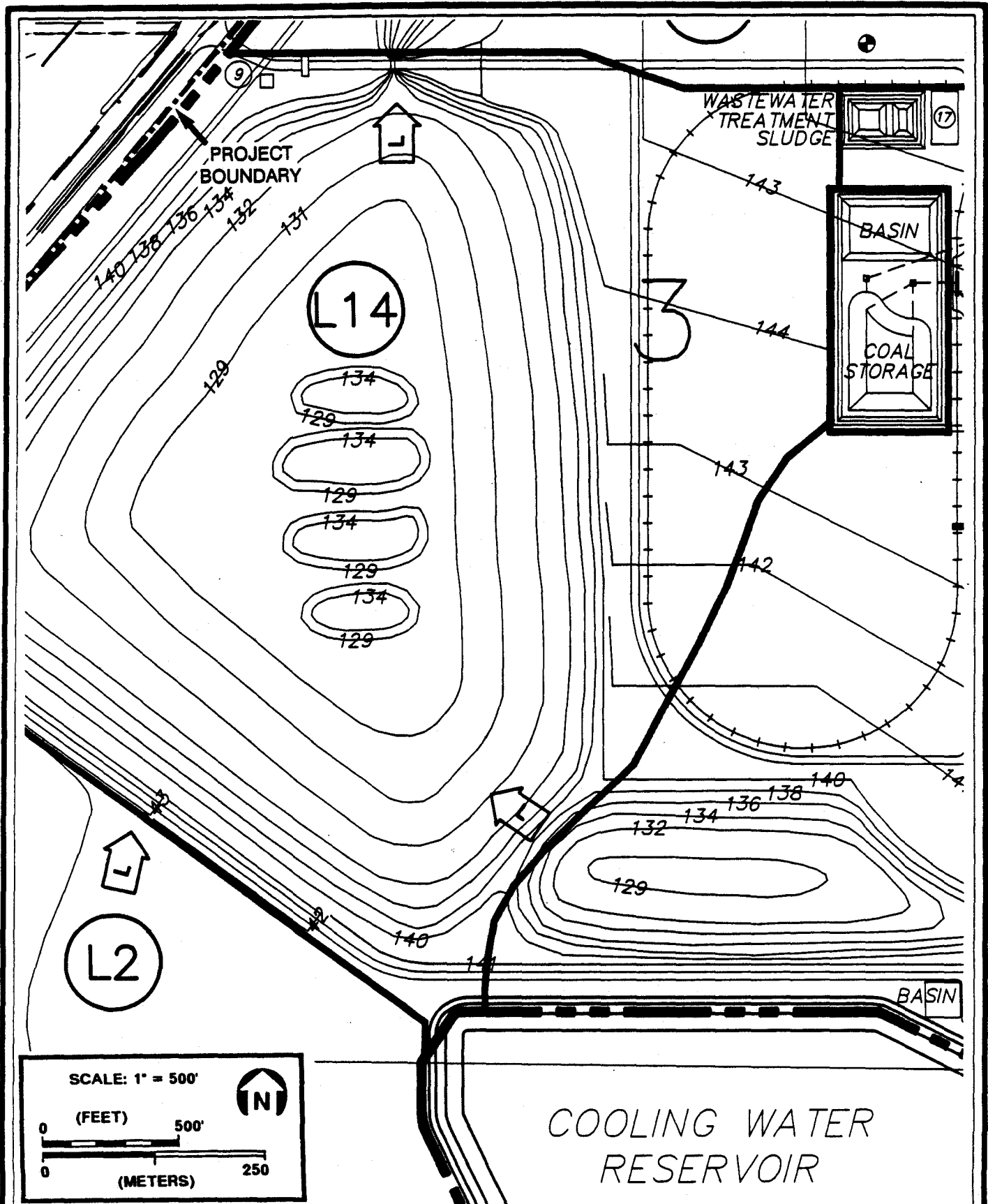


FIGURE 4.
POST-RECLAMATION TOPOGRAPHY (PAGE 6 OF 13)
DREDGE AND FILL PERMIT APPLICATION

Source: ECT, 1992.

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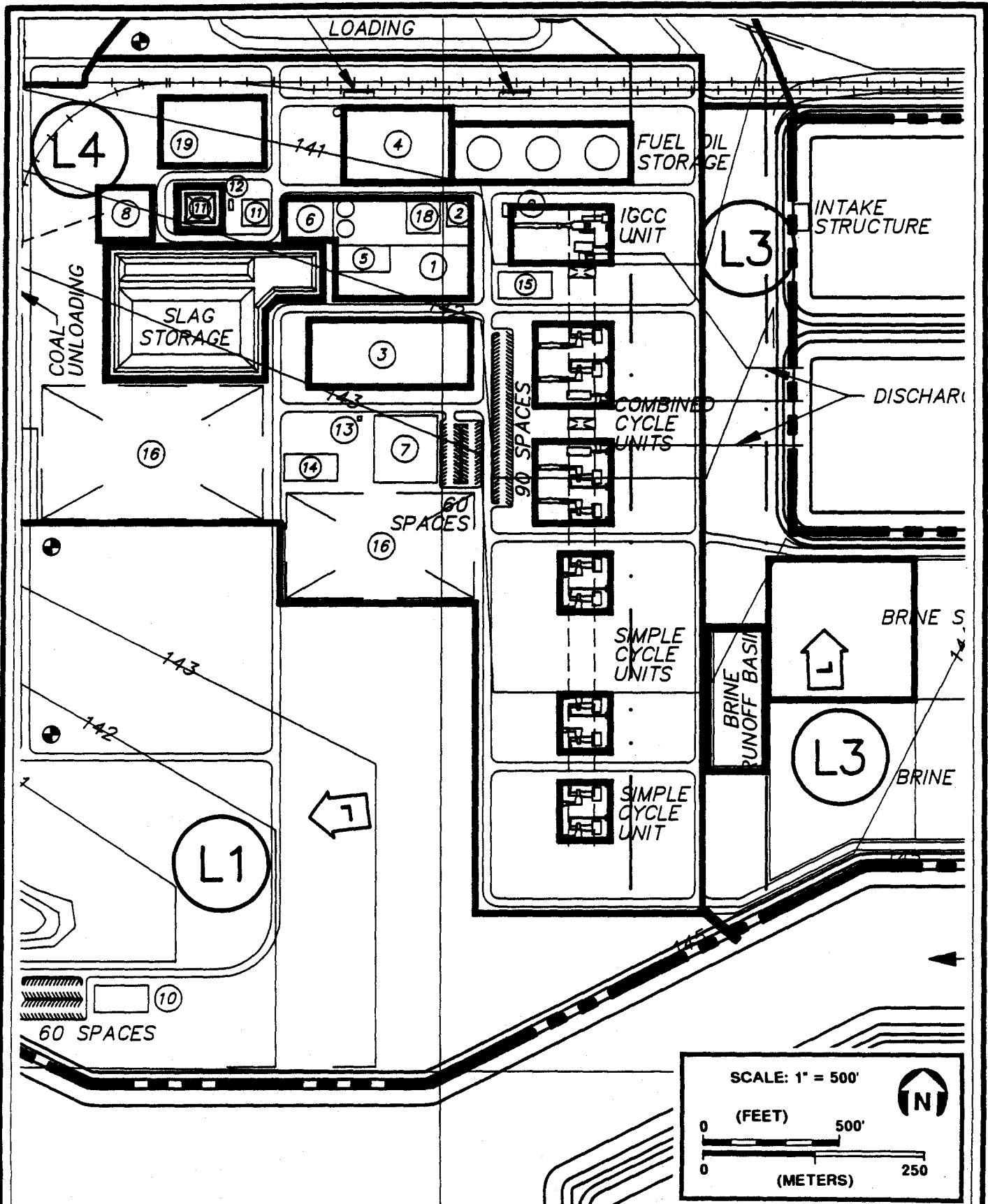
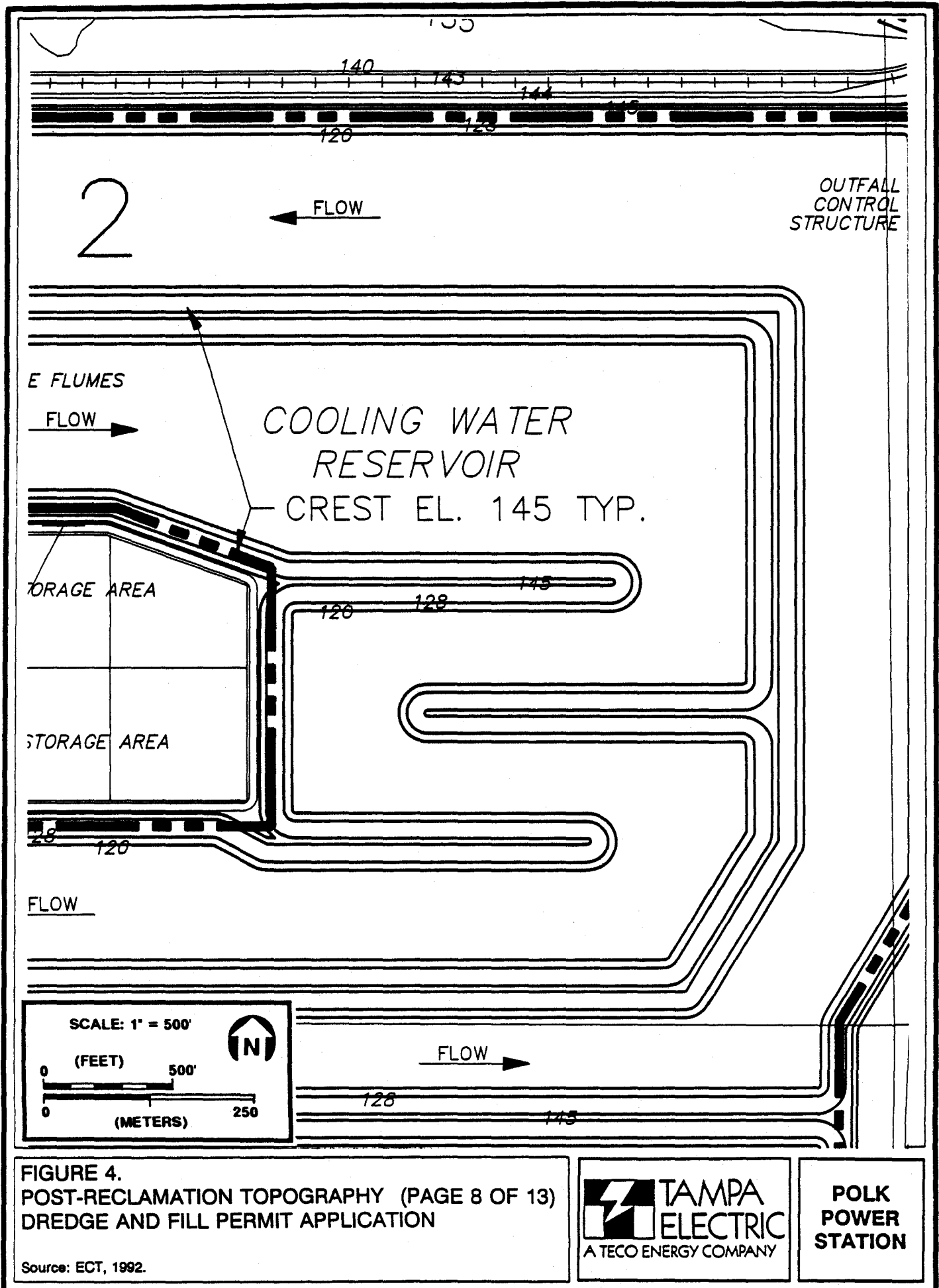


FIGURE 4.
POST-RECLAMATION TOPOGRAPHY (PAGE 7 OF 13)
DREDGE AND FILL PERMIT APPLICATION

Source: ECT, 1992.

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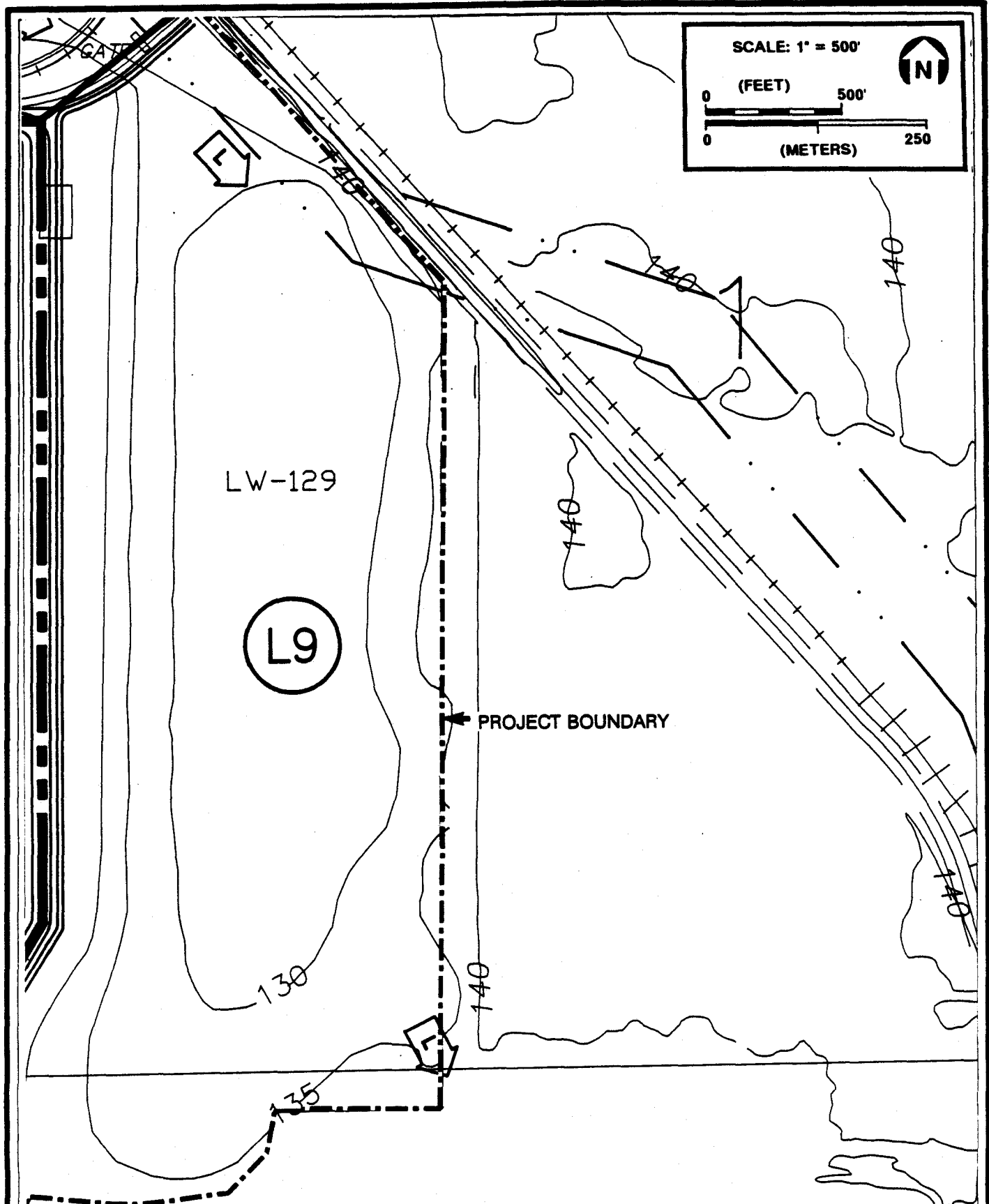
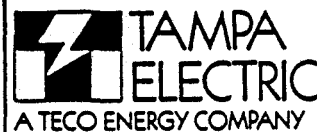


FIGURE 4.
POST-RECLAMATION TOPOGRAPHY (PAGE 9 OF 13)
DREDGE AND FILL PERMIT APPLICATION

Source: ECT, 1992.



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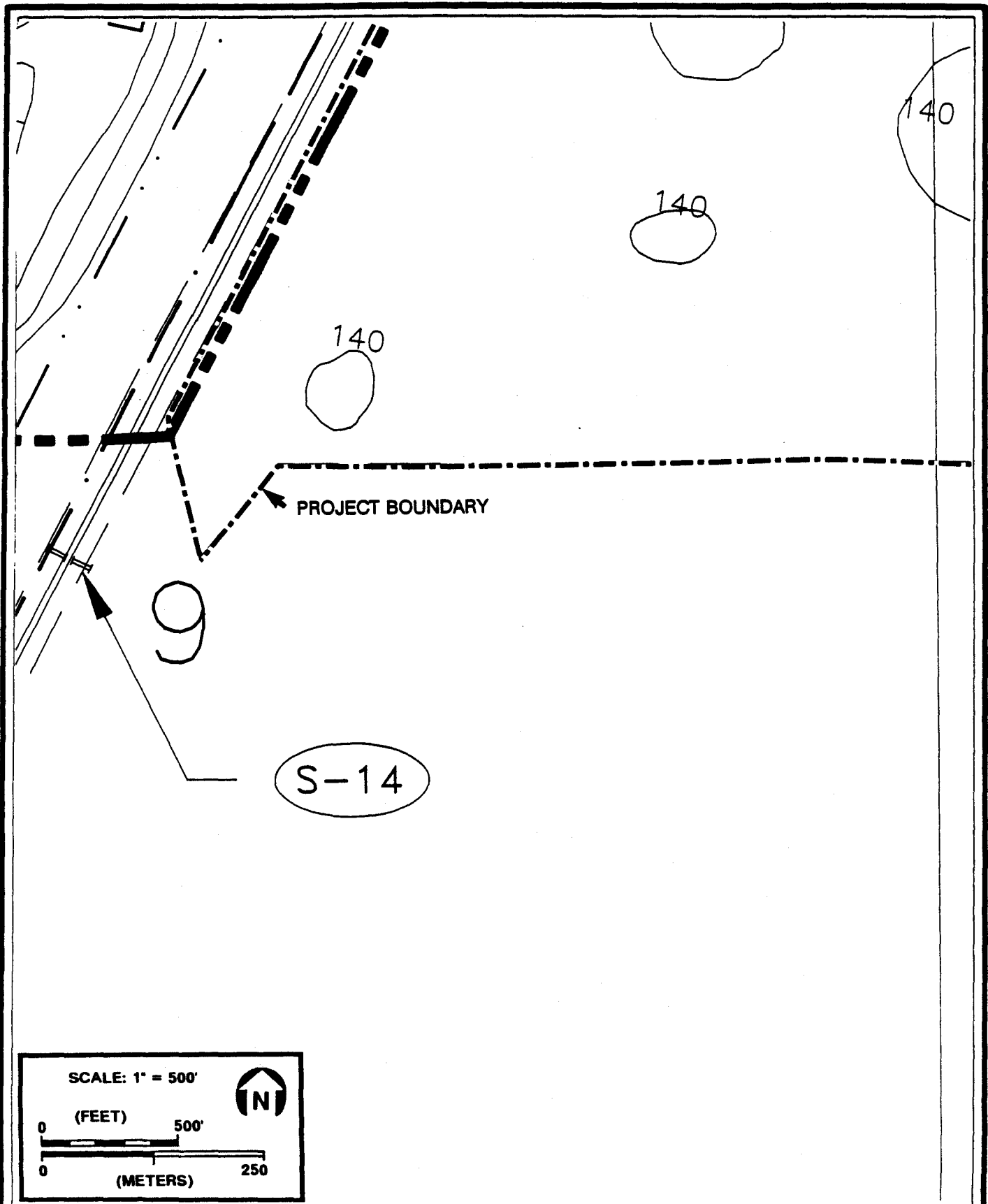


FIGURE 4.
POST-RECLAMATION TOPOGRAPHY (PAGE 10 OF 13)
DREDGE AND FILL PERMIT APPLICATION

Source: ECT, 1992.

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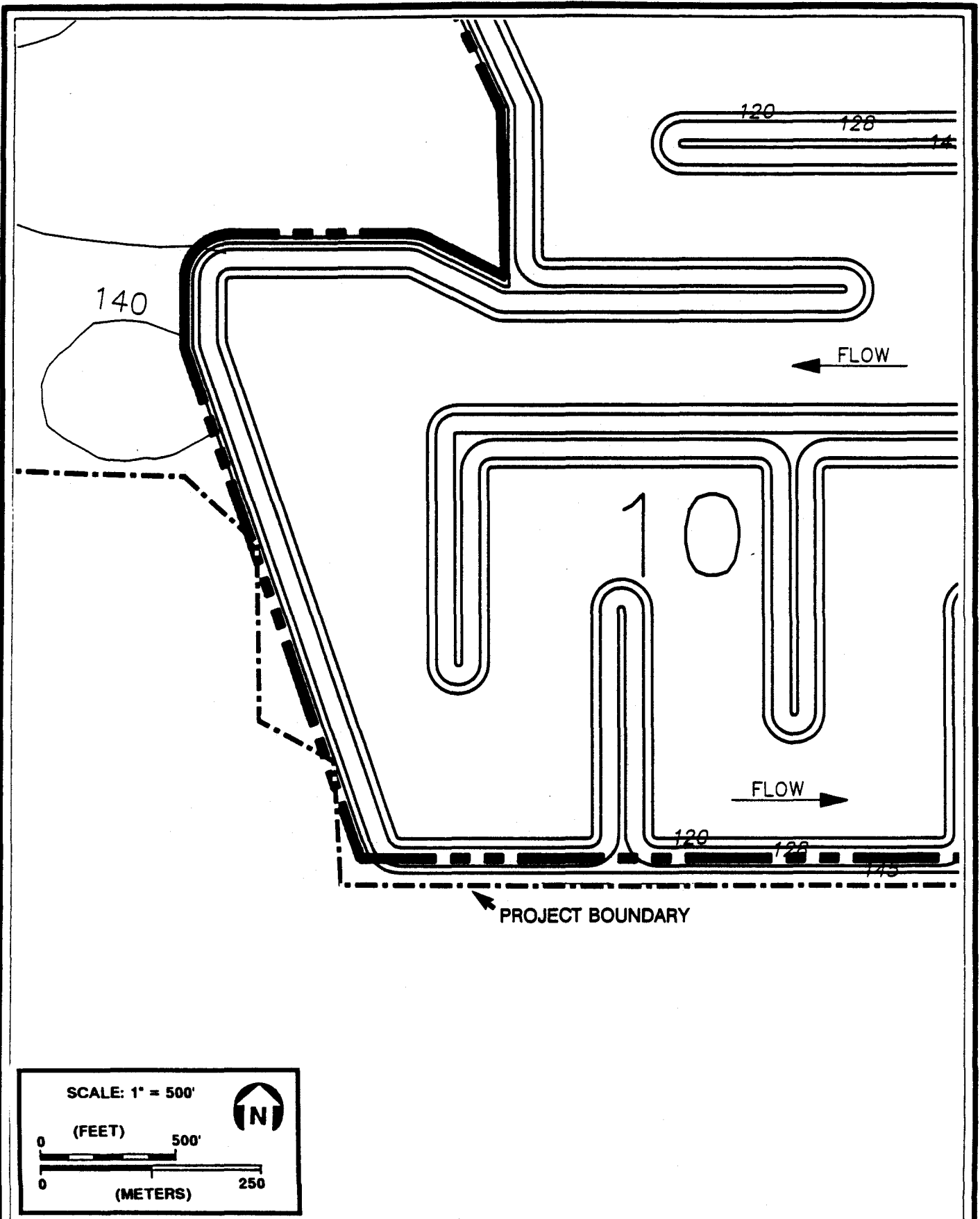


FIGURE 4.
POST-RECLAMATION TOPOGRAPHY (PAGE 11 OF 13)
DREDGE AND FILL PERMIT APPLICATION

Source: ECT, 1992.



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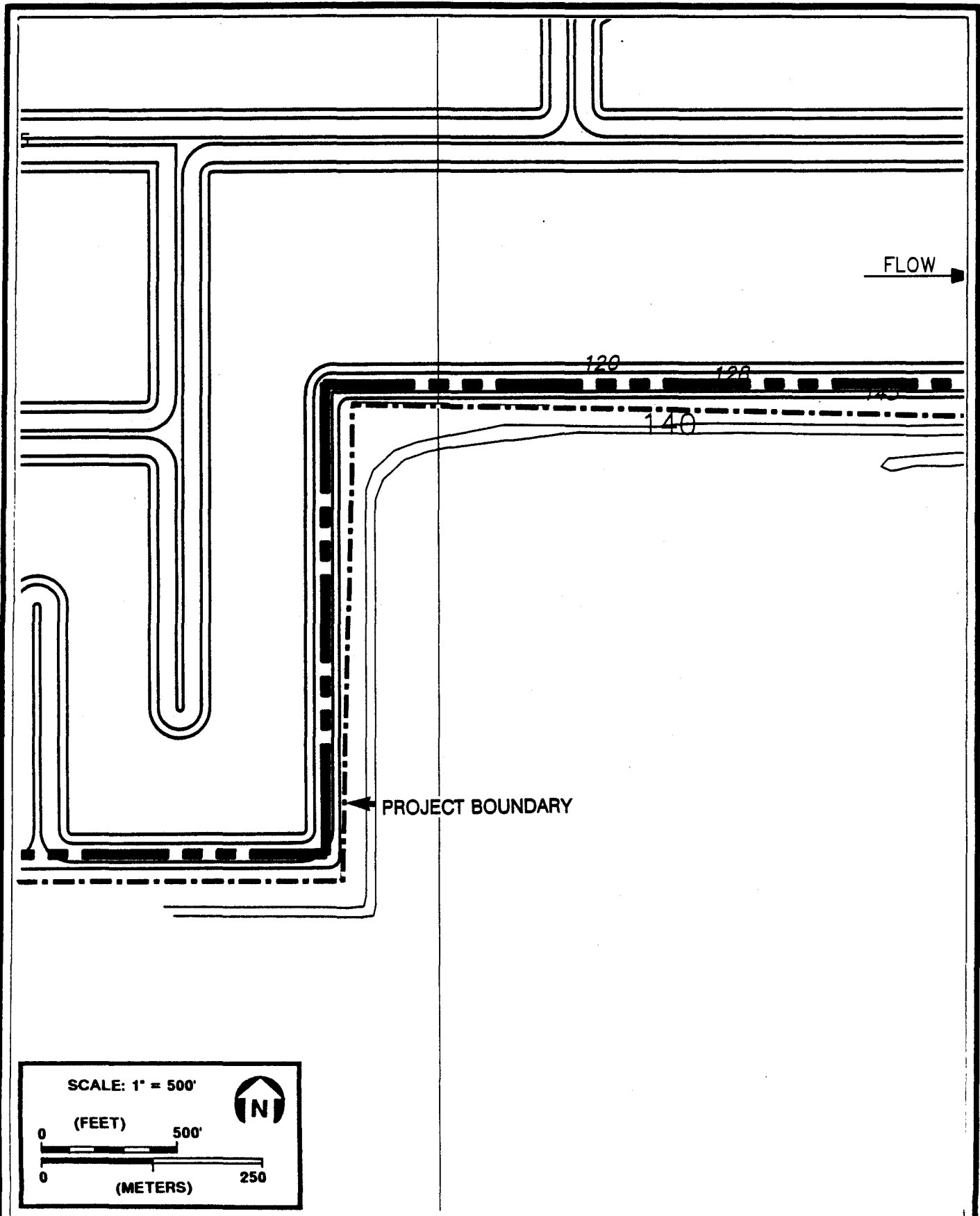


FIGURE 4.
POST-RECLAMATION TOPOGRAPHY (PAGE 12 OF 13)
DREDGE AND FILL PERMIT APPLICATION

Source: ECT, 1992.



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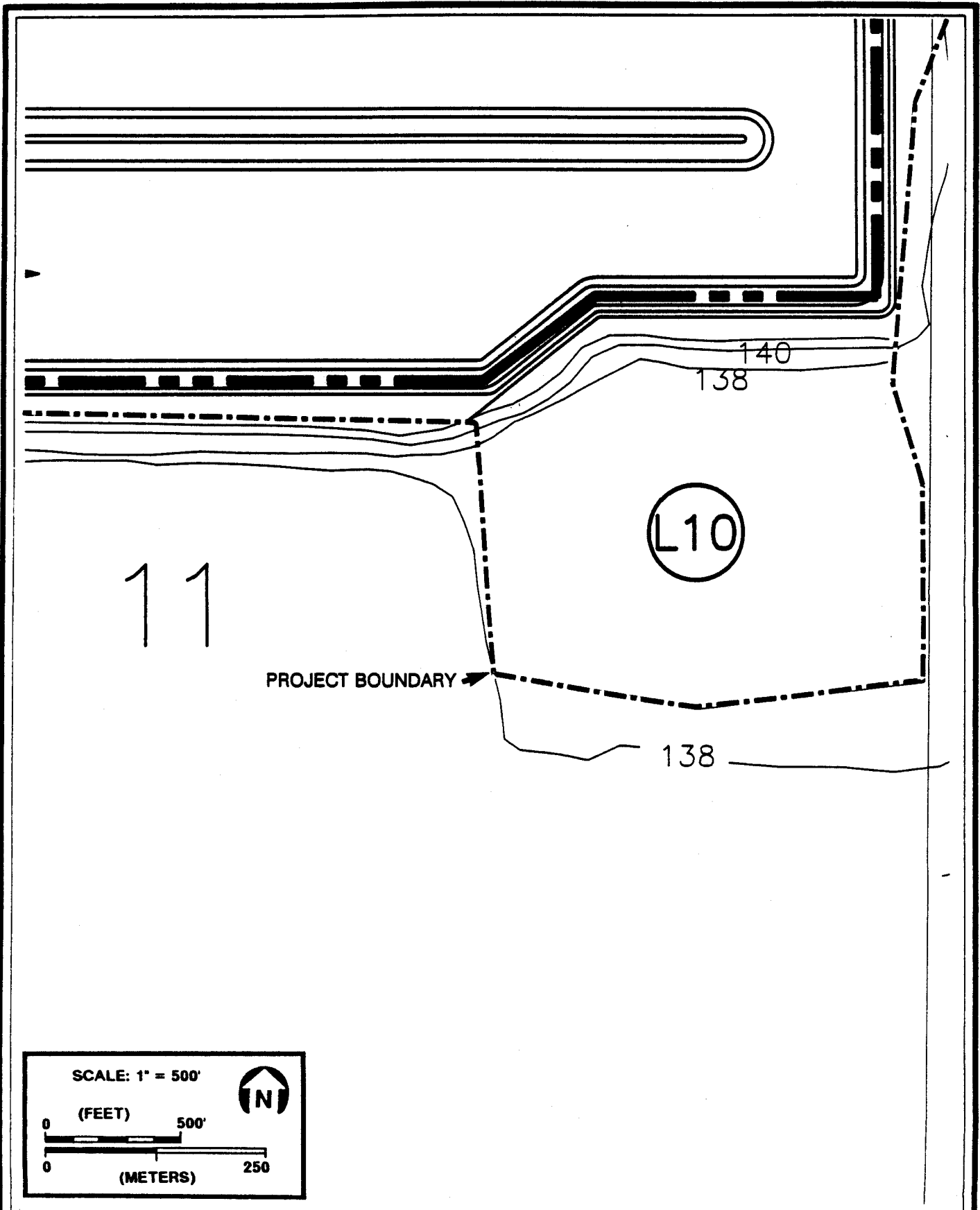


FIGURE 4.
POST-RECLAMATION TOPOGRAPHY (PAGE 13 OF 13)
DREDGE AND FILL PERMIT APPLICATION

Source: ECT, 1992.



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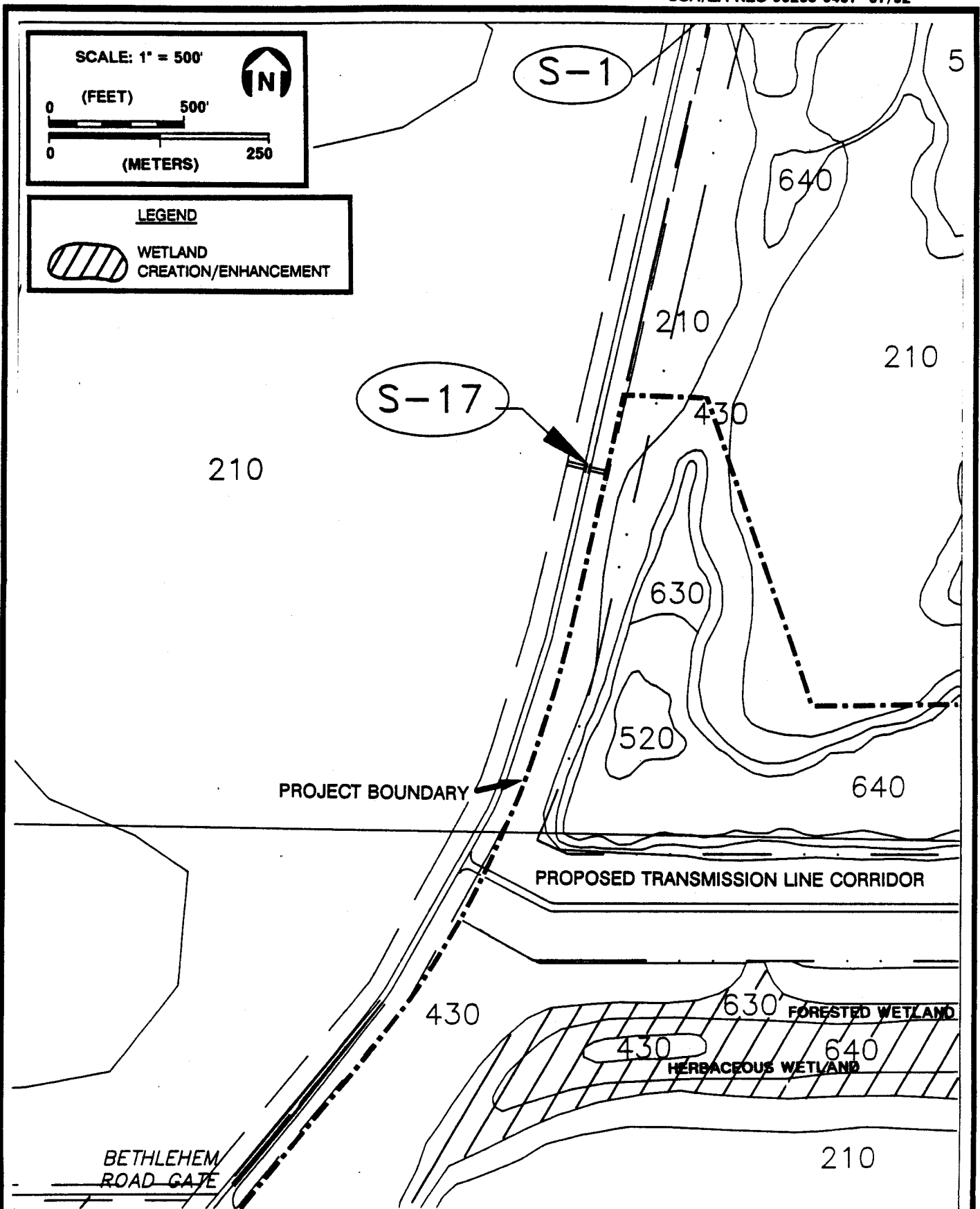


FIGURE 5. (PAGE 1 OF 13)
POST-RECLAMATION LAND USE WITH WETLAND
CREATION/ENHANCEMENT AREAS DEPICTED
DREDGE AND FILL PERMIT APPLICATION

Source: ECT, 1992.

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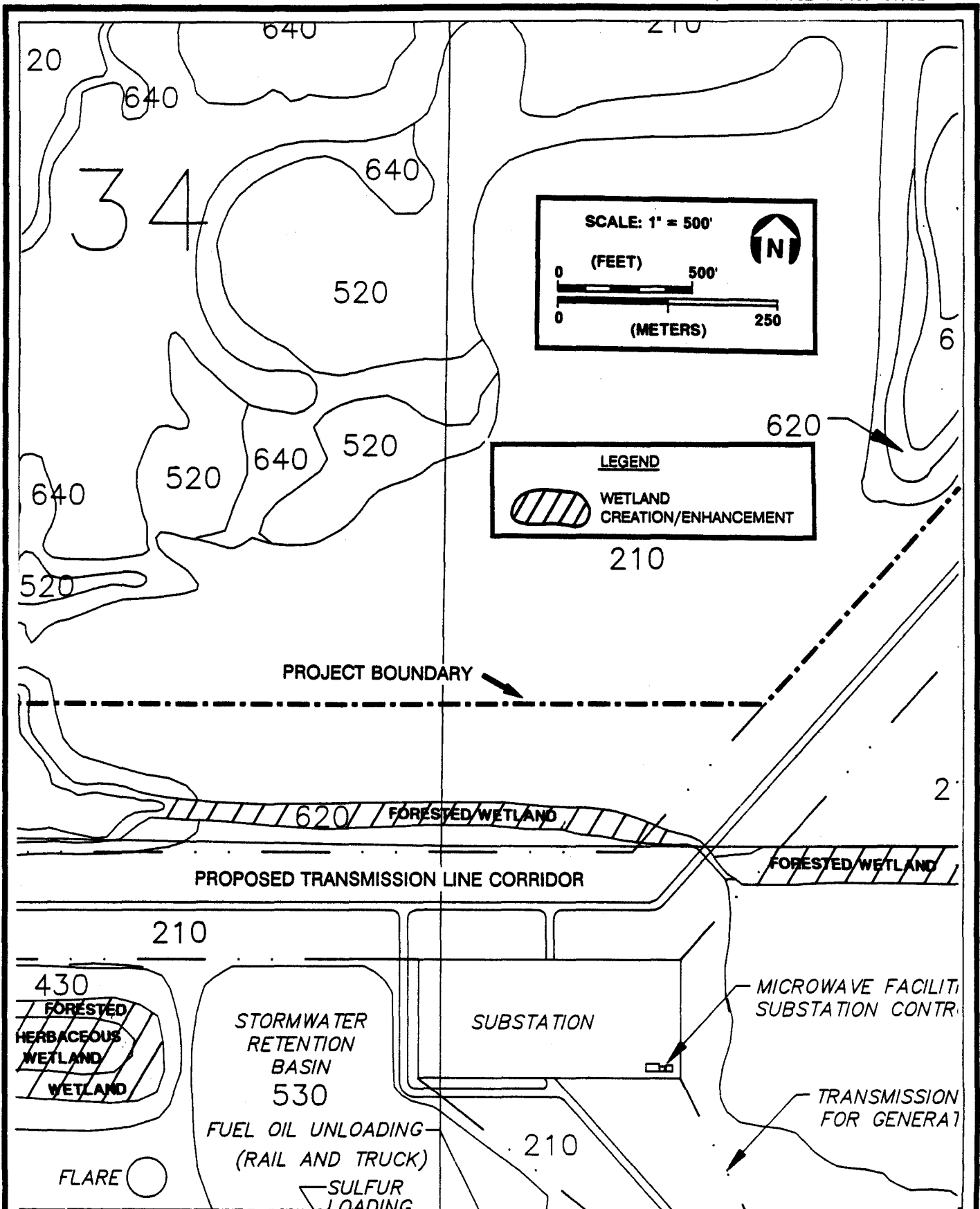
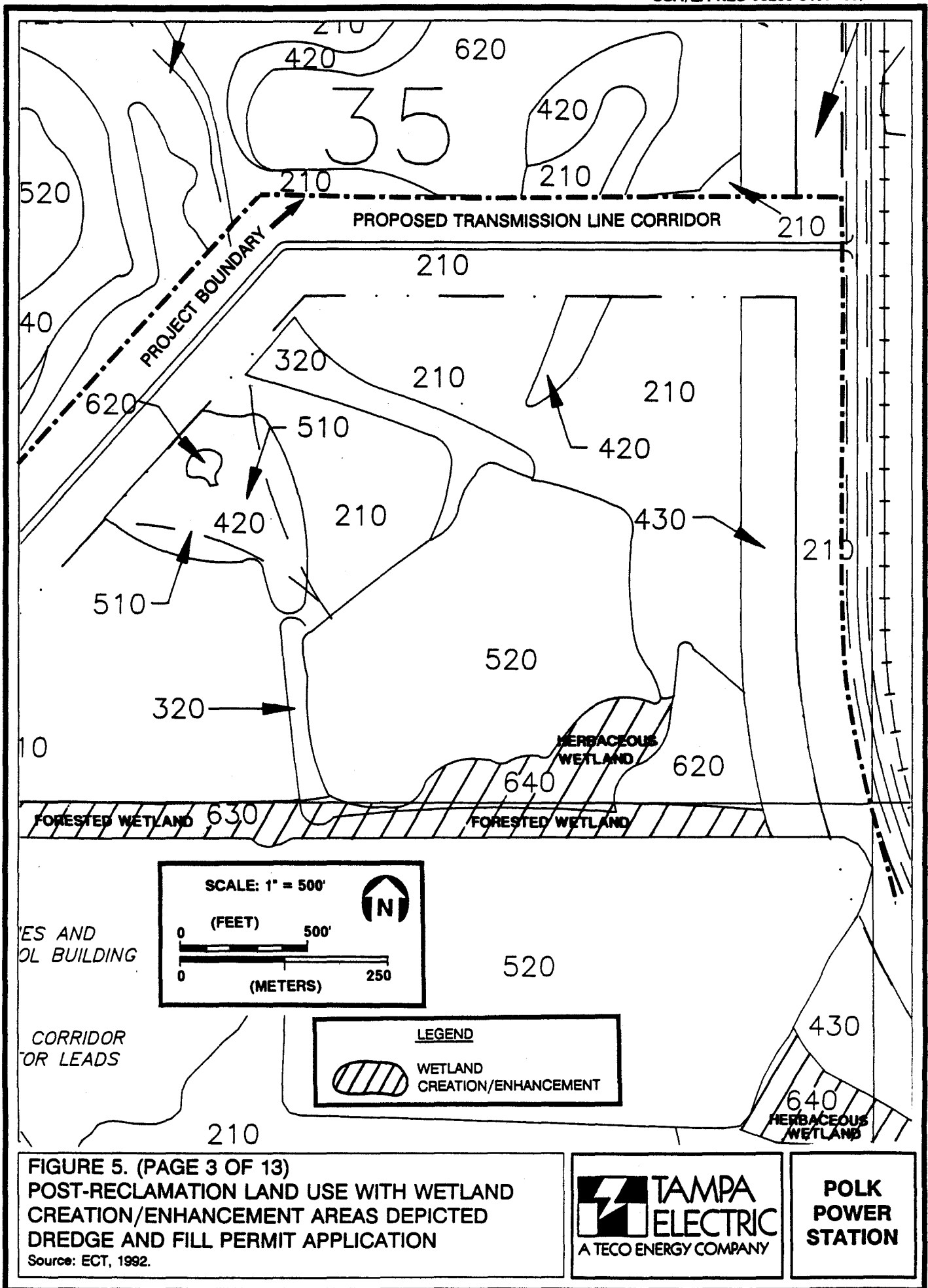


FIGURE 5. (PAGE 2 OF 13)
POST-RECLAMATION LAND USE WITH WETLAND
CREATION/ENHANCEMENT AREAS DEPICTED
DREDGE AND FILL PERMIT APPLICATION

Source: ECT, 1992.

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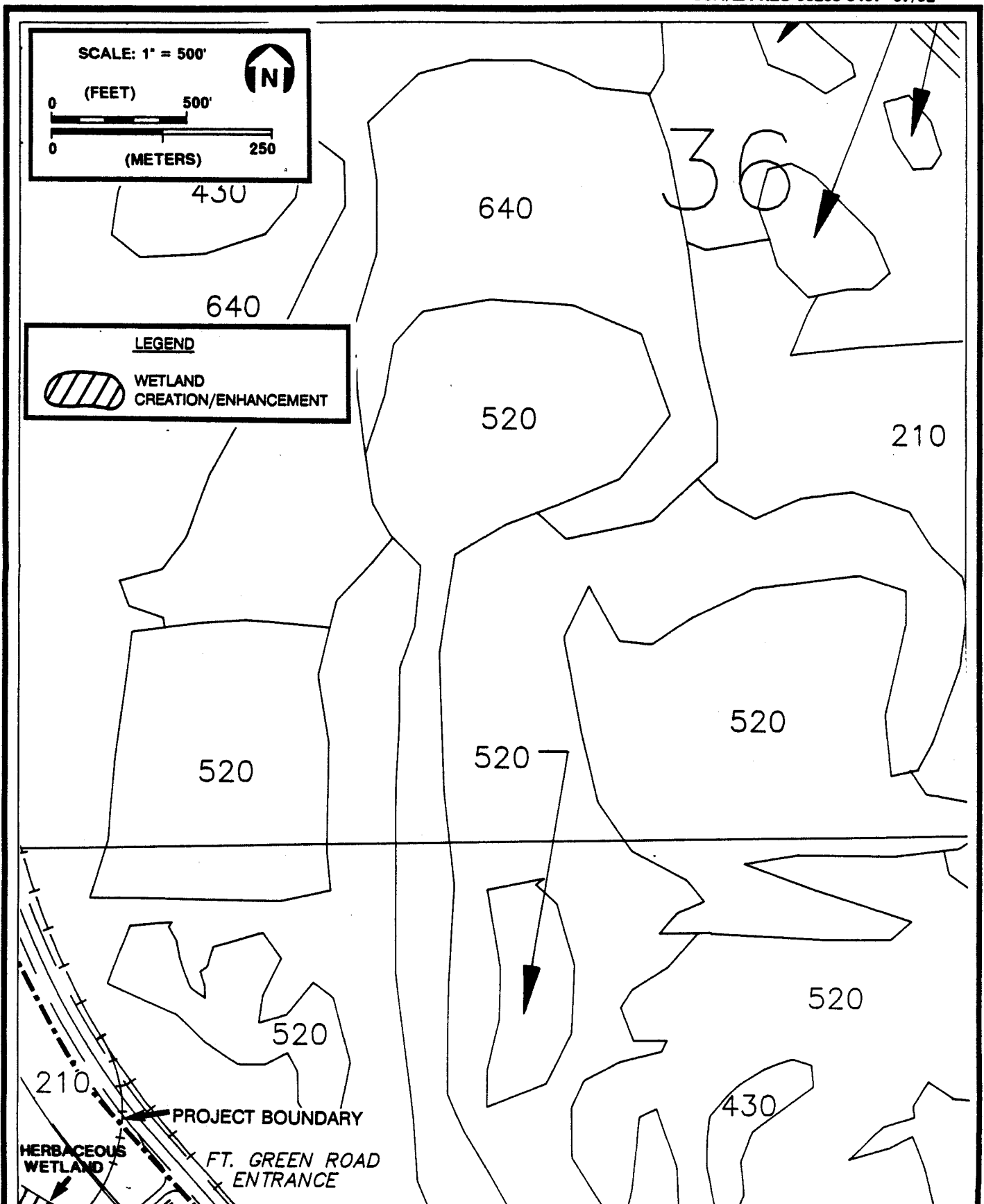
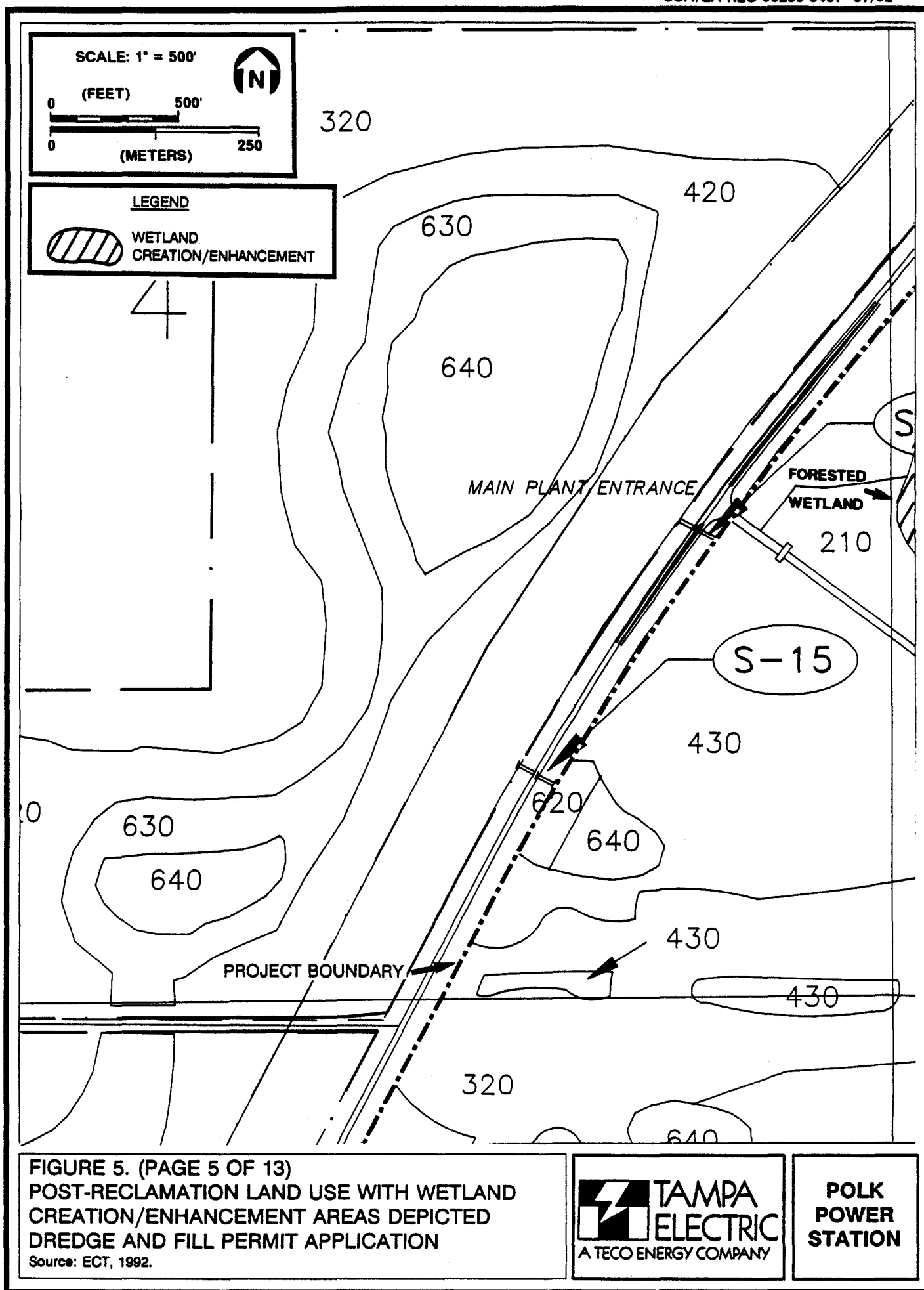


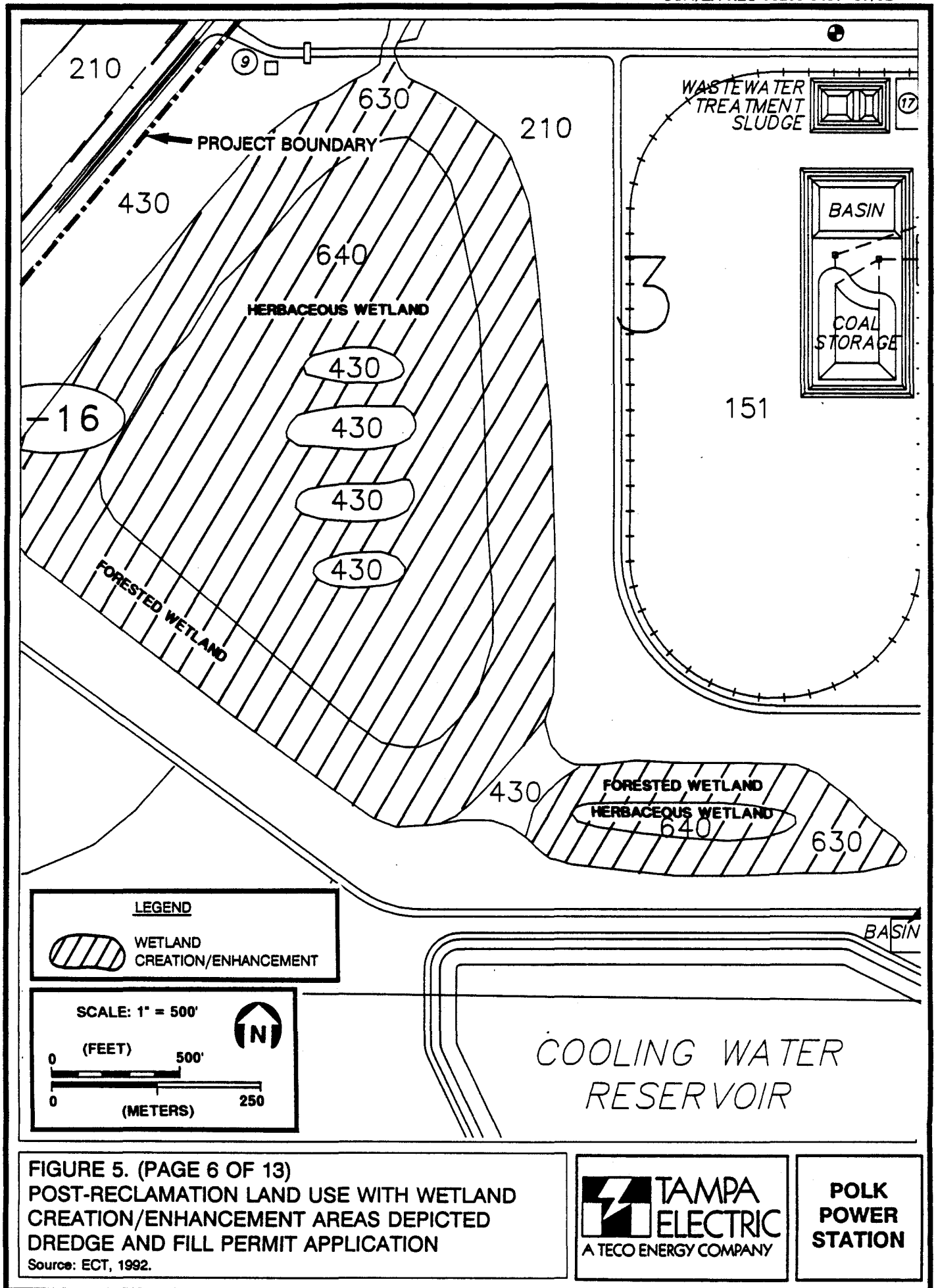
FIGURE 5. (PAGE 4 OF 13)
POST-RECLAMATION LAND USE WITH WETLAND
CREATION/ENHANCEMENT AREAS DEPICTED
DREDGE AND FILL PERMIT APPLICATION

Source: ECT, 1992.

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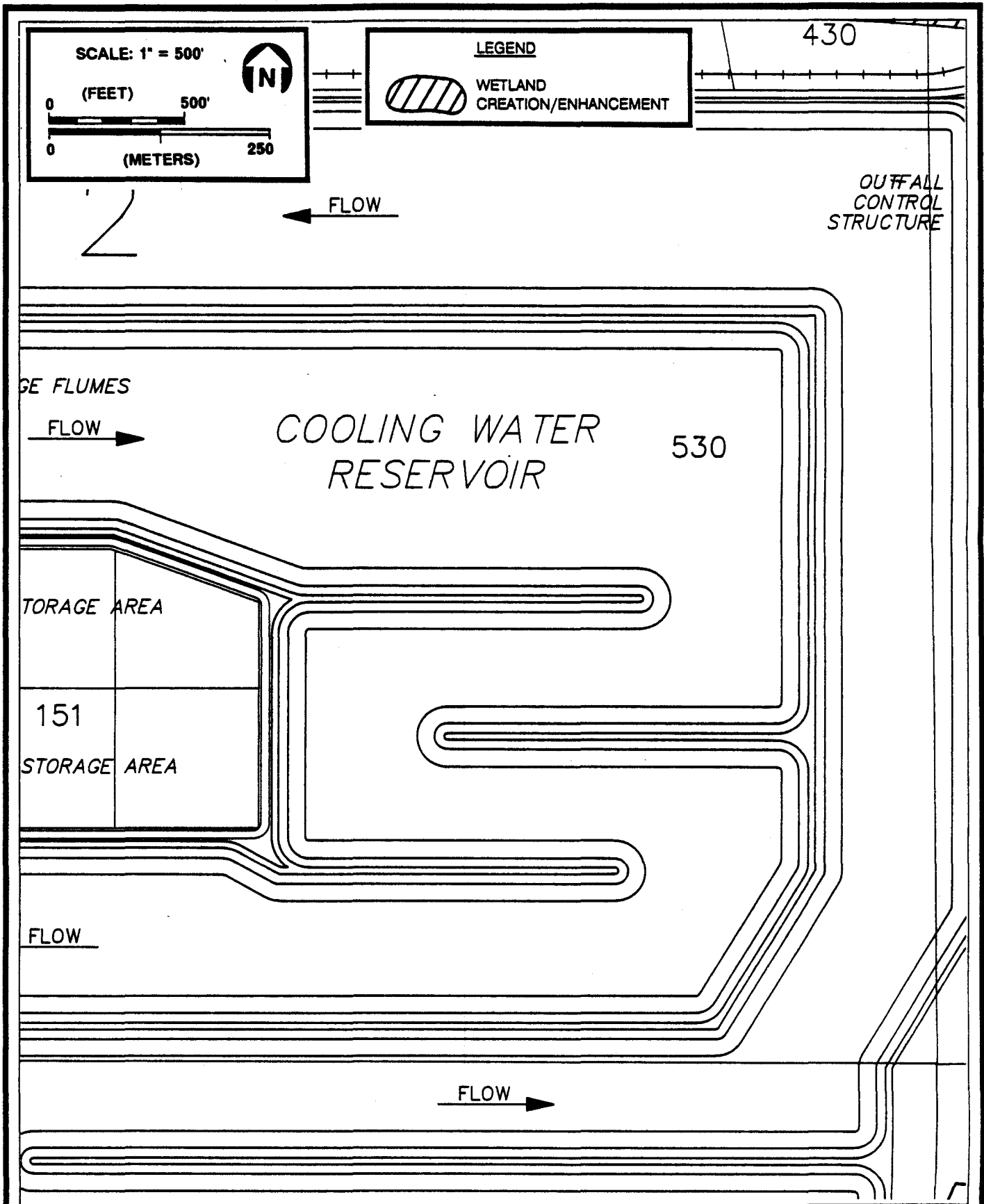


FIGURE 5. (PAGE 8 OF 13)
 POST-RECLAMATION LAND USE WITH WETLAND
 CREATION/ENHANCEMENT AREAS DEPICTED
 DREDGE AND FILL PERMIT APPLICATION

Source: ECT, 1992.

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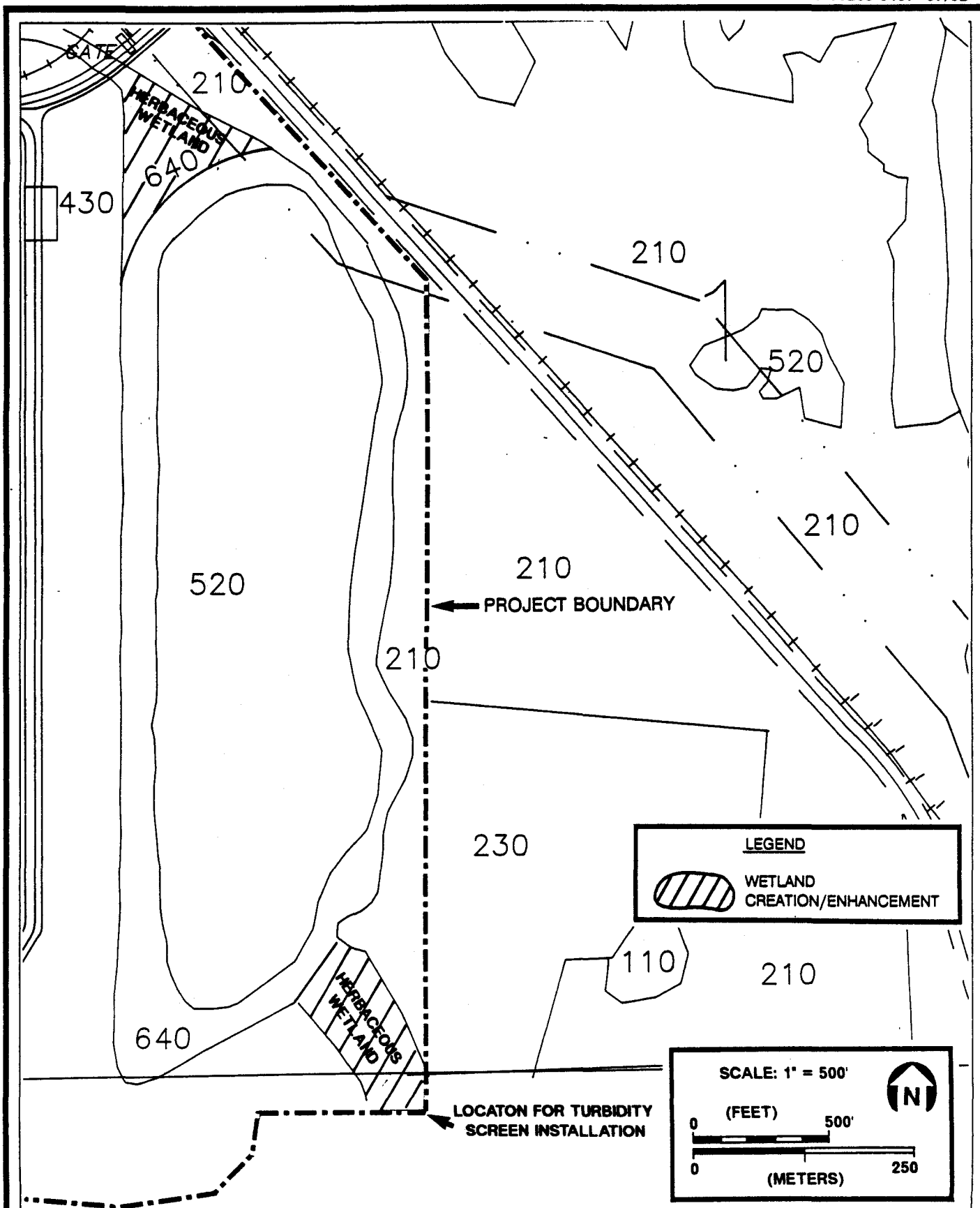


FIGURE 5. (PAGE 9 OF 13)
POST-RECLAMATION LAND USE WITH WETLAND
CREATION/ENHANCEMENT AREAS DEPICTED
DREDGE AND FILL PERMIT APPLICATION

Source: ECT, 1992.

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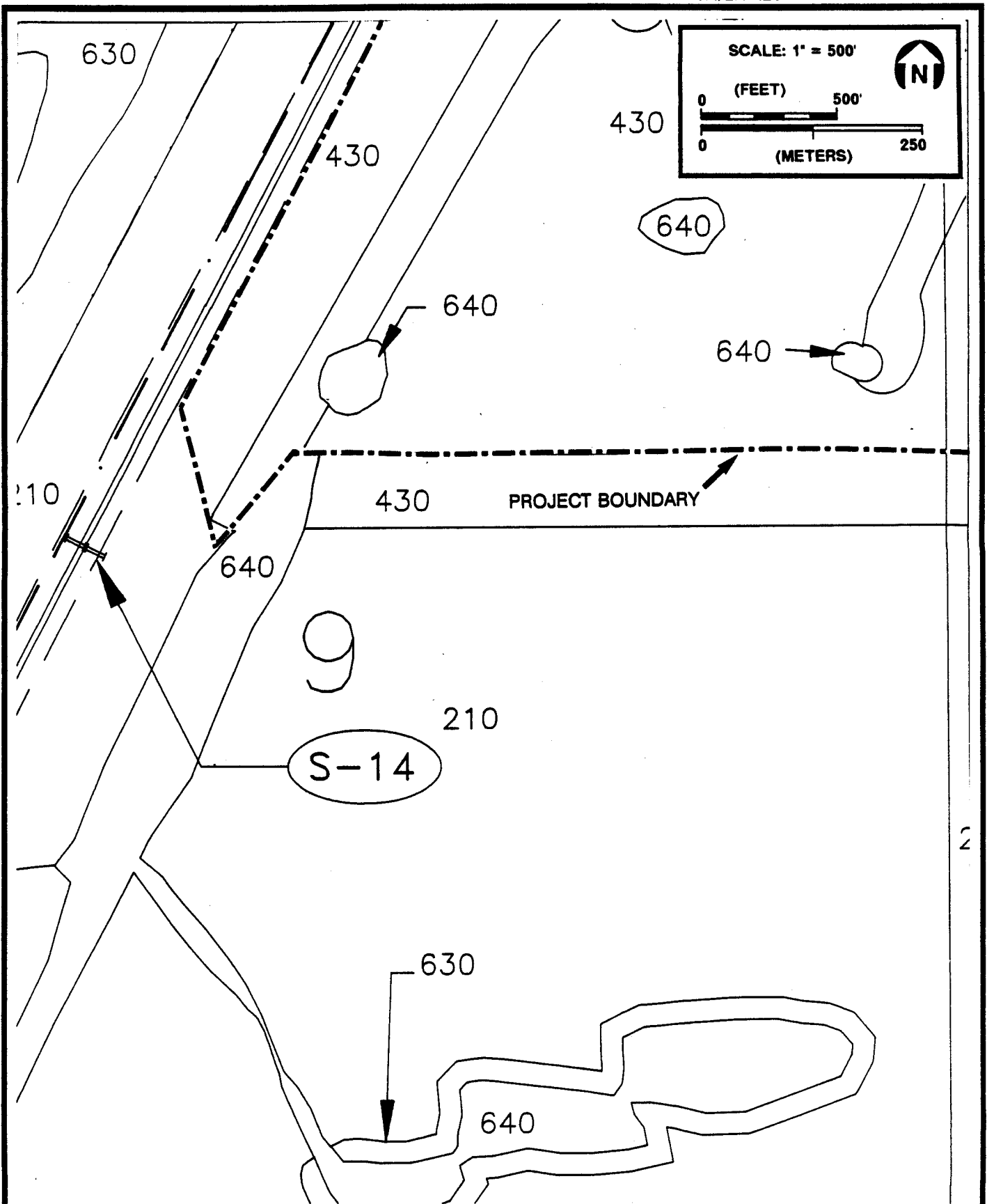


FIGURE 5. (PAGE 10 OF 13)
 POST-RECLAMATION LAND USE WITH WETLAND
 CREATION/ENHANCEMENT AREAS DEPICTED
 DREDGE AND FILL PERMIT APPLICATION

Source: ECT, 1992.



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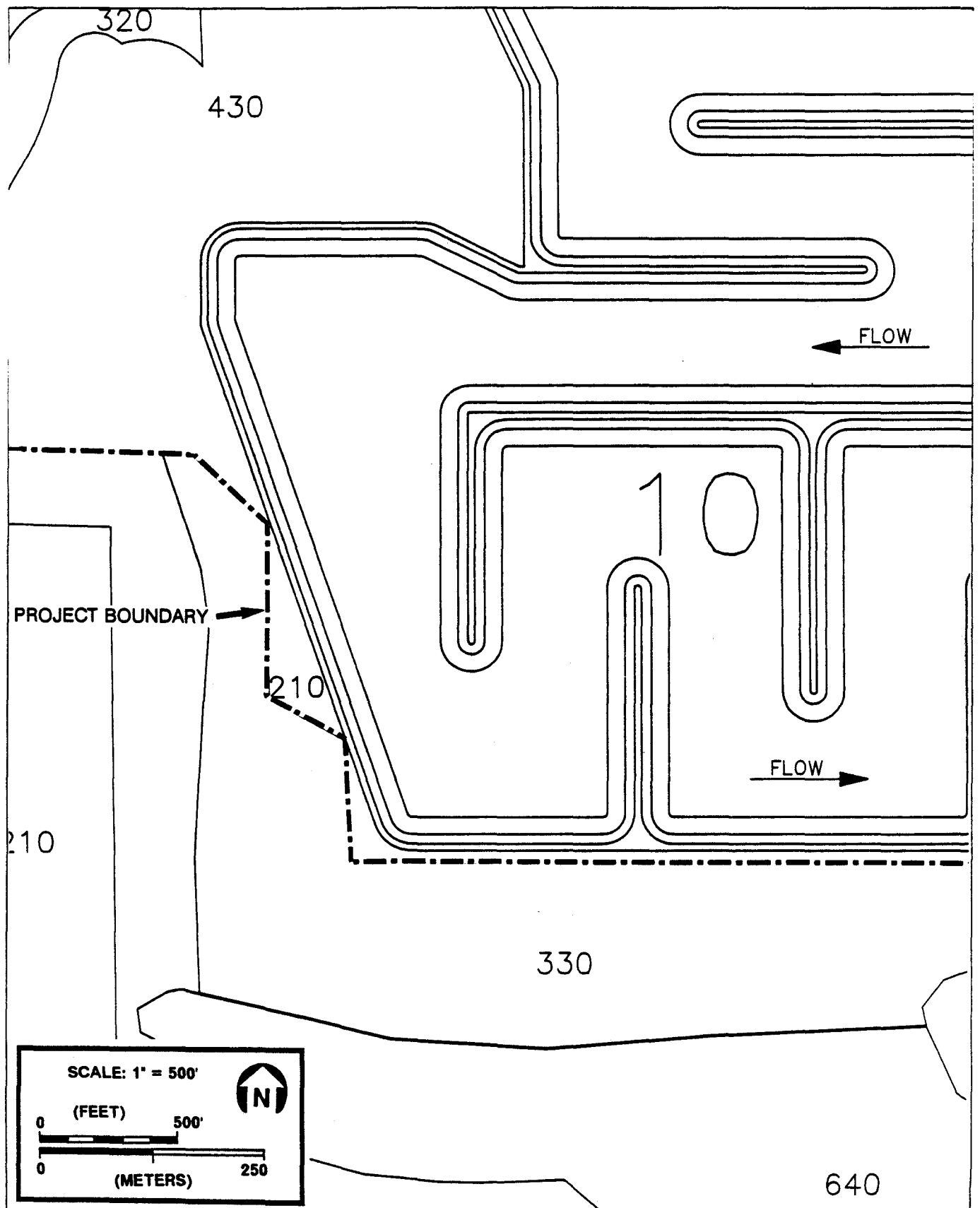


FIGURE 5. (PAGE 11 OF 13)
 POST-RECLAMATION LAND USE WITH WETLAND
 CREATION/ENHANCEMENT AREAS DEPICTED
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Source: ECT, 1992.

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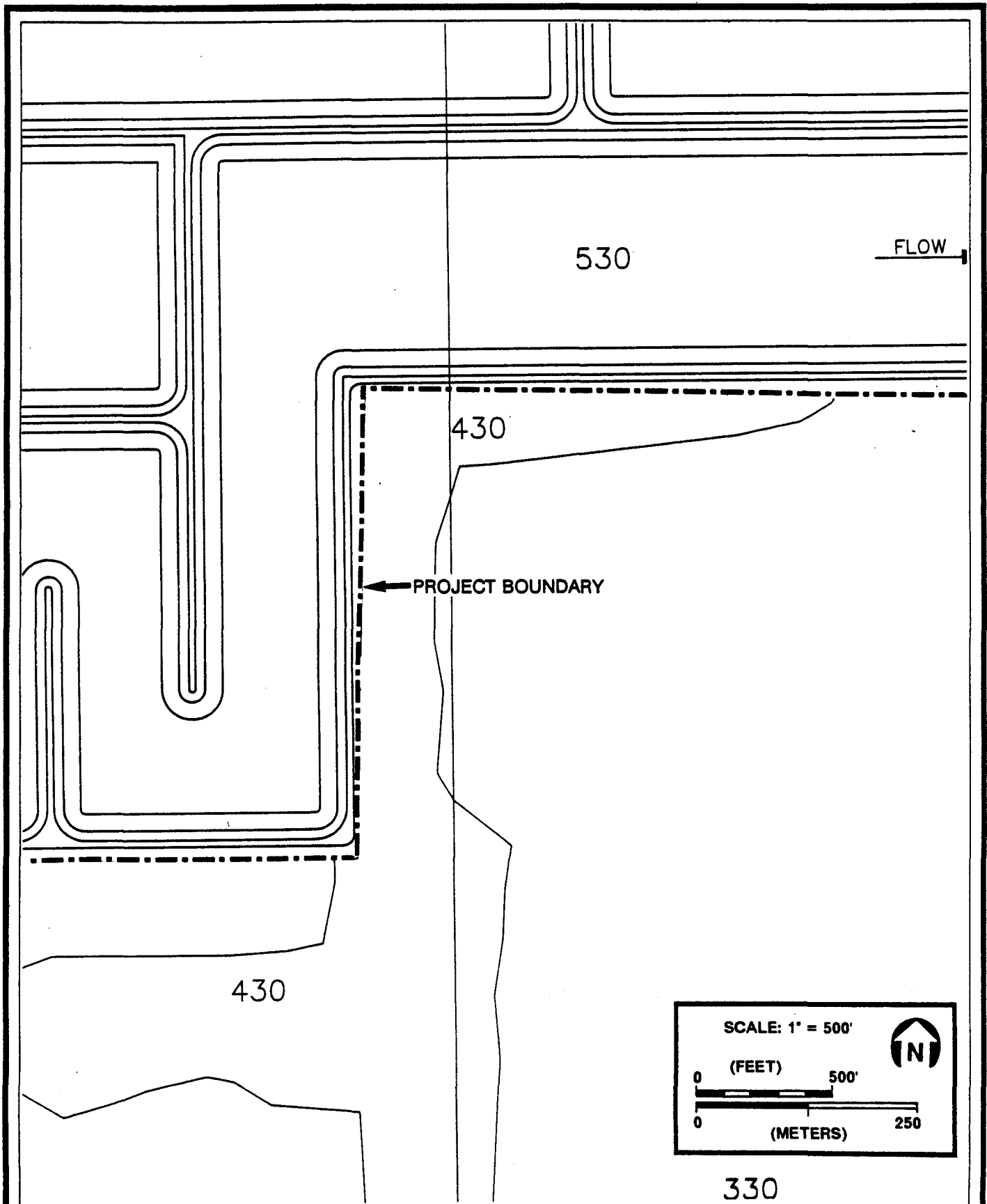
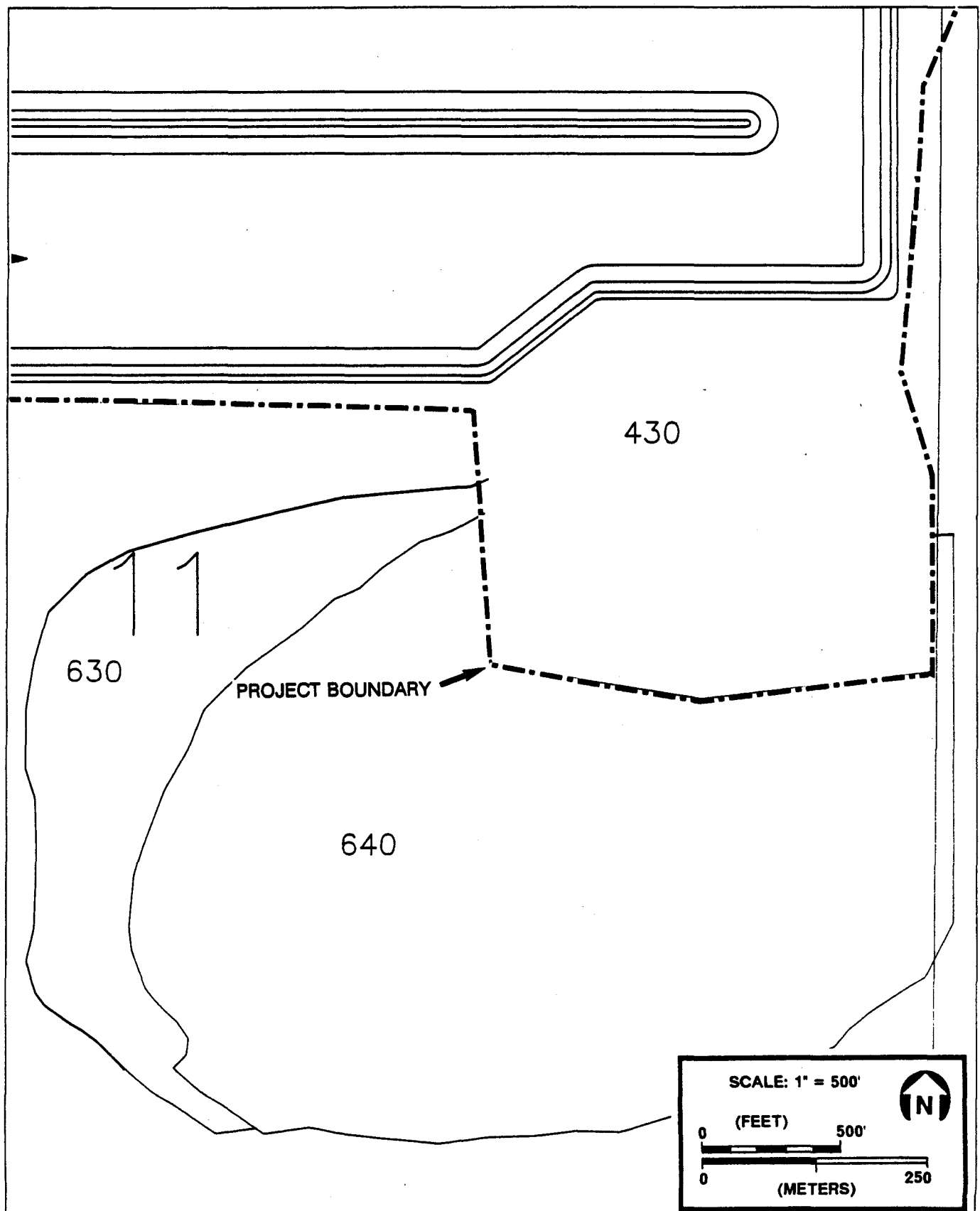


FIGURE 5. (PAGE 12 OF 13)
 POST-RECLAMATION LAND USE WITH WETLAND
 CREATION/ENHANCEMENT AREAS DEPICTED
 DREDGE AND FILL PERMIT APPLICATION

Source: ECT, 1992.

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**FIGURE 5. (PAGE 13 OF 13)
POST-RECLAMATION LAND USE WITH WETLAND
CREATION/ENHANCEMENT AREAS DEPICTED
DREDGE AND FILL PERMIT APPLICATION**

Source: ECT, 1992.

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Table 1. Acreages and Volumes of Wetland Fill

	Acres	Cubic Yards
Mine cuts filled for construction of the cooling water reservoir	180.81	2,917,068
Mine cuts filled for plant site construction	30.97	499,649
Disturbed herbaceous and early successional forested wetlands for plant site construction	41.33	133,358
TOTAL FILL	253.11	3,550,075

Source: ECT, 1992.

A total of 253.11 acres of highly disturbed wetlands are proposed for fill placement for construction of the Polk Power Station. As compensation for impacts to these wetland areas, Tampa Electric Company proposes to provide approximately 168.41 acres of combined wetland creation and wetland enhancement (see Table 2). The mitigation plan provides for recontouring of the remaining mine cuts to provide approximately 18.94 acres of forested wetland enhancement and 23.20 acres of herbaceous wetland enhancement. The remainder of the compensation package includes approximately 62.69 acres of forested wetland creation and approximately 63.58 acres of herbaceous wetland enhancement. The ratio of compensation acreage offered per acre of wetland fill is approximately 0.67:1.0.

The compensation package will include plantings of laurel oak, water oak, sweet gum (Liquidambar styraciflua), swamp redbay (Persea palustris), red maple, black gum (Nyssa sylvatica var. biflora) and other tree species as available for the canopy layer, as well as an herbaceous layer which includes maidencane (Panicum hemitomon), pickerelweed, and arrowhead.

Construction within or adjacent to the existing mine cuts will be facilitated by isolating and draining working areas and pumping the water into nearby mine cuts. This will minimize the occurrence of erosion or downstream silt and sedimentation in runoff. The only silt/sedimentation barrier to be installed will be erected upstream of a ditch which leads off the property (see Figure 5, Sheet 9 of 13 and Figure 6). Site grading activities will be primarily accomplished with pans and bulldozers. Typical cross sections of jurisdictional areas proposed for fill placement are included (Figure 7 and 8).

ALTERNATIVES ANALYSIS

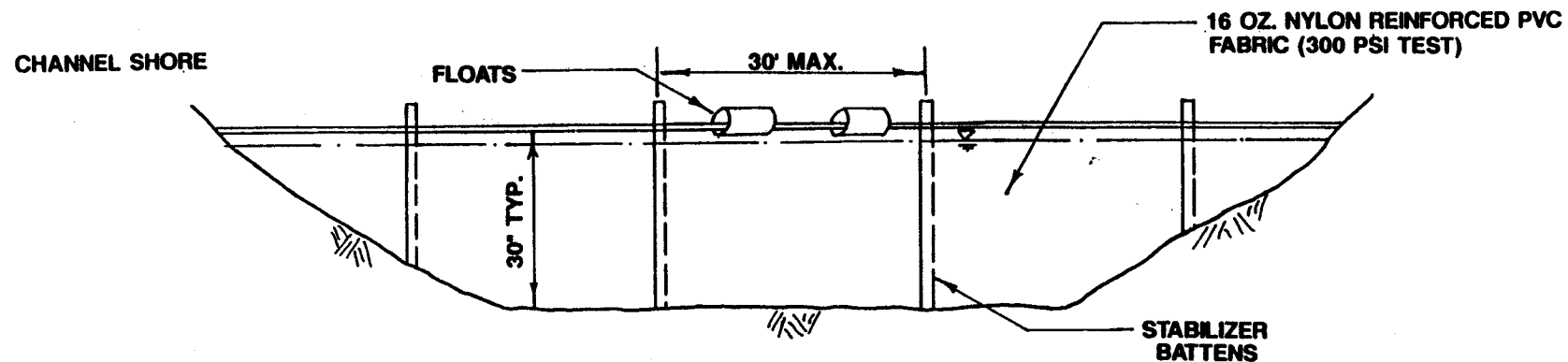
In order to meet the needs of a rapidly growing community, it has become necessary for several utility companies serving the area to update and expand their capacity to generate and transmit electricity. Numerous transmission corridors have been constructed or expanded to even out loading, and deactivated generating facilities

Table 2. Acreages of Wetland Compensation

	Acres
<u>Wetland Creation</u>	
Forested	62.69
Herbaceous	63.58
<u>Wetland Enhancement</u>	
Forested	18.94
Herbaceous	23.20
<u>Total Mitigation</u>	
Forested	81.63
Herbaceous	86.78
TOTAL COMBINED MITIGATION	168.41

Ratio = Mitigation:Impact = 0.67:1.0

Source: ECT, 1992.



LENGTH SUFFICIENT FOR
TOTAL WATER COLUMN COVERAGE

FIGURE 6.
TURBIDITY SCREEN DETAIL
DREDGE AND FILL PERMIT APPLICATION

Source: ECT, 1992.



**POLK
POWER
STATION**

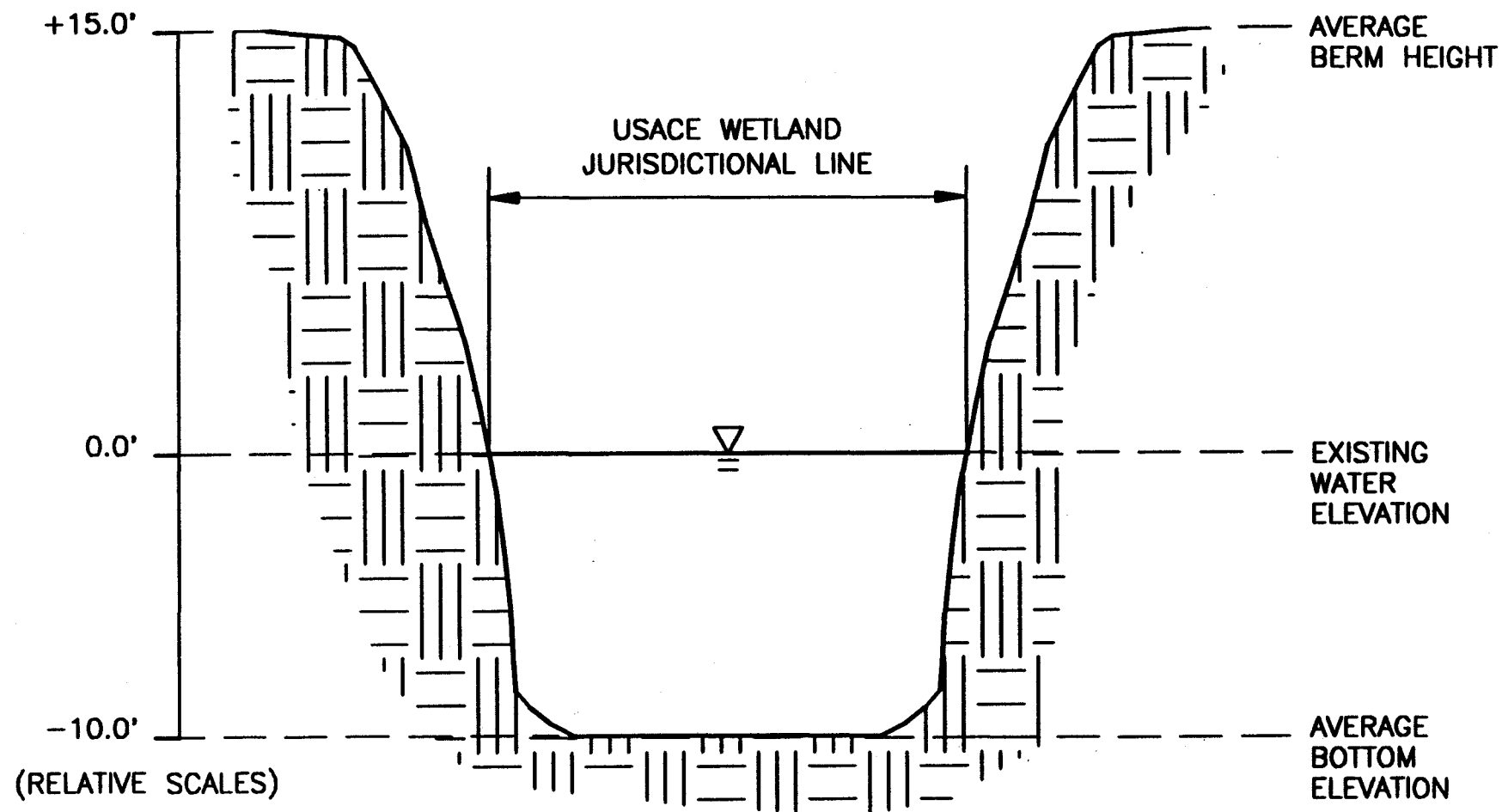


FIGURE 7.
TYPICAL CROSS SECTION OF EXISTING MINE CUTS
DREDGE AND FILL PERMIT APPLICATION

Source: ECT, 1992.

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 A TECO ENERGY COMPANY

POLK
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STATION

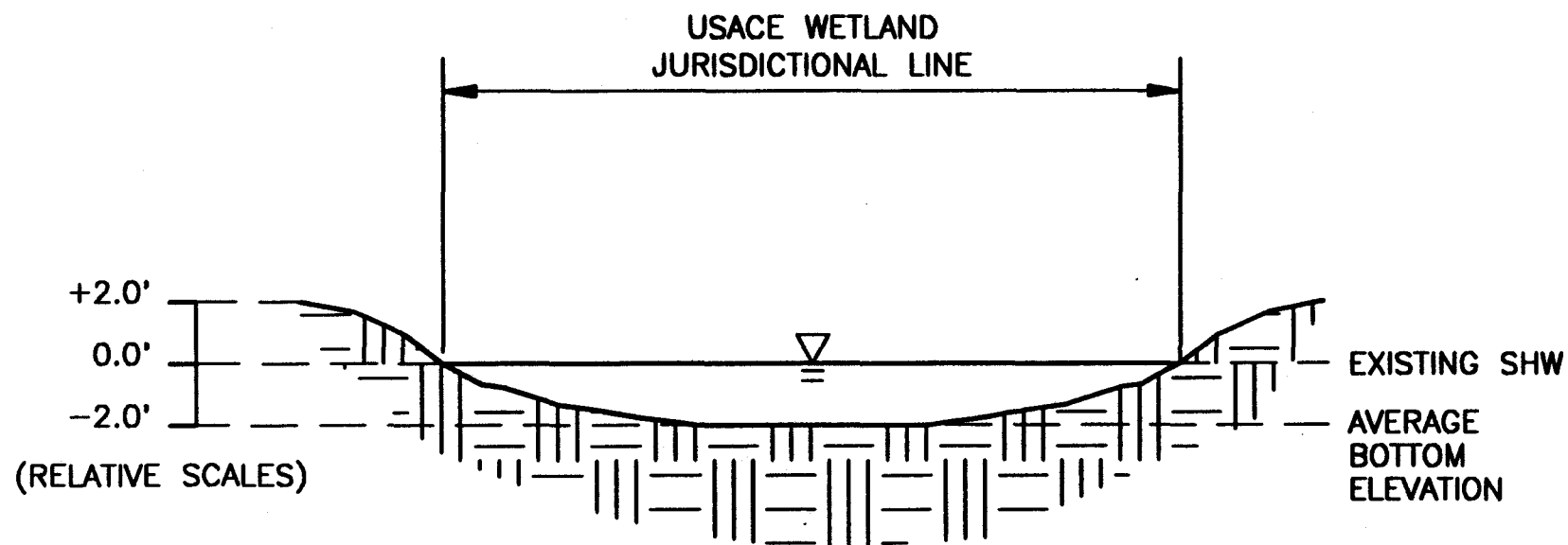


FIGURE 8.
TYPICAL CROSS SECTION OF EXISTING DISTURBED HERBACEOUS WETLANDS
DREDGE AND FILL PERMIT APPLICATION

Source: ECT, 1992.

 **TAMPA
ELECTRIC**
A TECO ENERGY COMPANY

**POLK
POWER
STATION**

have been returned to service to assist in managing peak loads. In addition to these measures, new, modern generating facilities need to be constructed to supply the west-central Florida area.

During the course of selecting an appropriate site for constructing a new power plant, Tampa Electric Company first considered a large tract of land on lower Tampa Bay adjacent to Port Manatee that was Tampa Electric Company property. This property had the advantages of ready access to a barge transported coal supply, proximity to the area which was to be served, and existing Tampa Electric Company ownership. However, this property had the disadvantage of being located adjacent to an environmentally sensitive estuary, Cockroach Bay. Public concerns expressed relative to this proposed power plant site led Tampa Electric Company to establish a committee comprised of public and private individuals from the business and environmental communities to examine alternatives to the Port Manatee site. Upon examining the available property that had appropriate dimensions and assessing the various parcels for environmental sensitivity, proximity to the service area and access to fuel supplies, the committee selected the property now known as the Polk Power Station.

The Polk Power Station property has the advantages of already being in a highly disturbed condition subsequent to phosphate mining activities, access to rail service for fuel supply, and access by existing highways or roads for ancillary service and employee commuting. Construction of the Polk Power Station on the selected property has a disadvantage since an exceptionally large acreage of the property is, by definition, jurisdictional wetland. The vast majority of the jurisdictional wetland is open water standing in unreclaimed mine cuts made when draglines excavated below natural grade to access phosphate reserves. Although the site plan proposes a seemingly large acreage of displacement for this type of habitat, most has been retained within the design of the cooling reservoir (see Figure 3). In addition most of the berms constructed for directing the cooling water around its circuitous path are situated such that they overlie the upland ridges between the mine cuts.

The placement of fill for plant site construction in other disturbed areas which contain jurisdictional wetlands is necessary for the development of a workable site plan. Wetland areas that are sufficiently removed from the plant site will be retained intact after construction (i.e., the southwestern corner of the property, see Figure 5, Pages 5 and 10 of 13). The remainder are displaced, but their functions and values are more than replaced by the large, inter-connected wetland compensation areas with diverse habitat and mosaics of wetland and upland communities. Tampa Electric Company has substantially avoided the potential disturbance to higher quality wetlands by the selection of the Polk Power Station over the Port Manatee property, minimized the displacement of wetlands with a sensitive site plan, only displaced the most disturbed wetland areas with the lowest functional values, and more than compensated for the values and functions displaced with a large, diverse community derived from wetland creation and wetland enhancement.

ATTACHMENT B
POLK POWER STATION LEGAL DESCRIPTION OF LANDS

LANDS FROM FREEPORT MACMORAN RESOURCE PARTNERS, LIMITED PARTNERSHIP (Agrico Chemical Company)

LANDS TO THE EAST OF STATE ROAD 37:

TOWNSHIP 32 SOUTH, RANGE 23 EAST, POLK COUNTY, FLORIDA

SECTION 1

That part of the West 330.00 feet of the East 1/2 of the West 1/2 of said Section 1, lying southwesterly of Fort Green Road, AND all that part of the West 1/4 of said Section 1 lying southwesterly of Fort Green Road.

SECTION 2

- a. The West 848.00 feet of the NW 1/4 of the NW 1/4.
- b. The South 3/4 LESS that part described as; Begin 400.00 feet West of the NE corner of said South 3/4, run thence West 3600.00 feet; thence South 150.00 feet; thence East 450.00 feet; thence South 200.00 feet; thence East 700.00 feet; thence North 200.00 feet; thence East 2450.00 feet; thence North 150.00 feet to the POINT OF BEGINNING.

SECTION 3

All lying East of State Road 37.

SECTION 4

All lying East of State Road 37.

SECTION 9

BEGIN at the NE corner of said Section 9 and proceed 5.00°04'08"E. along the East line of said Section 9 for 2117.07 feet; thence N.88°05'57"W. for 323.11 feet; thence S.88°42'07"W. for 983.72 feet; thence N.89°51'23"W. for 1058.61 feet; thence S.39°38'56"W. for 454.20 feet; thence N.13°09'59"W. for 538.34 feet to the easterly right-of-way line of State Road No. 37 (being 80 feet at right angles from centerline); thence N.27°31'59"E. along said right-of-way line for 2184.60 feet to the North line of said Section 9; thence N.89°32'05"E. along said North line for 1765.11 feet to the POINT OF BEGINNING.

SECTION 10

BEGIN at the NE corner of said Section 10 and proceed S.00°00'02"E. along the East line of said Section 10 for 1885.69 feet thence N.88°45'46"W. for 324.02 feet; thence S.01°25'49"W. for 1761.69 feet; thence N.89°56'27"W. for 3504.25 feet; thence N.02°46'52"W. for 454.48 feet; thence N.61°33'02"W. for 320.02 feet; thence N.00°22'41"W. for 641.25 feet; thence N.46°54'10"W. 372.71 feet; thence N.88°05'57"W. for 820.69 feet; to the West line of said Section 10; thence N.00°04'08"W. for 2117.07 feet to the NW corner of said Section 10; thence S.89°53'15"E. along the North line of said Section 10 for 5274.75 feet to the POINT OF BEGINNING.

SECTION 11

BEGIN at the NE corner of said Section 11 and proceed S.00°13'13"E. along the East line of said Section 11 for 731.09 feet; thence S.22°01'06"W. for 60.15 feet; thence S.04°41'20"W. for 1038.35 feet; thence S.16°25'50"E. for 399.84 feet again to the East line of said Section 11; thence S.00°13'13"E. along said East line for 448.50 feet to the East Quarter Section Corner of said Section 11; thence S.00°19'20"W. along the East line of the SE 1/4 of said Section 11 for 277.57 feet; thence S.83°10'34"W. for 845.66 feet; thence N.80°44'17"W. for 775.80 feet; thence N.04°00'31"W. for 937.40 feet; thence N.88°45'46"W. for 3637.10 feet to the West line of said Section 11; thence N.00°00'02"W. for 1885.69 feet to the NW corner of said Section 11; thence N.89°55'04"E. for 5298.52 feet to the POINT OF BEGINNING.

SECTION 12

BEGIN at the NW corner of said Section 12 and proceed S.88°52'09"E. along the North line of the NW 1/4 of said Section 12 for 1649.70 feet to a concrete monument number 1943; thence S.00°19'05"W. for 75.98 feet; thence S.89°23'48"W. for 614.63 feet; thence S.10°48'34"W. for 155.81 feet; thence S.43°38'11"W. for 211.14 feet; thence S.82°21'29"W. for 355.22 feet; thence N.84°53'22"W. for 385.84 feet; thence S.22°01'06"W. for 320.75 feet to the West line of said Section 12; thence N.00°13'13"W. along said West line for 731.09 feet to the POINT OF BEGINNING.

LANDS TO THE WEST OF STATE ROAD 37:

TOWNSHIP 32 SOUTH, RANGE 23 EAST, POLK COUNTY, FLORIDA

SECTION 3

The part of the South 1/2 of the NW 1/4 lying West of State Road No. 37. LESS existing county maintained right-of-way for Bethlehem Road.

SECTION 4

The SE 1/4 of the SW 1/4, LESS existing county maintained right-of-way for Albritton Road. The SE 1/4 of said Section 4 lying North and West of State Road No. 37, LESS existing county maintained right-of-way for Albritton Road, and subject to GAS PIPELINE EASEMENT in O.R. Book 219 on Page 341 of the Public Records of Polk County, Florida. That part of the South 1/2 of the NE 1/4 of said Section 4 lying North and West of State Road No. 37, LESS existing county maintained right-of-way for Bethlehem Road, and subject to GAS PIPELINE EASEMENT in O.R. Book 219 on Page 341 of the Public Records of Polk County, Florida.

TOWNSHIP 32, SOUTH, RANGE 23 EAST, POLK COUNTY, FLORIDA

SECTION 7

The NE 1/4, LESS the NE 1/4 of the NE 1/4, AND LESS the North 416.00 feet of the East 209.00 feet of the NW 1/4 of the NE 1/4, AND LESS existing county maintained right-of-way for Albritton Road.

The SE 1/4, LESS right-of-way for State Road No. 674.

The SW 1/4, LESS right-of-way for State Road No. 674.

The NW 1/4, LESS the NE 1/4 of the NW 1/4, AND LESS existing county maintained right-of-way for Albritton Road. Said Section 7 being subject to existing Florida Gas Transmission Co. Pipeline Easement.

SECTION 8

The NE 1/4, LESS the West 1/2 of the NW 1/4 of the NE 1/4.

The SE 1/4 of Section 8, LESS right-of-way for State Road No. 674.

The SW 1/4 of Section 8, LESS right-of-way for State Road No. 674.

The South 1/2 of the NW 1/4.

SECTION 9

ALL, lying West of State Road No. 37 LESS existing county maintained right-of-way for Albritton Road, AND LESS right-of-way for State Road No. 674.

LANDS FROM AMERICAN CYANAMID COMPANY

TOWNSHIP 31 SOUTH, RANGE 23 EAST, POLK COUNTY, FLORIDA

SECTION 34

All the part of the S-3/4 of E-3/4 of the section lying east of the right-of-way of State Road 37 and also lying south of the right-of-way of County Road 630 (formerly designated State Road 630).

SECTION 35

All the part of the S-3/4 of the section lying south of the right-of-way of County Road 630 (formerly designated State Road 630) and also lying west of the right-of-way of the Brewster-Fort Green Road.

TOWNSHIP 32 SOUTH, RANGE 23 EAST, POLK COUNTY, FLORIDA

SECTION 2

- a. The N-1/2 of N-1/2, LESS the west 848 feet thereof, and SUBJECT TO existing right-of-way of the Brewster-Fort Green Road at the northeast corner thereof.
- b. The part of the S-1/2 of N-1/2 (being part of U.S. Government Lot 1 in the NW-1/4 and of U.S. Government Lot 1 in the NE-1/4) described as: begin at a point on the north boundary of said S-1/2 of N-1/2 located 400 feet west of the northeast corner thereof (measured along said north boundary), thence west along said north boundary 3600 feet, thence south 150 feet, thence east 450 feet, thence south 200 feet, thence east 700 feet, thence north 200 feet, thence east 2450 feet, thence north 150 feet to the point of beginning. (The directions "north" and "south" meaning the bearing of the east boundary of Section 2, and the directions "east" and "west" meaning the bearing of the north boundary of said S-1/2 of N-1/2 of Section 2.)

Source: Andrew Edgemon & Associate, 1991.

REC'D JUL 06 1992



Southwest Florida Water Management District

2379 Broad Street (U.S. 41 South) Brooksville, Florida 34609-6899
Phone (904) 796-7211 or 1-800-423-1476 SUNCOM 628-4150

July 1, 1992

Charles A. Black
Chairman, Crystal River
Roy G. Harrell, Jr.
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James E. Martin
St. Petersburg
Margaret W. Sistrunk
Odessa

Peter G. Hubbell
Executive Director
Mark D. Farrell
Assistant Executive Director

Anthony N. Arcuri
Environmental Consulting and Technology, Inc
5405 Cypress Center Drive
Suite 200
Tampa, Fla. 33609

Subject: Proposed Tampa Electric Co. Polk Power Station Site
Sections 2,3/Township 32 S/Range 23 E
Polk County

Dear Mr. Arcuri:

As a result of the June 29, 1992, on site meeting with you, it was determined that there are some areas of wetlands in the unmined portion of the proposed power plant site. The poor quality of the June 13, 1991, aerial photograph you provided, and the disturbed nature of the site made it unworkable to verify the present wetland boundaries you identified. After inspecting better quality 1984 aerial photography and examining the National Wetland Inventory (NWI) maps for the unmined portion of the site, we determined that they more realistically reflect the acreage and type of wetlands you will need to compensate for. Please utilize these maps for wetland planning purposes for this project.

Please contact me at 534-1448 to further discuss this matter.

Sincerely,

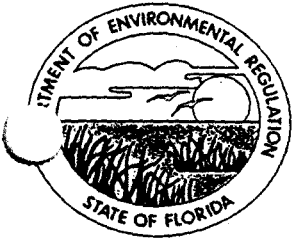
A handwritten signature in dark ink, appearing to read "David Bishof".

David Bishof
Environmental Scientist
Bartow Permitting Department
Resource Regulation

DB:kmh226

cc: Richard Gannon

*Excellence
Through
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Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

Lawton Chiles, Governor

Carol M. Browner, Secretary

April 15, 1992

Tampa Electric Company
c/o Robert Hearon
Environmental Consulting & Tech., Inc.
5405 Cypress Center Drive, Suite 200
Tampa, FL 33609

Dear Mr. Hearon:

This letter is to confirm our telephone conversation regarding my request that TECO have a binding jurisdictional determination done on the proposed Polk County power plant site. After discussing the matter with Rick Cantrell. I am withdrawing my request that a binding jurisdictional determination be done for the site.

The BWRM staff has discussed how the baseline study should deal with mined-out lands, i.e., to evaluate them as if reclamation has been completed and the restored communities were mature. Part of the application information shall be copies of all permits issued to mine the site and copies of the approved LRU's from DNR for the site. This information should be used to produce maps showing what the site will look like after reclamation has occurred without a power plant on the site. The maps should show all wetlands indicate the wetland type and jurisdiction and be used to estimate the impacts of the power plant on the restored wetlands. If the review of the reclamation plans indicates that the reclamation plans can be revised to incorporate both the power plant and the required reclamation, the impact of the plant would be greatly reduced.

If you have any questions, I can be contacted at (904) 488-0130.

Sincerely,

Trudie D. Bell

Trudie D. Bell
Environmental Supervisor II
Wetland Resource Management

cc: Buck Oven

APPENDIX 11.11

**ANNUAL MONITORING DATA REPORT FOR
TAMPA ELECTRIC COMPANY
PREVENTION OF SIGNIFICANT DETERIORATION
NETWORK, POLK COUNTY, FLORIDA**

APPENDIX 11.11

**ANNUAL MONITORING DATA REPORT
OF TAMPA ELECTRIC COMPANY
PSD NETWORK
POLK COUNTY, FLORIDA**

Prepared for:



Tampa, Florida

Prepared by:



90-263-0302

July 1992

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11.11.2.2 <u>SULFUR DIOXIDE</u>	11.11.2-1
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APPENDIX B--	FIRST, SECOND, AND THIRD QUARTERLY AUDIT REPORTS; AND FOURTH QUARTER FDER, EPA AUDIT REPORTS AND SHUTDOWN AUDIT
APPENDIX C--	MONTHLY PARAMETER REPORTS OF HOURLY AVERAGES

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11.11.1.0 INTRODUCTION

Environmental Consulting & Technology, Inc. (ECT), under contract to Tampa Electric Company (TEC), maintained a Prevention of Significant Deterioration (PSD) ambient air monitoring network in Polk County, Florida. The network consisted of two stations: AQ-1 and AQ-2. Station AQ-1 collected data for ozone (O_3), sulfur dioxide (SO_2), wind direction, windspeed, ambient temperature, sigma theta, and precipitation on a continuous basis. The O_3 and SO_2 monitors were automatically cycled through zero, span, and precision checks once every 24 hours. All of the calibration continuous analyzer data were recorded by the data acquisition system (DAS). Site AQ-1 also collected particulate matter less than or equal to 10 micrometers aerodynamic diameter (PM_{10}) data from a single sampler. Station AQ-2 consisted of two PM_{10} samplers; one sampler was assigned as the designated unit (AQ-2D) and the other was labeled as the collocated sampler (AQ-2C). The data comparison between the designated and the collocated sampler provided the required precision information. All three PM_{10} samplers ran in accordance with U.S. Environmental Protection Agency (EPA)-designated National 6-Day Sampling Schedule.

ECT provided all technical, audit, and data reduction services for this network. All continuous data were collected on a DAS which was polled daily. An ECT technician visited the stations at least every 6 days to perform service checks and change the PM_{10} filters.

As part of the contract with TEC, ECT submitted data reports on a quarterly basis. All quality assurance and data reporting conform with ECT's Standard Operating Procedures (SOP) Manual and Quality Assurance (QA) plan approved by the State of Florida, Florida's State Wide QA Air Program Plan and the EPA QA Handbooks, Volumes I and II. This report contains the results of the annual monitoring year 1991-1992.

11.11.2.0 MONITORING/SAMPLING RESULTS

11.11.2.1 OZONE

O₃ concentrations at AQ-1 for the year 1991-1992 are below the National and Florida Ambient Air Quality Standards (AAQS) given in Table 11.11.2-1. A summary of the monthly mean and 1-hour maximum concentrations is provided in Table 11.11.2-2. The highest monthly mean O₃ concentration of 35 parts per billion (ppb) occurred in June 1991; the maximum 1-hour concentration was 99 ppb on September 20, 1991, at 1400 hours, which is below the 1-hour standard of 125 ppb.

Precision checks for the year 1991-1992 revealed test gas concentration to analyzer reading variability to be quite low, with an average yearly percent difference of 0.3.

11.11.2.2 SULFUR DIOXIDE

SO₂ concentrations at AQ-1 are also below the National and Florida AAQS (Table 11.11.2-1). A summary of the monthly mean, and maximum 3-hour and 24-hour concentrations is given in Table 11.11.2-3. The highest monthly mean SO₂ concentration was 4 ppb in June, January, February and March, respectively. The maximum 3-hour concentration was 78 ppb ending on November 23, 1991, at 1700 hours; the maximum 24-hour concentration was 17 ppb ending on November 24, 1991, at 0400 hours. The 3-hour and 24-hour maximum concentrations were well below the standards of 500 and 100 ppb, respectively.

Precision checks for the year 1991-1992 reveal test gas concentration to analyzer reading variability to be low, with an average yearly percent difference of 2.7.

11.11.2.3 PM₁₀

A summary of the PM₁₀ concentrations for AQ-1 and AQ-2 is given in Table 11.11.2-4. The maximum 24-hour concentration at AQ-1 was 48.3 micrograms per cubic meter (μg/m³) on June 29, 1991; the maximum at AQ-2C was 46.9 μg/m³ on July 29, 1991; and the maximum at AQ-2D was 43.9 μg/m³ on July 5, 1991, and

Table 11.11.2-1. National and Florida AAQS for PM₁₀, SO₂, and O₃ (μg/m³)

Pollutant	Averaging Time	National AAQS		Florida AAQS
		Primary	Secondary	
PM ₁₀	Annual arithmetic mean*	50	50	50
	24-hour maximum +	150	150	150
SO ₂	Annual arithmetic mean	80 (0.03 ppm)	NA	60 (0.02 ppm)
	24-hour maximum**	365 (0.14 ppm)	NA	260 (0.1 ppm)
	3-hour maximum**	NA	1,300 (0.5 ppm)	1,300 (0.5 ppm)
O ₃	1-hour maximum +	235 (0.12 ppm)	235 (0.12 ppm)	235 (0.12 ppm)

Note: ppm = parts per million.

* Attained when the expected annual arithmetic mean is less than or equal to the standard.

+ Standard is attained when the expected number of days per calendar year with hourly average concentrations above the standard is equal to or less than one.

** Maximum concentration not to be exceeded more than once per year.

Sources: 40 Code of Federal Regulations (CFR) 50.
Section 17-2.300, Florida Administrative Code (F.A.C.).

Table 11.11.2-2. Summary of Monthly Mean and 1-Hour Maximum O₃ Concentrations (ppb) at AQ-1 for the Monitoring Year 1991-1992, TEC, Polk County, FL

Month	Mean	Maximum 1-Hour	Date and Time
April	24	69	04/02/91 19:00
May	25	72	05/30/91 14:00
June	35	82	06/13/91 16:00
July	24	77	07/23/91 16:00
August	23	81	08/24/91 17:00
September	34	99	09/20/91 14:00
October	31	96	10/13/91 1300
November	24	67	11/08/91 1300
December	18	53	12/18/91 1500
January	21	53	01/18/92 1400
February	25	64	02/29/92 1500
March	33	75	03/28/92 1600
ANNUAL MEAN 26 (ppb)			
.026 (ppm)			

Source: ECT, 1992.

Table 11.11.2-3. Summary of Monthly Mean and Maximum 3-Hour and 24-Hour SO₂ Concentrations (ppb) at AQ-1 for the Monitoring Year 1991-1992, TEC, Polk County, FL

Month	Mean	Maximum 3-Hour*	Ending Date and Time	Maximum 24-Hour*	Ending Date and Time
April	2	21	04/21/91 17:00	9	04/22/91 11:00
May	3	43	05/06/91 17:00	16	05/07/91 14:00
June	4	53	06/04/91 18:00	11	06/04/91 21:00
July	3	40	07/09/91 11:00	12	07/09/91 10:00
August	2	31	08/09/91 13:00	10	08/09/91 17:00
September	2	26	09/26/91 15:00	9	09/27/91 12:00
October	3	23	10/11/91 1700	7	10/17/91 0500
November	5	78	11/23/91 1700	17	11/24/91 0400
December	3	29	12/22/91 2000	10	12/19/91 1900
January	4	48	01/06/92 1500	15	01/07/92 0700
February	4	26	02/28/92 1900	11	02/27/92 1700
March	4	76	03/07/92 2300	16	03/08/92 2000
ANNUAL MEAN		3 (ppb) .003 (ppm)			

*Based on a rolling average.

Source: ECT, 1992.

Table 11.11.2-4. Summary of PM₁₀ Concentrations (µg/m³) for AQ-1 and AQ-2 for the Monitoring Year 1991-1992, TEC, Polk County, FL

Date	PM ₁₀ Concentration by Site		
	AQ-1	AQ-2C	AQ-2D
03/31/91	23.3	28.3	26.9
04/06/91	17.6	Electrical problems	Electrical problems
04/12/91	18.9	18.1	18.7
04/18/91	14.3	Electrical problems	Electrical problems
04/24/91	19.7	Electrical problems	Electrical problems
04/30/91	18.2	Electrical problems	Electrical problems
05/06/91	20.5	17.3	19.8
05/12/91	22.5	26.4	22.4
05/18/91	15.4	17.6	16.5
05/24/91	13.8	14.6	14.1
05/30/91	29.3	30.0	33.5
06/05/91	20.9	22.7	21.2
06/11/91	16.4	16.3	15.8
06/17/91	13.3	18.2	12.9
06/23/91	20.6	20.4	21.1
06/29/91	48.3	17.1	29.6
07/05/91	23.4	43.5	Invalid
07/11/91	Invalid	29.6	12.0
07/17/91	45.4	16.7	23.6
07/23/91	29.9	18.8	29.9
07/29/91	42.4	46.9	Invalid
08/04/91	14.6	15.1	13.8
08/10/91	12.3	11.0	Invalid

Table 11.11.2-4. Summary of PM₁₀ Concentrations (µg/m³) for AQ-1 and AQ-2 for the Monitoring Year 1991-1992, TEC, Polk County, FL
(Continued, Page 2 of 3)

Date	PM ₁₀ Concentration by Site		
	AQ-1	AQ-2C	AQ-2D
08/16/91	25.1	27.0	26.5
08/22/91	16.2	9.4	9.4
08/28/91	9.9	8.4	Invalid
09/03/91	14.0	14.5	14.9
09/09/91	10.9	10.5	10.1
09/15/91	16.6	16.8	16.7
09/21/91	16.2	16.4	14.0
09/27/91	25.1	25.0	30.8
10/03/91	26.9	22.5	Invalid
10/09/91	26.3	Invalid	Invalid
10/15/91	23.5	20.0	19.5
10/21/91	10.8	14.4	13.3
10/27/91	11.6	12.1	10.5
11/02/91	14.6	12.6	12.1
11/08/91	45.1	42.7	43.9
11/14/91	19.5	22.4	24.0
11/20/91	7.5	7.2	6.8
11/26/91	24.4	20.7	22.7
12/02/91	7.9	8.5	8.7
12/08/91	8.1	8.5	7.4
12/14/91	7.1	8.7	9.0
12/20/91	16.8	17.6	18.3
12/26/91	13.7	14.1	14.0
01/01/92	12.3	11.7	11.6
01/07/92	19.2	19.1	19.3

Table 11.11.2-4. Summary of PM₁₀ Concentrations (µg/m³) for AQ-1 and AQ-2 for the Monitoring Year 1991-1992, TEC, Polk County, FL
(Continued, Page 3 of 3)

Date	PM ₁₀ Concentration by Site		
	AQ-1	AQ-2C	AQ-2D
01/13/92	9.9	10.6	11.4
01/19/92	7.6	8.8	8.3
01/25/92	14.8	16.5	15.8
01/31/92	10.2	11.6	12.1
02/06/92	7.7	7.6	8.2
02/12/92	25.5	27.6	28.1
02/18/92	11.8	11.4	9.0
02/24/92	7.1	8.6	10.0
03/01/92	19.3	19.1	17.6
03/07/92	8.1	7.3	7.7
03/13/92	12.2	12.4	13.6
03/19/92	30.2	18.7	19.6
03/25/92	15.0	14.8	14.9
03/31/92	14.4	12.5	13.4
ANNUAL	18.4	17.7	17.0

Source: ECT, 1992.

November 8, 1991, respectively. These concentrations are well below the PM_{10} 24-hour standard of $150.0 \mu\text{g}/\text{m}^3$ and the annual standard of $60 \mu\text{g}/\text{m}^3$.

Precision checks for the PM_{10} samplers produced an average yearly percent difference of -5.6, for sample pairs having concentrations greater than $20 \mu\text{g}/\text{m}^3$ for both samples.

11.11.2.4 PRECIPITATION

Total precipitation at AQ-1 for the year was 34.65 inches. Monthly totals for the year are given in Table 11.11.2-5, respectively.

For the period January 2, 1992, through February 25, 1992, the precipitation collector malfunctioned. All hourly values recorded for these months were 0.00. In order to validate some of the zero values, the National Daily Weather maps were used. The approach used to determine which hourly values were valid was that if no rain was recorded in Florida for a certain day, then that day of zeros would remain as valid data.

11.11.2.5 TEMPERATURE

A summary of the monthly mean, and maximum and minimum 1-hour average temperatures are given in Table 11.11.2-6. The highest monthly mean temperature was 26.5 degrees Celsius ($^{\circ}\text{C}$) in August. The maximum 1-hour average was 34.3°C on June 28, 1991, at 1500 hours; the minimum was 0.1°C on January 17, 1992, at 0600 hours.

11.11.2.6 WIND DIRECTION, WINDSPEED, AND SIGMA THETA

A summary of the monthly mean wind direction, monthly mean, maximum and minimum 1-hour windspeeds, and monthly mean sigma theta are provided in Table 11.11.2-7. Windspeeds measured below the threshold of the instrument [0.9 miles per hour (mph)] are considered to be valid. The manufacturer specifies

Table 11.11.2-5. Summary of Monthly Precipitation, Hourly Averages (inches)
at AQ-1 for the PPS Site (April 1991 through March 1992)

Date	Amount	Monthly Total
04/01/91	0.01	
04/06/91	1.84	
04/07/91	0.29	
04/08/91	0.01	
04/17/91	0.18	
04/18/91	0.57	
04/19/91	0.01	
04/20/91	0.62	
04/23/91	0.05	
04/25/91	0.66	
04/91 total		4.24
05/07/91	0.13	
05/09/91	0.16	
05/13/91	0.12	
05/14/91	0.05	
05/16/91	0.12	
05/17/91	0.01	
05/18/91	0.03	
05/19/91	0.13	
05/20/91	0.31	
05/21/91	0.02	
05/22/91	0.80	
05/23/91	0.18	
05/24/91	0.85	
05/26/91	2.04	
05/27/91	0.06	
05/28/91	0.01	
05/30/91	0.35	
05/91 total		5.37
06/05/91	2.03	
06/06/91	0.01	
06/17/91	0.55	
06/18/91	0.03	
06/19/91	0.02	
06/20/91	0.75	
06/21/91	0.01	

Table 11.11.2-5. Summary of Monthly Precipitation, Hourly Averages (inches)
at AQ-1 for the PPS Site (April 1991 through March 1992)
(Continued, Page 2 of 4)

Date	Amount	Monthly Total
06/22/91	0.57	
06/23/91	0.14	
06/24/91	0.02	
06/25/91	0.60	
06/26/91	0.01	
06/29/91	0.52	
06/30/91	0.61	
06/91 total		5.87
07/01/91	0.87	
07/02/91	0.34	
07/03/91	2.01	
07/04/91	0.01	
07/05/91	0.16	
07/06/91	0.17	
07/07/91	1.52	
07/09/91	0.47	
07/24/91	0.11	
07/25/91	0.03	
07/26/91	0.84	
07/28/91	0.24	
07/29/91	0.01	
07/30/91	0.28	
07/31/91	0.67	
07/91 total		7.73
08/01/91	0.12	
08/02/91	0.02	
08/06/91	0.01	
08/07/91	0.18	
08/09/91	0.94	
08/15/91	0.01	
08/16/91	0.01	
08/17/91	0.01	
08/18/91	0.11	
08/19/91	0.08	
08/20/91	0.19	

Table 11.11.2-5. Summary of Monthly Precipitation, Hourly Averages (inches)
at AQ-1 for the PPS Site (April 1991 through March 1992)
(Continued, Page 3 of 4)

Date	Amount	Monthly Total
08/21/91	0.37	
08/23/91	0.05	
08/24/91	1.89	
08/27/91	0.08	
08/28/91	0.03	
08/30/91	1.20	
08/31/91	0.01	
08/91 total		5.31
09/03/91	0.07	
09/06/91	0.43	
09/07/91	0.48	
09/08/91	0.76	
09/24/91	0.07	
09/25/91	0.35	
09/26/91	0.34	
09/29/91	0.04	
09/30/91	0.01	
09/91 total		2.55
10/01/91	0.08	
10/02/91	0.22	
10/04/91	0.01	
10/05/91	0.09	
10/06/91	0.17	
10/07/91	0.01	
10/10/91	0.01	
10/23/91	0.02	
10/25/91	0.08	
10/30/91	0.01	
10/91 total		0.70
11/03/91	0.02	
11/09/91	0.04	
11/20/91	0.05	
11/91 total		0.11

Table 11.11.2-5. Summary of Monthly Precipitation, Hourly Averages (inches)
at AQ-1 for the PPS Site (April 1991 through March 1992)
(Continued, Page 4 of 4)

Date	Amount	Monthly Total
12/02/91	0.24	
12/03/91	0.19	
12/04/91	0.29	
12/24/91	0.01	
12/27/91	0.03	
12/91 total		0.76
01/01/92	0.06	
01/92 total		0.06
02/26/92	0.02	
02/27/92	0.14	
02/92 total		0.16
03/01/92	0.07	
03/02/92	0.06	
03/03/92	0.04	
03/04/92	0.15	
03/05/92	0.01	
03/08/92	0.05	
03/10/92	0.09	
03/11/92	0.01	
03/12/92	0.12	
03/13/92	0.06	
03/16/92	0.01	
03/17/92	0.05	
03/21/92	0.04	
03/22/92	0.46	
03/23/92	0.28	
03/30/92	0.27	
03/31/92	0.02	
03/92 total		1.79
Yearly Total		34.65

Source: ECT, 1992.

Table 11.11.2-6. Summary of Monthly Mean, Maximum, and Minimum 1-Hour Temperatures (°C) for the Monitoring Year 1991-1992, TEC, Polk County, FL

Month	Mean	Maximum 1-Hour	Date and Time	Minimum 1-Hour	Date and Time
April	22.8	32.4	04/29/91 15:00	10.1	04/02/91 04:00
May	25.2	32.8	05/16/91 13:00	19.3	05/31/91 04:00
June	25.7	34.3	06/28/91 15:00	17.4	06/11/91 05:00
July	25.9	33.6	07/07/91 15:00	21.5	07/12/91 02:00
August	26.5	33.4	08/17/91 14:00	21.1	08/30/91 17:00
September	26.2	34.2	09/06/91 16:00	15.7	09/27/91 05:00
October	22.9	31.4	10/05/91 1300	8.9	10/17/91 0600
November	17.8	28.5	11/30/91 1500	3.1	11/26/91 0000
December	17.5	29.2	12/02/91 1500	3.4	12/05/91 0600
January	14.5	27.4	01/29/92 1400	0.1	01/17/92 0600
February	17.0	29.0	02/17/92 1400	3.8	02/02/92 0300
March	18.0	28.9	03/09/92 1600	5.5	03/12/92 0100
ANNUAL MEAN		21.7°C			

Source: ECT, 1992.

Table 11.11.2-7. Summary of Monthly Mean, Maximum, and Minimum 1-Hour Windspeeds; Monthly Mean Wind Direction; and Monthly Mean Sigma Theta for the Monitoring Year 1991-1992, TEC, Polk County, FL

Month	Speed					Direction Mean (degrees true)	Sigma Theta Mean (degrees)
	Mean (mph)	Maximum 1-Hour (mph)	Date and Time	Minimum 1-Hour (mph)	Date and Time		
April	5.6	17.0	04/23/91 14:00	0.3	04/22/91 01:00	150	17.3*
May	5.6	16.3	05/22/91 08:00	0.5	05/15/91 00:00	126	18.1
June	4.2	12.3	06/04/91 13:00	0.3	06/25/91 02:00	160	23.7
July	3.8	15.3	07/24/91 14:00	0.4	07/08/91 23:00	182	13.8*
August	3.6	11.5	08/23/91 16:00	0.4	08/09/91 02:00	168	23.6
September	4.2	11.1	09/18/91 14:00	0.4	09/13/91 03:00	97	20.3
October	4.8	13.5	10/25/91 1100	0.1	10/12/91 0500	98	17.2
November	4.9	15.9	11/29/91 1200	0.3	11/11/91 0700	115	16.2
December	4.5	17.2	12/20/91 1300	0.2	12/10/91 0400	127	16.4
January	5.0	15.7	01/23/92 1300	0.5	01/06/92 0500	166	16.5
February	5.4	16.3	02/26/92 1500	0.7	02/13/92 0200	171	16.3*
March	5.3	17.0	03/19/92 1400	0.5	03/24/92 0000	191	18.0
ANNUAL MEAN (mph)		4.7					

Source: ECT, 1992.

*Data capture for April was 58.8%, July was 62.6%, and February was 62.5%

a threshold that the instrument is guaranteed to measure. However, the instrument is capable of measuring windspeeds below the threshold.

11.11.2.7 SHELTER TEMPERATURE

A summary of the monthly mean, and maximum and minimum 1-hour average shelter temperatures is given in Table 11.11.2-8. The highest monthly mean shelter temperature was 25.3°C in December. The maximum 1-hour average was 35.6°C on January 1, 1992, at 1400; the minimum was 8.4°C on January 6, 1992, at 0700 hours.

On several occasions the shelter temperature was outside the desired temperature range of 19.5 to 30.4°C. The shelter air conditioner began to malfunction on December 30, 1991; this occurred on and off through January 6, 1992. The unit was repaired on January 7, 1992. O₃ and SO₂ data for the hours when the shelter temperature was out of range were invalidated.

Table 11.11.2-8. Summary of Monthly Mean, Maximum, and Minimum 1-Hour Shelter Temperatures (°C) for the Monitoring Year 1991-1992, TEC, Polk County, FL

Month	Mean	Maximum 1-Hour	Date and Time	Minimum 1-Hour	Date and Time
April	23.9	26.1	04/29/91 13:00	21.4	04/02/91 06:00
May	24.1	26.2	05/21/91 11:00	22.1	05/03/91 11:00
June	23.8	25.4	06/03/91 14:00	22.9	06/25/91 01:00
July	24.1	25.7	07/03/91 14:00	22.9	07/19/91 08:00
August	23.8	30.9	08/13/91 12:00	18.1	08/13/91 19:00
September	24.0	35.3	09/24/91 14:00	9.2	09/24/91 06:00
October	24.1	25.8	10/23/91 1400	20.1	10/31/91 0500
November	24.8	26.2	11/26/91 0300	20.4	11/05/91 0800
December	25.3	34.7	12/31/91 1500	15.2	12/30/91 1200
January	24.9	35.6	01/01/92 1400	8.4	01/06/92 0700
February	24.5	25.6	02/13/92 1300	23.7	02/05/92 1700
March	25.0	25.8	03/31/92 2200	23.2	03/12/92 0100
ANNUAL MEAN	24.4				

Source: ECT, 1992.

11.11.3.0 SUMMARY

ECT operated a two-station ambient air monitoring network for TEC in Polk County, Florida, from April 1, 1991, through March 31, 1992. Data collected at monitoring station AQ-1 included ambient O_3 , SO_2 , and PM_{10} . Data collected at monitoring station AQ-2 included ambient PM_{10} . The meteorological data collected at monitoring station AQ-1 included precipitation, temperature, windspeed, wind direction, and sigma theta.

The measured ambient concentrations of O_3 , SO_2 , and PM_{10} at both stations are within the applicable national and Florida AAQS. The percent data recovery for each parameter, presented in Table 11.11.3-1, is also in compliance with EPA guidelines.

Table 11.11.3-1. Monthly and Annual Percent Data Capture for Each Parameter for the Monitoring Year 1991-1992,
TEC, Polk County, FL

Month	O ₃	SO ₂	Precipitation	Wind-speed	Wind Direction	Sigma Theta	Temperature	Shelter Temperature	AQ-1 PM ₁₀	AQ-2 PM ₁₀	Monthly Average
April	83.6	87.6	85.7	87.9	87.9	58.8	86.1	84.0	100.0	33.3	79.5
May	94.0	94.5	99.2	99.6	99.6	99.6	99.9	99.6	100.0	100.0	98.6
June	92.2	92.9	97.8	97.8	97.8	97.6	97.8	97.8	100.0	100.0	97.2
July	68.3	68.4	62.5	99.7	99.7	62.6	99.7	61.3	80.0	100.0	80.2
August	94.1	86.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.1
September	94.0	94.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.8
October	92.7	93.0	98.9	98.1	98.1	98.1	98.1	98.9	100.0	80.0	95.6
November	95.4	95.4	100.0	99.4	99.4	99.4	99.9	100.0	100.0	100.0	98.9
December	91.8	91.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.4
January	87.6	88.8	61.3	99.9	99.7	99.7	99.7	100.0	100.0	100.0	93.7
February	79.0	78.9	61.6	99.6	99.6	62.5	99.6	62.8	100.0	100.0	84.4
March	95.3	95.4	99.9	99.7	99.7	99.7	99.9	99.9	100.0	100.0	99.0
ANNUAL AVERAGE	89.0	89.0	88.9	98.5	98.5	89.8	98.4	92.1	98.3	92.8	93.5

Source: ECT, 1992.

11.11-22

**APPENDIX A
EQUIPMENT LISTING**

EQUIPMENT LISTING

STATION AQ-1

<u>Continuous Monitors</u>		<u>Serial Number</u>
O ₃	Thermo Environmental 49/103	32794-243
SO ₂	Thermo Environmental 43A	43A-32759-242
DAS	Odessa DSM-3260	103735
Recorder	EA MS-412C (2 Channel)	3000076

Meteorological Monitors

WS/WD	R. M. Young Wind Monitor - AQ	09352
Temperature	T. M. Young Aspirated 43347	---
Precipitation	Climatronics 100508	---
Recorder	EA - 413C (3 Channel)	30000940

Particulate Sampler

PM ₁₀	Anderson - SAUV - 15H	1129
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STATION AQ-2

Particulate Sampler

PM ₁₀	Anderson SAUV - 15H (Designated)	1131
PM ₁₀	Anderson SAUV - 15H (Collocated)	1130

APPENDIX B
FIRST, SECOND, AND THIRD QUARTERLY AUDIT REPORTS;
AND FOURTH QUARTER FDER, EPA AUDIT REPORTS
AND SHUTDOWN AUDIT

FIRST QUARTER SUMMARY

All instruments reflected accuracy well within the accepted QA limits, except for the wind direction. The misalignment problem with the wind direction sensor was noted shortly after the site was installed, but was not realigned until the audit in order to document the exact amount of variance. All systems were fully functional at the conclusion of the audit. Audit results and QA criteria are summarized in the following table:

<u>Parameter</u>	<u>Audit Value</u>	<u>QA Criteria</u>
<u>O₃</u>		
Mean deviation (percent)	-4.497	>-10 and <10
Slope	0.95830	>0.85 and <1.15
Intercept (ppb)	-0.17415	>-30 and <30
Correlation coefficient	0.9999967	>0.995
<u>SO₂</u>		
Mean deviation (percent)	5.47	>-10 and <10
Slope	1.0787	>0.85 and <1.15
Intercept (ppb)	-2.785	>-15 and <15
Correlation coefficient	0.99987	>0.995
<u>Wind direction</u>		
Maximum deviation (°)	3	>-3 and <3
<u>Windspeed</u>		
Maximum deviation (mph)	0.2	>-0.5 and <0.5
<u>Temperature</u>		
Maximum deviation (°C)	0.2	>-0.5 and <0.5
<u>Precipitation</u>		
Maximum deviation (percent)	0.0	>-10 and <10
<u>PM₁₀--Station AQ-1</u>		
Flow rate deviation (percent)	-1.2	>-7 and <7
<u>PM₁₀--Station AQ-2</u>		
Flow rate deviation (percent)	-0.52	>-7 and <7

SECOND QUARTER SUMMARY

Performance audits of the O₃, SO₂, and PM₁₀ monitors were performed by FDER personnel on August 13, 1991. All monitors were found to be within acceptable QA accuracy limits. Audit results and QA criteria are summarized as follows:

Site Number	Pollutant	Audit Parameter	Audit Value	QA Criteria
AQ-1	O ₃	Mean deviation (%)	13.2	± 15
		Slope	1.13	>0.85 and <1.15
		Intercept (ppb)	0.175	±30
		Correlation coefficient	0.9999	>0.995
AQ-1	SO ₂	Mean deviation (%)	7.5	± 15
		Slope	1.07	>0.85 and <1.15
		Intercept (ppb)	1.25	±30
		Correlation coefficient	0.9995	>0.995
AQ-1	PM ₁₀	Flow rate deviation (%)		
		Actual	-1.0	±7
		Design	3.4	±7
AQ-2D	PM ₁₀	Flow rate deviation (%)		
		Actual	-0.6	±7
		Design	2.7	±7
AQ-2C	PM ₁₀	Flow rate deviation (%)		
		Actual	-1.0	±7
		Design	2.9	±7

THIRD QUARTER SUMMARY

Performance audits of the O₃, SO₂, and PM₁₀ monitors were performed by FDER personnel on December 3, 1991. All monitors were found to be within acceptable QA accuracy limits. Audit results and QA criteria are summarized as follows:

Site No.	Pollutant	Audit Parameter	Audit Value	QA Criteria
AQ-2	O ₃	Mean deviation (%)	1.0	± 15
		Slope	1.13	>0.85 and <1.15
		Intercept (ppb)	0.175	± 30
		Correlation coefficient	0.9999	>0.995
AQ-1	SO ₂	Mean deviation (%)	4.1	± 15
		Slope	1.04	>0.85 and <1.15
		Intercept (ppb)	0.14	± 30
		Correlation coefficient	0.9999	>0.995
AQ-1	PM ₁₀	Flow rate deviation (%)		
		Actual	0.5	± 7
		Design	3.3	± 7
AQ-2D	PM ₁₀	Flow rate deviation (%)		
		Actual	0.5	± 7
		Design	1.8	± 7
AQ-2C	PM ₁₀	Flow rate deviation (%)		
		Actual	2.8	± 7
		Design	-1.0	± 7

FOURTH QUARTER SUMMARY

Performance audits of the O₃, SO₂, and PM₁₀ monitors were performed by FDER personnel on February 19, 1992. All monitors were found to be within acceptable QA accuracy limits. Audit results and QA criteria are summarized as follows:

Site No.	Pollutant	Audit Parameter	Audit Value	QA Criteria
AQ-1	O ₃	Mean deviation (%)	5.0	± 15
		Slope	1.03	>0.85 and <1.15
		Intercept (ppb)	2.629	± 30
		Correlation coefficient	0.9999	>0.995
AQ-1	SO ₂	Mean deviation (%)	-1.5	± 15
		Slope	0.98	>0.85 and <1.15
		Intercept (ppb)	1.08	± 30
		Correlation coefficient	0.9999	>0.995
AQ-1	PM ₁₀	Flow rate deviation (%)		
		Actual	0.3	± 7
		Design	2.9	± 7
AQ-2D	PM ₁₀	Flow rate deviation (%)		
		Actual	-0.7	± 7
		Design	3.5	± 7
AQ-2C	PM ₁₀	Flow rate deviation (%)		
		Actual	0.4	± 7
		Design	2.2	± 7

As required by FDER and the PSD monitoring regulations, ECT submitted a request to EPA Region IV dated October 4, 1991, to participate in the EPA National Performance Audit Program. The request was approved by EPA's Atmospheric Research and Exposure Assessment Laboratory (AREAL) on November 14, 1991. The EPA National Performance Audit Program is implemented by an EPA contractor, ManTech Environmental.

The first audit device received from ManTech Environmental addressed PM₁₀ flow rate measurements. The PM₁₀ audits were conducted by ECT using the EPA audit device on January 16, 1992. The audit results are summarized as follows:

PM ₁₀ Monitor	EPA Value (m ³ /min)	Reported Value (m ³ /min)	Difference (%)
AQ-1	1.165	1.119	-4.0
AQ-2D	1.147	1.107	-3.5
AQ-2C	1.138	1.106	-2.8

Differences of ± 10 percent or less are considered acceptable.

Audits for SO₂ and O₃ using EPA audit devices were conducted by ECT on February 13, 1992. The audit results are summarized as follows:

Analyzer	Accuracy (Avg. % Diff.)	Regression Line Slope
O ₃	4.2	1.0345
SO ₂	-7.6	0.9549

Average differences within ± 15 percent and slopes between 0.90 and 1.10 are considered acceptable.

SHUTDOWN AUDIT RESULTS

All instruments reflected accuracy well within the accepted QA limits. All systems were fully functional at the conclusion of the audit on March 31, 1992. On April 1, 1992, ECT personnel shut down all equipment, concluding the Tampa Electric 1991-1992 monitoring year. Audit results for meteorological instrumentation, data acquisition system by channel, and chart recorder by channel are as follows:

Meteorological Instrumentation

<u>Parameter</u>	<u>Audit Value</u>	<u>QA Criteria</u>
Wind Direction		
Maximum deviation	2.52	> -3 and < 3
Windspeed		
Maximum deviation	-0.27	> -0.5 and < 0.5
Temperature		
Maximum deviation	0.2	> -0.5 and < 0.5
Indoor Temperature		
Maximum deviation	0.0	> -0.5 and < 0.5
Precipitation		
Maximum deviation	0.0	> -10 and < 10

Data Acquisition System

<u>Parameter</u>	<u>Average % Deviation</u>		<u>QA Criteria</u>
	<u>VDC</u>	<u>Deg</u>	
Wind direction	0.04	0.01	± 1%
Windspeed	0.17	0.13	± 1%
Temperature	0.38	-0.17	± 0.25°C
<u>Parameter</u>	<u>VDC</u>	<u>ppb</u>	<u>QA Criteria</u>
Ozone	0.46	0.46	± 1%
Sulfur dioxide	-0.13	-0.50	± 1%
<u>Parameter</u>	<u>VDC</u>	<u>mph</u>	<u>QA Criteria</u>
Windspeed	0.17	0.13	± 1%

Chart Recorder

<u>Parameter</u>	<u>Average % Deviation</u>	<u>QA Criteria</u>
Wind direction	-0.3	$\pm 1\%$
Windspeed	0.7	$\pm 1\%$
Ozone	0.3	$\pm 1\%$
Temperature	-0.17	$\pm 1\%$
Sulfur dioxide	-0.3	$\pm 1\%$

APPENDIX C
MONTHLY PARAMETER REPORTS OF HOURLY AVERAGES

HOURLY AVERAGES FOR PRECIPITATION (INCHES)

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY TOTALS FOR PRECIPITATION IN INCHES

		APRIL, 1991																							DAILY		
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL	
DAY																											
1		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	
2		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
3		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
4		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
6		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.95	0.57	0.01	0.31	0.00	0.00	1.84	
7		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.14	0.00	0.00	0.12	0.00	0.29	
8		0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Qal	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	0.01
9		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
10		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
11		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
16		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Miss	Miss	PwrF	PwrF	PwrF	PwrF	PwrF	0.00	
17		PwrF	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	PwrF	0.00	0.00	0.00	0.00	0.00	PwrF	0.00	0.00	0.00	0.00	0.00	0.00	
18		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.57	
19		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	
20		0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.40	0.21	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.63	
21		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
22		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
23		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.03	0.00	0.05	
24		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
25		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.46	0.11	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.66	
26		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
27		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
28		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
29		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
30		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

TOTAL HOURS 720 TOTAL GOOD HOURS 617 DATA CAPTURE 85.7%

MONTHLY TOTAL 4.07 ARITHMETIC MEAN 0.01 STANDARD DEV. 0.06

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qal - Data questionable external influence, Purg - Analyzer in Purge

11.11-35

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY TOTALS FOR PRECIPITATION IN INCHES

		MAY, 1991																								DAILY TOTAL
DAY	HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.12	0.00	0.00	0.00	0.00	0.00	0.13
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.06	0.01	0.00	0.00	0.00	0.16
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.07	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.04	0.00	0.00	0.00	0.00	0.00	0.12
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.08	0.00	0.01	0.02	0.00	0.13
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.00	0.09	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.31
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Down	Down	Down	Down	Down	Down	0.00	0.00	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.20
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.22	0.05	0.01	0.01	0.01	0.02	0.07	0.14	0.01	0.00	0.00	0.00	0.00	0.80
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.00	0.00	0.01	0.12	0.02	0.00	0.00	0.00	0.00	0.18
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.85
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	1.38	0.17	0.14	0.08	0.03	0.00	0.00	0.00	0.00	0.00	0.00	2.04
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.06
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.06	0.01	0.00	0.00	0.00	0.00	0.35
31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TOTAL HOURS 744 TOTAL GOOD HOURS 738 DATA CAPTURE 99.2%

MONTHLY TOTAL 5.55 ARITHMETIC MEAN 0.01 STANDARD DEV. 0.06

KEY FOR MISSING CODES

Badc - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY TOTALS FOR PRECIPITATION IN INCHES

		JUNE, 1991																								DAILY TOTAL
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
DAY																										
1		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5		0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.82	1.13	0.03	0.02
6		0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
7		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.41	0.06	0.00	PwrF	PwrF	0.00	0.00	0.00	0.00	0.00	0.00
18		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.48
19		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.03
20		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.66	0.00	0.03	PwrF	PwrF	PwrF	PwrF	0.02
21		PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75
22		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.10	0.00	0.00	0.00	0.31	0.04	0.00	0.00	0.00	0.00	0.01
23		0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.11	0.00	0.00	0.00	0.01	0.14
24		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
25		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.35	0.04	0.00	0.00	0.00	0.60
26		0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
27		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.14	0.03	0.08	0.03	0.00	0.00	0.52
30		0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.24	0.04	0.09	0.01	0.00	0.01	0.00	0.00	0.61

TOTAL HOURS 720 TOTAL GOOD HOURS 704 DATA CAPTURE 97.8%

MONTHLY TOTAL 5.80 ARITHMETIC MEAN 0.01 STANDARD DEV. 0.07

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qal - Data questionable external influence, Purg - Analyzer in Purge

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY TOTALS FOR PRECIPITATION IN INCHES

		JULY, 1991																							DAILY TOTAL	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22		23
DAY																										
1		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.83	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.87
2		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.34
3		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.34	0.10	0.78	0.78	0.00	0.00	0.00	0.00	2.01
4		0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
5		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16
6		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17
7		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.11	0.41	0.00	1.52
8		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.47
10		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	0.00
11		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	0.00
12		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
13		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
14		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
15		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
16		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
17		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
18		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
19		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	0.00
20		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	0.00
21		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
22		0.00	0.00	0.00	0.00	0.00	0.00	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	0.00
23		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.02	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.11
25		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
26		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.80	0.03	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.84
27		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.10	0.00	0.00	0.00	0.00	0.00	0.24
29		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01
30		0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28
31		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.06	0.02	0.00	0.00	0.00	0.22	0.00	0.00	0.00	0.01	0.00	0.67

TOTAL HOURS 744 TOTAL GOOD HOURS 465 DATA CAPTURE 62.5%

MONTHLY TOTAL 7.73 ARITHMETIC MEAN 0.02 STANDARD DEV. 0.10

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

10-29-91

11.11-38

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY TOTALS FOR PRECIPITATION IN INCHES

		AUGUST, 1991																								DAILY TOTAL
DAY	HOUR (EST)	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65	0.20	0.01	0.01	0.05	0.02	0.00	0.00	0.00	0.00	0.94
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.01	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.35	0.01	0.37
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.05
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.56	0.32	0.00	0.00	0.00	0.00	0.01	1.89
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
28	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	1.20
31	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01

TOTAL HOURS 744 TOTAL GOOD HOURS 744 DATA CAPTURE 100.0X

MONTHLY TOTAL 5.31 ARITHMETIC MEAN 0.01 STANDARD DEV. 0.08

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

10-21-91

11.11-39

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY TOTALS FOR PRECIPITATION IN INCHES

		SEPTEMBER, 1991																								DAILY
		HOUR (EST)																								TOTAL
DAY		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
4		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.14	0.00	0.43
8		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.01	0.70	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.76
9		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25		0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.14	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00
26		0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.34
27		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.01	0.00
30		0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01

TOTAL HOURS 720 TOTAL GOOD HOURS 720 DATA CAPTURE 100.0%

MONTHLY TOTAL 2.55 ARITHMETIC MEAN 0.00 STANDARD DEV. 0.03

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

10-21-91

11.11-40

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY TOTALS FOR PRECIPITATION IN INCHES

		OCTOBER, 1991																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
DAY																										
1		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
2		0.00	0.01	0.02	0.04	0.05	0.06	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22
3		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01
5		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.01	0.02	0.00	0.00	0.01	0.01	0.00	0.00	0.09
6		0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.03	0.10	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17
7		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
8		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
11		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	Bad<	0.00	0.00	0.00	0.00	0.00	0.02
24		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.08
26		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	PwrF	PwrF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
31		PwrF	PwrF	PwrF	PwrF	PwrF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL HOURS		744					TOTAL GOOD HOURS					736					DATA CAPTURE					98.9%				

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

02/17/91

11.11.41

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY TOTALS FOR PRECIPITATION IN INCHES

		NOVEMBER, 1991																							DAILY TOTAL
DAY	HOUR (EST)	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TOTAL HOURS 720 TOTAL GOOD HOURS 720 DATA CAPTURE 100.0%

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

02/17/92

11.11-42

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY TOTALS FOR PRECIPITATION IN INCHES

		DECEMBER, 1991																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
DAY																										
1		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.24
3		0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.01	0.00	0.19
4		0.00	0.03	0.07	0.01	0.04	0.06	0.05	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29
5		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
25		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
28		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL HOURS		744					TOTAL GOOD HOURS					744					DATA CAPTURE 100.0%									

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

02/17/92

11.11-43

TEC AQ - 1
Polk County, Florida - Site 001

HOURLY TOTALS FOR PRECIPITATION IN INCHES

		JANUARY 1992																							DAILY TOTAL	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22		23
DAY																										
1		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.06	
2		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
3		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
4		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
6		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
7		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
8		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
9		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
10		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
11		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
15		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
16		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
17		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
18		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
19		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
20		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
21		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
22		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
23		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
24		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
25		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
26		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
27		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
28		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
29		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
30		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
31		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

TOTAL HOURS 744 TOTAL GOOD HOURS 456 DATA CAPTURE 61.3%

MAX. 1HR AVG 0.03 01/01/92 23:00:00 2ND MAX. 1 HR AVG 0.03 01/01/92 22:00:00

MIN. 1HR AVG 0.00 01/01/92 00:00:00 ARITHMETIC MEAN 0.00 STANDARD DEV. 0.00

KEY FOR MISSING CODES

Bad< - To few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration
BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data
Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

11.11.44

TEC AQ - 1
Polk County, Florida - Site 001

HOURLY TOTALS FOR PRECIPITATION IN INCHES

		FEBRUARY 1992																								DAILY TOTAL
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
DAY																										
1		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
6		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
7		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
8		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
9		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
10		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
18		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
20		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
21		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
23		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
24		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
25		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Pwrf	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	Pwrf	Pwrf	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
27		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14
28		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TOTAL HOURS 696 TOTAL GOOD HOURS 429 DATA CAPTURE 61.6%

MAX. 1HR AVG 0.14 02/27/92 16:00:00 2ND MAX. 1 HR AVG 0.02 02/26/92 09:00:00

MIN. 1HR AVG 0.00 02/01/92 00:00:00 ARITHMETIC MEAN 0.00 STANDARD DEV. 0.01

KEY FOR MISSING CODES

Bad< - To few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, Pwrf - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

11.11-45

TEC AQ - 1
Polk County, Florida - Site 001

HOURLY TOTALS FOR PRECIPITATION IN INCHES

		MARCH 1992																							DAILY TOTAL		
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
DAY																											
1		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.02	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
2		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
3		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
4		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.01	0.05	0.01	0.00	0.01	0.03	0.01	0.00	0.15	
5		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	
6		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
7		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
8		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.02	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
9		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	
10		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	
11		0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	
12		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13		0.02	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.10	
14		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	
15		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
16		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
17		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	
18		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	
19		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
20		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
21		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
22		0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.04	0.05	0.03	0.06	0.08	0.01	0.01	0.00	0.12	0.46	
23		0.07	0.18	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28	
24		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
25		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
26		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
27		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
28		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
29		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
30		0.00	0.00	0.00	0.00	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.07	0.13	0.00	0.00	0.00	0.00	0.27	
31		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	Cal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	

TOTAL HOURS 744 TOTAL GOOD HOURS 743 DATA CAPTURE 99.9%

MAX. 1HR AVG 0.18 03/23/92 01:00:00 2ND MAX. 1 HR AVG 0.13 03/30/92 19:00:00

MIN. 1HR AVG 0.00 03/01/92 00:00:00 ARITHMETIC MEAN 0.00 STANDARD DEV. 0.01

KEY FOR MISSING CODES

Bad< - To few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

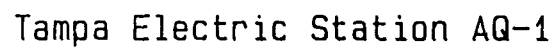
BadS - Bad Analyzer Status, Pwrf - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

11.11-46

HOURLY AVERAGES FOR WIND DIRECTION (DEGREES TRUE)

11.11-48



Averaging Time: 3600 sec

Average Frequency Distribution of Wind Direction and Windspeed
for the Polk Power Station Site (April 1991 through March 1992)

Direction	Frequency Distribution Speed (mph)				
	3.0 - 8.3	8.3 - 13.5	13.5 - 18.8	18.8 - 24.0	>24.0
N	2.8	0.0	0.0	0.0	0.0
NNE	5.9	0.2	0.0	0.0	0.0
NE	7.0	0.6	0.0	0.0	0.0
ENE	7.2	1.4	0.1	0.0	0.0
E	6.9	1.8	0.2	0.0	0.0
ESE	5.8	1.1	0.0	0.0	0.0
SE	4.0	0.4	0.0	0.0	0.0
SSE	2.5	0.3	0.0	0.0	0.0
S	2.4	0.4	0.0	0.0	0.0
SSW	2.0	0.4	0.0	0.0	0.0
SW	1.9	0.4	0.1	0.0	0.0
WSW	2.3	0.6	0.0	0.0	0.0
W	2.9	1.3	0.2	0.0	0.0
WNW	3.9	1.1	0.0	0.0	0.0
NW	1.8	0.0	0.0	0.0	0.0
NNW	1.2	0.0	0.0	0.0	0.0
Total	60.5	10.0	0.6	0.0	0.0

Note: Calms = 30.9 percent.

Source: ECT, 1992.

APRIL, 1991

DAY	HOUR (EST)																							DAILY AVG		
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22		23	
1	1	10	352	339	357	355	12	13	26	34	41	40	37	44	44	44	47	58	57	70	71	65	58	54	93	
2	49	35	36	29	32	28	23	29	40	49	62	67	71	70	76	76	80	80	81	76	70	64	64	54	56	
3	44	26	20	14	18	27	37	48	67	88	84	88	86	81	79	88	77	75	73	82	71	74	78	86	63	
4	36	43	73	65	75	61	48	58	73	92	95	84	80	78	79	80	92	94	78	72	78	87	86	83	75	
5	66	51	55	68	72	67	72	80	87	111	118	124	105	121	133	119	110	108	109	119	123	96	111	81	96	
6	94	99	72	67	84	75	60	101	127	110	114	114	110	114	98	73	70	47	130	146	87	154	52	78	95	
7	72	63	80	78	91	100	108	120	128	128	147	142	144	141	119	166	185	251	213	195	20	6	41	22	115	
8	59	80	90	84	79	78	80	80	83	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Back	
9	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	
10	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	
11	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	79	79	108	85	95	97	107	105	82	Back
12	100	112	79	96	78	70	74	91	102	93	107	111	107	95	91	78	81	78	80	84	90	91	90	93	91	
13	90	86	87	87	97	96	90	96	110	115	124	125	127	129	129	137	138	130	128	96	97	93	97	104	109	
14	112	104	95	94	85	79	87	100	116	125	128	118	124	111	104	110	107	119	118	100	115	111	107	117	108	
15	114	97	105	113	114	107	73	108	141	155	162	154	162	186	148	162	151	168	204	284	284	360	22	268	161	
16	216	160	156	148	166	138	141	145	168	168	179	170	166	141	139	220	291	294	4	PwrF	PwrF	PwrF	PwrF	PwrF	169	
17	PwrF	Miss	199	177	161	155	150	112	112	139	155	177	188	PwrF	42	167	223	278	PwrF	320	320	48	115	137	169	
18	127	192	357	177	179	195	204	200	213	229	244	254	270	269	265	275	263	260	268	268	246	258	307	255	241	
19	273	243	257	267	264	260	279	137	139	340	218	234	294	28	281	266	262	256	251	244	246	247	242	241	240	
20	267	267	288	248	186	55	17	11	25	17	27	283	338	359	330	331	299	280	273	279	288	287	300	267	222	
21	278	274	264	272	269	269	284	290	289	280	281	279	276	278	278	275	283	280	284	276	282	283	277	249	277	
22	282	290	293	301	294	308	261	124	76	75	127	103	90	162	195	205	211	233	238	265	267	275	212	172	211	
23	162	166	155	157	162	152	150	169	186	183	197	213	219	220	225	229	236	229	211	214	35	107	150	265	183	
24	237	187	201	194	200	200	195	204	224	236	249	255	256	265	274	264	267	268	266	275	277	273	284	280	243	
25	272	308	24	360	62	72	80	85	102	93	89	80	62	43	262	268	335	21	36	96	127	102	135	137	136	
26	190	193	8	40	131	54	147	112	88	90	114	122	137	117	118	64	146	349	12	36	359	240	163	151	133	
27	127	115	131	104	100	115	116	115	121	141	179	172	181	170	187	185	219	226	294	292	286	249	205	213	177	
28	202	178	127	170	138	124	132	155	159	179	171	172	169	169	172	190	198	219	277	272	271	82	19	75	167	
29	119	137	144	145	152	147	149	156	146	152	155	162	156	141	138	138	144	138	138	115	292	332	366	135	166	
30	137	148	151	162	125	122	127	124	141	158	156	150	146	140	149	145	163	211	280	245	258	320	325	41	172	

TOTAL HOURS	720	TOTAL GOOD HOURS	633	DATA CAPTURE	87.9%
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ARITHMETIC MEAN 150 STANDARD DEV. 85

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, Pwrf - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

HOURLY AVERAGES FOR WIND DIRECTION IN DEGREES-TRUE

DAILY
AVG

		HOUR (EST)																							DAILY	
		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1		176	22	338	25	75	137	144	162	165	165	132	110	108	115	134	152	182	211	277	329	342	341	33	17	162
2		13	26	72	71	16	31	62	49	65	80	47	42	47	49	43	44	49	36	40	26	58	91	96	100	52
3		95	101	97	83	86	102	96	102	93	101	110	103	118	122	112	134	103	101	97	93	89	95	100	107	102
4		114	115	106	103	112	110	98	114	136	144	121	124	122	118	98	166	135	152	58	138	118	114	213	135	124
5		131	141	145	147	137	145	148	148	159	158	175	145	122	148	154	155	146	166	136	119	182	179	171	142	150
6		122	141	156	191	134	116	138	158	158	171	183	169	157	160	155	311	278	312	17	45	74	97	121	74	152
7		7	24	76	79	103	79	98	106	122	128	113	121	121	103	92	76	91	110	107	102	99	102	100	86	94
8		92	95	94	101	97	86	93	100	114	124	118	115	113	112	110	112	118	111	101	93	97	99	102	105	104
9		102	96	94	91	90	94	94	104	120	128	126	129	119	110	128	132	132	87	76	87	100	101	113	103	107
10		100	112	124	131	112	104	107	104	122	132	124	117	119	114	108	112	112	113	111	113	95	85	92	102	111
11		94	95	88	100	85	67	85	94	104	107	94	88	74	83	84	76	76	81	87	87	92	90	98	89	88
12		86	86	84	81	79	78	68	90	104	104	122	128	129	138	117	117	127	107	107	131	128	121	104	98	106
13		84	97	114	149	136	119	139	172	186	216	256	248	223	202	197	265	306	23	76	101	129	154	165	176	164
14		188	205	198	193	182	162	182	198	217	246	226	242	235	237	257	236	128	250	256	259	225	242	253	182	217
15		118	165	219	107	73	166	151	152	164	187	205	226	245	255	253	253	263	279	276	284	282	262	255	304	214
16		195	233	231	206	234	4	46	155	185	165	122	253	125	108	251	213	117	158	144	48	18	83	70	255	151
17		71	31	59	104	104	95	91	110	127	138	148	129	105	117	112	131	122	85	213	4	301	293	311	349	140
18		43	334	45	353	73	64	64	102	122	121	128	96	121	107	95	76	104	105	110	93	101	125	105	102	116
19		94	96	100	96	92	90	95	103	110	124	121	118	121	138	159	88	80	97	113	121	121	87	86	91	106
20		93	89	94	88	89	91	93	97	115	114	108	121	153	134	127	111	108	100	91	79	79	85	81	88	101
21		89	86	84	87	91	90	92	97	96	98	99	Down	Down	Down	95	91	87	87	81	82	80	81	84	87	89
22		88	91	92	91	86	83	84	85	92	98	111	108	91	89	94	96	95	86	89	89	89	90	87	84	91
23		88	88	88	82	94	121	122	114	125	123	121	101	82	77	78	87	85	92	98	84	94	83	87	92	96
24		98	104	104	113	115	106	107	94	111	137	121	127	140	137	88	49	3	312	359	10	82	93	102	102	117
25		103	97	89	84	79	77	83	95	99	101	104	97	104	103	106	98	94	97	94	83	136	115	84	81	96
26		80	99	125	127	142	133	156	157	156	169	154	115	135	155	181	162	130	95	89	123	119	104	108	96	130
27		91	101	107	117	119	113	121	128	130	135	133	144	154	168	169	244	322	302	49	30	47	51	70	91	131
28		100	111	112	109	107	101	107	122	130	126	131	126	121	119	122	105	124	109	112	101	94	100	98	105	112
29		118	116	157	185	27	174	150	125	115	109	130	66	57	60	51	82	63	76	67	41	305	1	4	20	96
30		46	46	21	98	68	150	162	174	200	97	338	334	356	326	324	288	22	55	142	322	201	18	65	0	160
31		249	286	313	322	80	315	263	315	26	98	84	313	314	312	338	288	312	342	16	0	7	150	158	342	218

ARITHMETIC MEAN 126 STANDARD DEV. 67

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration
 BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data
 Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR WIND DIRECTION IN DEGREES-TRUE

		JUNE, 1991																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1		301	309	331	305	292	315	301	289	303	308	274	246	255	289	33	98	142	199	240	228	250	266	277	274	255
2		279	251	239	251	242	265	261	229	237	258	258	259	274	288	285	329	289	275	270	261	258	252	250	244	263
3		243	253	243	248	250	253	255	264	272	280	279	277	274	266	276	274	271	272	261	264	257	243	243	248	261
4		257	255	243	236	215	249	225	236	256	244	245	259	277	268	270	279	272	281	282	265	257	252	263	265	256
5		234	259	240	303	204	196	223	227	245	270	270	266	282	289	288	282	276	288	15	102	94	43	169	158	218
6		149	196	226	300	17	36	26	27	26	29	36	49	54	49	49	59	68	78	69	34	21	31	28	29	70
7		30	25	17	18	8	359	15	28	43	45	60	35	21	25	356	0	14	38	48	56	58	55	58	43	60
8		58	56	52	41	35	31	36	50	61	69	66	69	74	72	67	62	66	77	78	73	69	69	61	65	61
9		70	60	58	55	57	54	63	73	73	73	80	74	72	60	64	76	80	77	77	75	72	66	68	64	68
10		59	57	61	54	46	40	39	51	72	87	81	75	73	75	72	74	72	68	86	76	75	69	60	51	65
11		45	25	30	36	19	32	51	66	82	89	86	86	80	81	74	72	71	66	77	74	83	84	82	83	66
12		76	70	61	59	59	60	78	85	88	110	96	55	52	49	37	44	21	15	29	21	79	86	83	80	62
13		71	81	87	103	121	121	123	128	121	86	49	58	27	29	33	40	28	32	11	8	53	99	111	103	72
14		118	137	145	133	31	23	11	100	119	124	118	106	140	139	114	169	168	262	296	315	295	306	319	333	168
15		65	159	147	156	160	173	171	179	184	188	175	128	129	273	313	325	304	336	347	310	343	64	110	227	207
16		339	74	218	306	326	163	187	232	318	295	270	307	281	295	296	284	293	260	163	183	151	175	178	209	242
17		215	197	152	165	220	218	161	232	288	247	305	254	180	2	171	195	137	PwrF	PwrF	356	300	155	205	217	208
18		209	211	211	188	223	193	169	182	220	214	284	344	320	200	259	258	259	308	126	158	171	182	233	200	222
19		187	174	180	161	178	197	151	184	212	221	240	225	281	305	306	270	288	285	17	85	111	169	224	176	201
20		207	168	209	215	46	158	147	169	125	122	127	117	94	134	157	133	328	310	175	185	PwrF	PwrF	PwrF	PwrF	166
21	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	79	118	113	165	190	197	245	333	32	112	189	192	242	353	Bad<
22		177	1	353	9	48	63	112	116	144	190	219	188	254	320	295	287	287	301	274	345	39	149	149	251	190
23		309	244	233	168	243	240	216	198	208	264	215	271	298	288	306	279	252	241	71	133	180	179	209	262	230
24		326	9	336	286	304	224	22	83	14	11	24	57	65	32	279	157	185	134	231	140	4	41	21	49	126
25		24	18	131	352	12	49	67	70	69	88	94	95	135	108	66	355	325	35	64	311	152	308	267	308	146
26		12	336	3	351	70	307	330	47	75	42	4	7	108	191	205	263	284	291	291	72	64	81	45	95	149
27		132	122	111	109	106	112	108	117	97	117	109	359	22	231	231	269	260	277	254	189	359	343	293	315	193
28		6	56	18	355	339	14	42	47	53	53	63	53	26	320	326	350	323	312	335	285	3	92	77	29	149
29		55	94	120	332	144	19	288	109	150	101	65	25	41	34	103	313	260	17	31	126	33	131	238	158	124
30		145	94	298	291	343	11	46	59	89	113	60	149	136	17	7	36	151	218	267	121	269	284	110	162	145

TOTAL HOURS 720 TOTAL GOOD HOURS 704 DATA CAPTURE 97.8%

ARITHMETIC MEAN 160 STANDARD DEV. 104

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR WIND DIRECTION IN DEGREES TRUE

		JULY, 1991																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1	142	127	135	161	171	197	174	180	134	241	234	234	204	196	239	268	280	271	243	209	180	169	175	200	199	
2	206	207	205	200	213	243	298	229	234	254	316	268	266	221	237	246	253	250	254	235	225	216	202	129	234	
3	167	175	152	136	152	162	158	185	194	223	235	228	215	207	200	174	207	58	64	189	139	173	149	147	170	
4	170	167	130	142	169	199	209	215	231	225	248	255	236	239	235	327	308	319	322	247	97	145	157	190	216	
5	172	137	150	153	167	157	186	177	179	175	166	223	245	191	252	301	305	312	37	68	28	134	131	137	174	
6	148	152	165	172	151	160	175	234	250	245	187	214	197	159	156	223	252	87	357	16	355	122	113	150	185	
7	202	140	349	328	312	185	195	69	76	90	75	105	106	107	343	281	313	315	307	282	220	120	2	32	190	
8	113	68	315	327	266	3	271	194	30	25	61	100	358	15	262	276	270	294	258	252	255	277	346	220	202	
9	246	323	303	236	262	207	198	176	160	227	238	249	353	311	308	306	275	265	251	238	223	240	250	200	252	
10	204	154	210	198	180	195	212	228	236	255	256	256	140	145	200	157	178	178	189	211	189	211	221	232	202	
11	200	217	234	298	216	241	300	242	250	265	254	259	318	PwrF	232	232	265	297	319	297	211	157	238	225	251	
12	225	297	2	167	243	67	297	200	216	259	297	319	254	254	232	2	329	324	297	265	243	216	221	216	227	
13	238	211	211	238	248	211	221	270	297	221	189	340	324	297	275	243	Miss	254	265	297	319	259	167	232	253	
14	211	221	167	167	140	162	189	221	67	131	157	173	211	211	270	297	275	130	151	211	184	184	297	67	187	
15	110	243	275	67	99	121	121	131	167	173	162	178	232	157	88	72	88	110	99	121	110	126	151	162	140	
16	124	146	146	135	135	135	146	151	157	178	194	189	205	243	351	34	115	146	162	130	124	119	119	140	155	
17	184	124	108	119	119	108	119	140	157	167	173	178	167	173	189	135	265	275	162	157	45	50	135	178	151	
18	94	286	130	113	119	140	135	135	146	157	135	135	124	97	119	115	110	81	56	297	184	200	232	119	144	
19	16	40	72	87	74	77	67	91	120	122	123	94	297	286	351	135	157	146	113	119	92	270	137	131	134	
20	114	77	76	72	67	61	43	61	77	99	297	77	67	88	121	243	40	326	275	340	45	67	67	40	118	
21	34	56	61	67	56	34	50	67	45	72	67	50	83	72	50	61	270	167	167	243	45	77	99	121	88	
22	129	138	125	132	124	356	13	83	77	254	50	61	61	67	61	45	88	45	162	194	211	205	275	297	136	
23	329	99	319	167	178	146	243	189	113	113	319	221	243	178	275	288	296	4	23	216	11	338	326	199		
24	346	1	271	299	288	135	221	224	223	224	281	151	316	267	267	279	141	3	293	104	140	121	173	222	208	
25	180	185	183	188	207	231	159	161	195	185	164	200	231	249	187	199	182	119	63	20	328	61	118	167	173	
26	209	235	199	189	172	140	126	163	178	190	232	254	238	347	104	89	108	90	48	77	113	147	146	168	165	
27	159	200	204	170	204	200	168	204	226	279	36	3	322	113	337	297	263	204	168	161	195	145	150	155	190	
28	195	134	154	217	187	146	164	181	176	178	167	198	207	178	200	250	263	249	249	308	10	133	120	130	183	
29	162	184	142	135	160	182	144	146	161	169	161	170	174	223	238	220	333	234	270	263	116	130	108	123	181	
30	143	177	140	134	141	133	141	152	164	169	176	181	213	204	240	227	200	192	139	131	137	133	127	137	164	
31	142	142	142	177	157	148	125	148	155	160	165	180	232	193	189	182	189	205	229	190	174	175	161	162	172	

TOTAL HOURS 744 TOTAL GOOD HOURS 742 DATA CAPTURE 99.7%

ARITHMETIC MEAN 182 STANDARD DEV. 78

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

10-29-91

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR WIND DIRECTION IN DEGREES TRUE

		AUGUST, 1991																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1	165	151	151	162	170	173	172	174	181	193	206	202	356	316	188	213	242	236	170	145	125	145	125	134	187	
2	124	140	129	116	131	128	141	161	177	175	196	205	221	235	294	295	36	126	9	174	166	178	164	148	161	
3	155	144	149	161	128	78	28	74	121	101	103	359	34	296	49	288	305	296	289	301	299	336	83	110	179	
4	213	160	197	223	285	5	249	264	347	1	299	285	297	289	284	285	295	297	289	279	275	281	274	285	248	
5	281	299	277	171	206	349	329	194	25	281	332	188	116	14	27	292	207	280	284	161	160	196	251	239	215	
6	177	160	189	113	224	149	121	116	114	117	137	120	119	135	162	179	106	31	353	302	281	342	340	21	171	
7	22	22	30	47	65	77	81	89	107	117	105	106	114	83	128	82	296	134	119	108	89	98	81	101	96	
8	107	106	113	121	54	75	94	128	123	137	101	89	136	183	9	169	95	261	308	305	32	105	174	217	135	
9	183	205	49	144	211	242	271	310	282	311	312	302	324	50	200	89	83	70	87	97	146	190	257	229	194	
10	241	200	193	127	126	141	149	167	204	229	236	237	214	231	249	252	271	263	268	273	243	236	234	229	217	
11	231	209	228	233	177	215	206	204	246	289	258	240	177	220	233	231	253	274	276	281	271	273	242	264	239	
12	167	224	124	168	152	185	167	195	208	207	246	246	239	266	294	284	286	282	259	131	112	128	52	154	199	
13	194	218	220	236	170	160	173	191	194	181	191	201	217	182	161	210	291	274	308	21	37	149	156	132	186	
14	112	181	124	163	175	152	158	166	169	168	170	190	189	182	279	291	278	290	275	288	281	23	155	123	191	
15	77	151	181	177	158	154	164	192	202	217	253	254	281	199	231	291	285	296	37	73	82	126	141	194	184	
16	218	187	335	300	5	37	50	330	344	13	356	357	24	12	13	22	322	284	16	42	15	33	72	315	154	
17	291	325	328	322	330	343	20	359	0	322	330	320	330	305	326	308	315	303	281	284	284	276	284	281	286	
18	282	276	278	274	267	254	274	272	282	295	271	299	298	319	258	215	204	195	216	206	230	249	234	202	256	
19	194	190	187	312	215	191	198	185	191	227	284	265	227	262	265	204	131	75	121	112	142	157	161	164	194	
20	159	193	189	188	189	229	198	236	216	264	252	291	300	299	281	267	262	310	101	206	209	170	136	123	220	
21	119	114	159	160	154	177	238	207	242	233	233	254	253	232	277	271	276	277	267	248	257	308	77	108	214	
22	139	156	137	214	246	37	22	94	88	92	101	89	82	122	271	25	123	145	88	104	104	93	76	97	114	
23	115	112	102	97	97	102	96	114	132	127	119	119	109	116	168	49	88	94	104	114	98	105	115	96	108	
24	83	88	112	129	148	130	114	133	151	147	162	160	233	175	354	346	66	328	11	37	96	126	132	126	149	
25	130	136	139	131	128	99	65	101	124	145	165	210	258	250	262	270	289	299	107	93	93	110	140	139	162	
26	177	102	338	306	5	45	339	24	58	101	106	102	88	79	83	57	44	60	79	101	114	95	90	97	112	
27	100	112	77	89	58	49	52	63	70	75	90	96	82	76	80	99	12	36	22	52	123	85	84	81	73	
28	50	343	38	62	55	33	72	74	77	82	78	76	100	94	57	79	86	94	35	7	42	73	80	79	78	
29	84	64	35	67	72	64	62	77	75	94	98	88	72	90	80	88	73	175	69	75	78	65	66	71	78	
30	76	76	73	61	59	65	75	74	86	97	102	96	82	68	189	212	178	5	24	46	257	296	333	87	113	
31	100	126	51	38	48	116	7	67	91	83	99	109	96	130	204	21	64	119	133	191	251	91	96	110	102	

TOTAL HOURS 744 TOTAL GOOD HOURS 744 DATA CAPTURE 100.0%

ARITHMETIC MEAN 168 STANDARD DEV. 90

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

10-21-91

11.11-55

11.11-55

11.11-55

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11.11-55

11.11-55

11.11-55

11.11-55

11.11-55

11.11-55

11.11-55

HOURLY AVERAGES FOR WIND DIRECTION IN DEGREES TRUE

		OCTOBER, 1991																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1		39	37	11	22	33	28	17	27	41	67	64	68	87	64	52	70	57	69	62	54	29	43	51	42	47
2		54	70	71	4	87	151	142	145	173	200	219	231	225	223	249	249	242	228	233	224	203	180	209	204	176
3		186	182	197	171	171	177	167	218	236	238	247	251	266	271	275	266	138	143	144	158	177	176	170	202	
4		171	307	42	94	57	35	55	94	112	116	146	176	139	146	140	279	342	356	248	360	68	84	77	92	156
5		97	109	98	103	118	108	106	116	160	175	166	161	167	186	224	329	258	353	104	36	34	38	69	84	142
6		91	106	75	143	171	215	205	160	166	206	212	223	253	266	242	22	3	15	12	7	20	11	16	6	119
7		11	14	14	12	11	13	9	11	7	15	30	50	41	39	39	43	43	41	38	30	27	29	26	27	26
8		28	28	28	23	30	29	28	30	43	56	67	60	55	65	52	49	51	53	56	53	49	36	37	34	43
9		37	39	39	38	37	27	32	28	38	44	57	63	62	66	64	62	55	58	56	43	51	45	43	48	47
10		41	2	12	5	15	5	2	11	22	18	18	32	49	7	7	7	15	360	359	21	18	Down	Down	5	47
11		25	14	305	352	12	37	5	347	12	18	21	21	42	49	48	249	273	284	284	301	292	308	311	327	164
12		333	38	339	315	214	213	188	156	172	175	251	257	267	284	265	271	271	274	274	238	278	265	269	231	243
13		309	288	255	277	264	292	296	256	282	315	348	18	38	45	56	56	43	45	297	313	339	336	90	101	207
14		104	112	123	142	101	96	63	71	88	114	107	115	110	118	121	130	122	145	122	120	116	102	104	76	109
15		69	68	74	68	66	54	32	46	66	55	104	124	133	83	142	335	7	21	61	80	88	106	288	270	102
16		281	279	281	222	301	338	352	351	352	1	347	331	320	325	303	305	292	290	297	292	298	322	315	336	297
17		7	2	3	14	25	58	24	28	44	50	71	75	77	73	82	122	113	43	5	31	35	66	76	72	50
18		62	52	34	37	34	38	37	54	58	68	69	61	60	68	62	72	67	67	67	70	66	57	36	31	55
19		34	30	22	17	16	13	14	22	27	43	50	47	49	34	33										

ARITHMETIC MEAN 98 STANDARD DEV. 90

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration
BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data
Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg

02/17/92

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR WIND DIRECTION IN DEGREES TRUE

		NOVEMBER, 1991																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1	113	122	110	115	130	113	135	151	170	174	167	186	198	199	221	215	204	208	201	246	258	228	242	173	178	
2	173	210	215	162	151	147	117	145	181	176	189	208	225	232	235	296	284	281	327	316	335	339	327	344	234	
3	341	338	343	11	7	3	13	21	43	62	99	67	12	Down	Down	3	11	19	12	14	21	17	14	11	67	
4	10	13	16	24	12	12	7	15	18	25	35	30	31	23	23	17	17	8	17	6	8	17	22	10	17	
5	2	4	9	20	11	5	5	3	13	17	25	23	32	43	37	30	34	14	12	15	8	6	12	9	16	
6	9	11	0	10	5	4	6	5	4	PwrF	29	52	47	13	34	24	23	10	6	11	4	17	17	24	16	
7	13	23	22	20	29	28	31	27	24	27	13	8	26	33	51	38	15	10	15	14	19	43	64	36	26	
8	7	4	10	29	49	3	13	340	356	2	11	351	340	Back	8	14	14	8	6	343	323	360	339	332	142	
9	336	346	350	340	342	359	336	349	343	346	355	2	343	343	329	319	292	324	1	19	13	343	351	15	271	
10	19	335	301	300	295	353	12	286	344	328	317	336	328	323	292	285	282	278	270	295	279	263	209	210	273	
11	221	177	170	240	281	341	349	345	279	346	320	298	303	298	288	292	284	280	286	301	292	297	346	12	277	
12	18	353	332	352	5	3	349	2	18	14	55	64	7	353	319	336	305	289	291	302	303	315	333	335	210	
13	350	7	4	6	1	3	8	12	22	33	44	44	38	42	39	54	61	38	33	44	42	36	38	30	43	
14	30	30	35	43	38	43	40	44	47	59	85	105	106	107	100	87	81	19	35	57	72	70	67	55	61	
15	43	34	33	34	35	43	44	47	56	90	114	105	95	75	68	70	68	58	59	65	71	55	39	24	59	
16	42	40	38	37	48	50	43	53	49	72	70	68	67	53	46	35	49	43	52	50	52	62	63	60	52	
17	52	61	60	61	64	52	48	66	64	65	74	81	85	75	77	75	79	76	65	65	72	72	70	70	68	
18	66	67	63	43	40	44	61	70	89	97	104	99	105	104	100	98	86	75	84	87	87	89	88	78	80	
19	66	68	70	65	66	77	88	89	81	100	105	108	99	98	102	103	96	89	91	90	88	85	86	85	87	
20	94	79	88	92	97	94	94	97	107	106	138	137	133	126	109	108	87	78	70	103	108	123	130	131	105	
21	121	97	98	74	65	83	90	94	106	116	129	133	121	137	124	137	135	136	111	161	168	109	104	124	116	
22	139	134	129	130	123	144	163	141	147	158	172	169	175	182	195	202	196	204	187	179	197	171	210	219	169	
23	168	195	227	246	268	288	287	298	322	356	12	338	329	347	284	277	282	284	286	291	293	295	299	290	273	
24	286	284	280	277	277	271	303	292	329	343	353	346	351	346	305	318	309	298	299	305	318	331	353	1	299	
25	9	13	13	12	5	9	7	9	13	17	20	24	38	38	31	19	20	17	21	25	18	28	27	5	18	
26	10	18	5	5	14	20	19	20	22	24	25	35	44	39	40	44	40	31	35	40	29	29	21	18	26	
27	20	20	24	22	18	17	13	16	20	26	41	49	49	59	63	51	62	65	60	40	33	25	22	20	35	
28	18	18	20	23	20	21	23	22	37	49	64	68	74	82	81	73	80	70	68	60	58	43	45	61	49	
29	64	56	55	44	38	41	43	48	56	80	102	97	90	88	90	81	88	89	91	83	78	83	85	82	73	
30	86	100	91	91	91	93	91	93	100	99	108	119	122	121	117	105	100	97	103	90	84	96	98	99	100	

TOTAL HOURS 720 TOTAL GOOD HOURS 716 DATA CAPTURE 99.4%

ARITHMETIC MEAN 115 STANDARD DEV. 111

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

02/17/92

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR WIND DIRECTION IN DEGREES TRUE

		DECEMBER, 1991																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1	84	78	93	105	96	96	98	102	105	121	127	126	125	119	111	107	100	107	101	107	103	111	113	113	106	
2	115	101	103	103	100	110	111	118	137	140	133	140	153	156	156	164	137	136	111	152	226	87	132	139	132	
3	133	141	157	168	180	183	176	180	171	178	189	208	199	208	212	224	225	219	227	236	218	271	305	308	205	
4	318	313	322	314	319	360	357	5	5	10	12	4	7	9	358	354	360	12	353	330	321	355	12	10	201	
5	13	14	9	8	7	9	9	5	11	16	45	44	56	68	77	68	75	37	13	20	23	35	31	34	30	
6	34	25	26	23	17	34	33	48	20	45	47	71	69	61	63	65	88	31	25	55	74	65	50	55	47	
7	63	62	60	76	81	43	27	34	43	72	88	108	102	114	68	51	55	39	48	34	50	68	92	96	65	
8	95	86	96	69	9	27	45	46	71	84	114	116	111	121	108	78	70	37	32	68	68	73	82	86	75	
9	45	32	13	62	36	45	25	43	69	100	107	106	114	99	95	96	99	303	333	286	303	312	299	171	133	
10	130	14	300	260	17	258	318	281	231	249	246	279	299	288	286	288	288	285	285	295	359	18	50	29	223	
11	25	50	23	24	18	16	17	25	43	43	52	71	124	122	102	50	51	18	25	29	34	33	41	63	46	
12	71	47	50	64	67	70	59	55	48	64	81	90	123	120	107	98	88	78	77	86	89	95	96	85	79	
13	75	74	54	47	39	45	48	62	67	88	104	129	135	122	123	131	109	24	50	83	86	150	186	128	90	
14	144	130	118	121	168	167	164	85	157	181	189	216	240	258	281	289	286	286	281	272	290	333	11	6	195	
15	14	26	27	24	14	17	12	11	21	27	34	31	33	32	45	29	19	23	24	19	18	19	14	6	22	
16	6	8	7	12	15	22	24	26	24	25	20	21	27	20	28	24	22	25	32	36	30	40	45	27	23	
17	16	14	9	2	22	17	5	5	18	36	44	59	64	86	80	87	87	51	22	37	40	46	335	337	63	
18	353	3	360	12	17	32	37	49	55	41	43	53	78	102	117	142	24	14	339	342	12	13	13	10	94	
19	13	20	9	20	19	19	22	25	31	41	43	53	64	65	60	61	61	61	60	57	55	61	58	43		
20	58	62	62	62	62	59	50	39	45	64	75	90	81	90	88	91	89	89	81	60	56	75	101	38	69	
21	31	35	55	68	46	15	19	35	44	53	101	112	117	105	86	117	71	16	50	92	41	59	84	81	64	
22	75	51	38	53	53	36	33	45	73	114	165	120	107	128	232	2	86	347	319	315	293	313	319	285	150	
23	349	340	301	276	326	30	148	206	201	141	185	236	239	247	249	237	238	242	238	222	234	190	173	177	226	
24	179	224	243	238	242	248	242	229	237	242	261	281	295	306	278	298	303	286	279	268	283	328	349	358	271	
25	340	336	336	3	5	353	350	346	14	25	45	43	123	127	133	121	117	331	340	265	291	284	302	278	204	
26	326	350	354	39	58	34	58	63	59	55	79	121	160	121	151	173	143	166	329	312	312	351	346	5	173	
27	305	32	50	83	94	99	112	137	111	114	123	153	153	138	120	120	101	75	67	70	87	108	78	123	111	
28	112	50	58	64	75	69	80	83	123	130	152	166	170	183	202	209	237	236	273	280	277	274	242	191	164	
29	243	205	220	271	285	279	292	285	298	323	321	298	298	311	317	298	306	289	316	329	330	302	279	315	292	
30	283	263	295	336	319	296	340	312	298	5	2	322	303	308	306	311	317	332	289	305	328	328	343	355	287	
31	359	25	15	25	56	36	6	6	43	34	18	25	33	38	35	36	31	32	16	18	23	28	25	30	41	

TOTAL HOURS 744 TOTAL GOOD HOURS 744 DATA CAPTURE 100.0%

ARITHMETIC MEAN 127 STANDARD DEV. 108

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

02/17/92

11.11-58

TEC AQ - 1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR WIND DIRECTION IN DEGREES TRUE

		JANUARY 1992																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1	23	30	33	29	17	11	25	39	45	41	44	45	43	44	46	42	19	14	25	17	43	32	49	44	33	
2	47	21	21	33	49	57	46	37	41	32	37	43	45	46	48	51	56	44	15	332	322	301	303	299	97	
3	307	298	306	241	276	275	287	295	307	306	303	301	298	295	286	279	284	286	290	281	269	274	266	282	287	
4	287	286	308	298	295	289	285	288	291	291	292	299	298	283	289	288	292	286	298	305	313	320	308	299	295	
5	290	313	275	285	280	277	289	288	319	320	312	293	277	260	243	246	274	274	290	286	288	293	302	259	285	
6	180	146	164	228	271	218	156	185	189	209	246	264	282	284	291	291	288	280	281	278	282	288	291	316	246	
7	279	272	287	294	301	291	312	315	333	11	46	36	25	357	357	46	47	26	26	10	345	32	65	62	174	
8	59	67	60	21	50	62	63	66	69	72	70	101	121	119	124	126	114	103	88	69	90	104	110	116	85	
9	107	132	176	210	350	58	5	52	95	156	179	198	210	223	232	235	258	258	263	253	237	Cal	Cal	248	188	
10	240	223	248	267	246	264	229	217	244	249	240	262	275	286	285	301	305	304	323	319	294	295	323	328	274	
11	345	359	7	9	12	14	7	10	12	27	51	38	57	59	49	67	65	73	70	6	49	50	53	41	64	
12	48	55	61	67	70	76	74	77	88	90	116	122	128	137	144	137	118	104	94	105	126	149	146	149	103	
13	150	142	149	142	144	142	141	145	154	174	190	201	210	215	213	211	205	201	199	202	192	191	200	204	180	
14	203	205	205	208	210	267	260	266	285	288	285	284	277	279	284	280	288	288	289	295	297	303	317	326	270	
15	326	328	343	343	12	15	12	14	14	15	0	340	322	297	305	305	336	343	322	311	310	296	286	291	228	
16	335	16	17	18	351	2	16	10	9	5	2	329	319	311	306	319	325	301	293	309	316	322	331	349	205	
17	3	16	22	34	30	31	27	32	45	46	40	55	69	93	112	68	23	10	1	340	305	323	333	19	87	
18	15	15	14	26	29	37	27	36	50	64	101	111	152	196	183	163	169	134	259	332	57	46	55	60	97	
19	88	92	33	30	57	82	118	155	151	163	160	195	199	203	216	242	294	21	19	24	21	25	23	19	110	
20	21	14	10	10	9	7	9	6	351	357	0	354	335	348	352	353	7	12	6	7	326	323	318	335	161	
21	347	350	345	352	9	357	3	6	4	14	47	41	57	84	70	47	43	36	32	39	65	76	84	76	108	
22	69	68	75	83	88	68	53	69	80	102	107	114	115	111	113	121	112	104	101	108	115	111	126	127	97	
23	137	143	168	168	171	162	171	173	185	190	207	214	222	233	256	239	249	233	221	230	232	241	275	286	209	
24	280	284	286	285	292	308	319	329	336	318	343	343	329	311	322	317	326	305	305	305	288	308	325	349	313	
25	10	17	18	21	22	30	30	27	31	42	39	43	44	66	63	35	60	11	15	6	343	333	353	24	70	
26	26	31	19	0	16	17	22	16	15	31	48	44	46	71	88	96	83	70	38	34	41	38	54	55	42	
27	41	42	47	57	44	50	37	44	60	88	108	109	108	103	125	135	128	136	119	120	77	65	70	76	83	
28	90	82	76	80	90	90	94	101	99	123	141	155	156	157	173	173	136	137	142	82	39	46	57	74	108	
29	78	95	100	104	102	126	91	110	154	150	113	194	227	250	247	267	288	287	292	330	34	48	65	66	159	
30	68	74	46	103	87	173	305	109	156	193	222	226	209	221	224	227	233	229	233	250	281	279	284	271	196	
31	276	282	281	284	286	295	296	305	311	286	295	302	308	300	297	309	286	281	274	277	284	285	278	277	290	

TOTAL HOURS 744 TOTAL GOOD HOURS 742 DATA CAPTURE 99.7%

MAX. 1HR AVG 359 01/11/92 01:00:00 2ND MAX. 1 HR AVG 357 01/21/92 05:00:00

MIN. 1HR AVG 0 01/15/92 10:00:00 ARITHMETIC MEAN 166 STANDARD DEV. 116

KEY FOR MISSING CODES

Bad< - To few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

TEC AQ - 1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR WIND DIRECTION IN DEGREES TRUE

		FEBRUARY 1992																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY		281	281	284	283	290	288	288	279	290	315	335	335	315	298	296	298	295	291	284	298	303	302	313	329	299
1		281	281	284	283	290	288	288	279	290	315	335	335	315	298	296	298	295	291	284	298	303	302	313	329	299
2		39	12	333	336	21	34	24	17	26	48	50	58	57	51	63	69	55	35	38	47	60	59	60	53	68
3		49	61	59	44	18	31	53	55	45	63	74	108	109	125	40	73	35	50	30	38	77	93	86	82	62
4		80	78	96	147	140	107	96	78	87	104	127	135	136	137	152	151	152	151	123	114	123	116	124	136	120
5		131	141	142	135	139	256	230	133	118	116	155	180	196	192	195	206	213	214	191	208	227	223	203	215	182
6		197	201	216	201	218	214	235	253	251	268	277	278	280	279	281	285	288	288	290	296	291	292	301	291	261
7		290	294	297	299	296	297	302	305	292	301	305	312	332	257	277	280	272	276	279	278	320	311	251	286	292
8		279	284	276	274	263	240	268	269	300	319	308	292	281	292	287	280	285	281	285	290	290	303	314	334	287
9		346	347	8	17	9	24	24	29	31	40	48	63	64	58	43	33	20	14	7	18	26	36	36	16	56
10		17	25	21	19	17	24	32	43	42	45	63	74	74	79	69	70	55	46	36	36	43	42	32	33	43
11		26	25	25	20	23	29	23	30	26	38	27	25	20	25	30	33	46	46	36	35	33	45	77	80	34
12		73	77	49	49	41	36	31	32	44	41	44	52	50	49	60	59	34	28	8	356	34	353	63	21	70
13		84	46	217	150	137	53	67	55	84	91	85	111	97	252	284	277	276	288	296	302	326	315	34	39	165
14		357	24	352	23	38	40	56	56	56	77	99	50	40	189	243	264	254	275	286	297	323	324	45	297	169
15		178	199	189	232	56	99	121	121	160	162	167	167	189	189	211	221	243	254	233	211	200	216	232	243	187
16		232	221	200	243	221	189	211	200	189	204	184	209	232	243	248	265	243	263	263	254	297	99	56	34	208
17		264	297	178	157	157	130	130	151	167	189	189	184	189	211	211	220	221	248	297	351	12	99	189	189	193
18		189	184	204	204	297	185	243	121	189	206	200	178	189	189	194	194	204	232	258	243	209	232	232	209	208
19		223	221	232	227	200	209	205	240	232	238	238	235	243	292	286	286	281	297	301	329	45	307	297	275	247
20		243	65	240	319	351	11	13	16	29	34	45	40	45	40	56	65	56	61	65	61	67	67	56	50	87
21		60	56	45	55	45	40	43	45	45	60	65	65	64	67	65	61	61	60	60	59	65	60	61	59	57
22		60	50	45	56	56	53	59	70	88	99	115	119	106	101	97	66	48	60	50	243	45	56	99	268	88
23		136	119	189	151	101	135	140	145	147	155	155	185	204	204	232	211	238	243	248	264	277	243	235	189	189
24		155	120	160	135	135	157	115	96	140	81	99	101	81	101	105	81	60	228	297	322	317	297	55	70	146
25		86	94	136	104	109	98	92	105	PwrF	142	161	171	162	193	198	243	242	208	198	206	231	261	257	204	170
26		197	194	211	206	226	227	223	241	278	273	270	274	PwrF	PwrF	274	270	281	276	279	281	282	284	277	284	255
27		283	285	286	291	295	289	295	289	292	293	290	287	283	281	278	281	284	281	284	284	284	259	196	266	281
28		292	257	278	292	290	301	319	295	330	336	305	292	293	286	279	267	276	275	279	269	258	263	264	237	285
29		270	249	264	264	223	228	217	223	254	288	284	291	289	284	291	280	281	278	278	281	281	286	262	249	266

TOTAL HOURS 696 TOTAL GOOD HOURS 693 DATA CAPTURE 99.6%

MAX. 1HR AVG 357 02/14/92 00:00:00 2ND MAX. 1 HR AVG 356 02/12/92 19:00:00

MIN. 1HR AVG 7 02/09/92 18:00:00 ARITHMETIC MEAN 171 STANDARD DEV. 104

KEY FOR MISSING CODES

Bad< - To few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

11.11-60

TEC AQ - 1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR WIND DIRECTION IN DEGREES TRUE

		MARCH 1992																							DAILY		
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG	
DAY		1	242	259	279	261	303	346	29	26	333	9	46	43	114	132	142	108	110	37	343	312	291	271	318	315	194
		2	316	302	355	31	358	355	9	14	42	44	57	80	120	145	126	147	125	52	20	299	301	339	52	73	157
		3	79	72	80	66	65	61	73	85	75	114	120	125	94	91	94	87	97	97	101	102	97	95	96	93	90
		4	80	78	52	68	57	58	69	37	29	73	96	137	137	132	163	175	155	139	110	113	89	76	84	85	95
		5	97	91	92	91	95	94	95	103	109	112	118	124	114	101	114	113	113	131	112	99	101	94	97	103	105
		6	99	94	97	90	87	93	99	93	109	134	154	170	179	176	199	221	240	245	249	267	268	267	235	235	171
		7	232	185	139	155	206	212	208	226	218	225	235	255	265	272	276	268	275	284	276	265	268	281	286	289	242
		8	289	298	293	302	302	340	346	312	306	301	339	0	34	353	329	347	0	12	286	279	281	275	274	312	259
		9	343	9	349	348	19	35	56	70	75	104	128	134	134	130	141	155	189	247	308	349	20	7	110	130	150
		10	124	126	148	161	162	154	160	165	176	196	208	202	208	207	214	215	215	220	219	221	238	312	320	279	202
		11	204	221	248	263	268	295	299	306	313	317	318	329	312	298	295	301	295	278	285	303	331	322	308	295	292
		12	294	317	357	11	7	14	4	9	23	47	83	116	120	340	346	346	43	306	306	307	318	316	355	186	190
		13	244	151	316	291	246	261	254	287	281	308	311	323	306	302	294	285	285	291	285	284	280	301	299	312	283
		14	308	309	329	308	352	326	328	2	21	29	42	43	353	296	335	295	289	284	281	282	291	291	284	291	249
		15	296	288	295	285	278	284	277	279	291	303	303	298	303	302	286	280	277	276	281	282	282	276	272	274	286
		16	271	271	281	265	261	278	351	18	32	44	42	48	46	44	58	43	31	35	67	75	75	73	73	67	119
		17	76	69	72	73	79	79	71	76	89	114	124	116	106	92	96	95	101	95	100	108	178	141	141	127	101
		18	116	123	136	142	143	130	122	117	140	153	161	156	156	178	184	203	235	223	226	227	235	215	201	155	170
		19	158	181	188	202	215	210	204	208	220	231	246	246	260	266	274	274	281	275	274	264	266	264	278	277	240
		20	272	274	272	267	267	273	277	279	291	292	288	282	285	280	284	285	279	280	282	289	298	292	286	282	282
		21	306	8	12	9	325	353	5	15	27	48	43	48	41	64	52	25	27	3	12	345	326	354	27	3	103
		22	16	7	14	40	19	24	22	71	92	103	130	170	182	207	206	242	252	262	163	171	132	149	163	179	126
		23	185	180	183	165	173	175	175	207	244	266	282	286	284	286	288	289	288	288	309	291	300	300	284	291	251
		24	231	330	19	14	16	15	24	29	33	33	42	43	48	58	69	63	54	47	58	65	65	61	59	66	64
		25	71	68	69	74	76	74	73	78	90	102	110	111	117	116	114	105	117	142	147	181	208	261	282	292	128
		26	284	298	5	323	277	281	294	282	293	305	316	308	301	295	291	291	291	296	285	281	281	281	271	302	280
		27	262	302	279	269	292	326	295	346	346	353	331	340	298	342	284	277	280	282	287	289	288	284	316	288	302
		28	308	295	284	286	321	332	14	43	53	64	62	75	62	50	49	34	32	28	11	7	11	43	64	80	109
		29	74	66	68	70	73	67	70	72	87	112	188	242	265	257	242	255	252	265	324	332	335	353	39	77	174
		30	72	343	292	243	201	173	149	105	128	183	210	212	233	248	252	253	262	286	232	177	165	178	184	203	208
		31	225	247	248	261	255	270	277	282	284	287	Cal	Cal	264	274	326	281	282	280	281	277	282	279	283	305	275

TOTAL HOURS 744 TOTAL GOOD HOURS 742 DATA CAPTURE 99.7%

MAX. 1HR AVG 358 03/02/92 04:00:00 2ND MAX. 1 HR AVG 357 03/12/92 02:00:00

MIN. 1HR AVG 0 03/08/92 11:00:00 ARITHMETIC MEAN 190 STANDARD DEV. 106

KEY FOR MISSING CODES

Bad< - To few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, Pwrf - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

11.11-61

HOURLY AVERAGES FOR WINDSPEED (MILES PER HOUR)

**TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001**

HOURLY AVERAGES FOR WINDSPEED IN MILES/HOUR

APRIL, 1991																									
	HOUR (EST)																							DAILY	
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																									
1	3.1	2.6	2.0	2.5	4.2	4.1	4.2	7.0	6.9	9.4	9.4	9.0	8.9	8.2	7.7	6.9	6.4	6.3	4.6	4.7	6.3	4.7	4.5	4.4	5.7
2	4.8	3.9	4.2	3.6	2.9	3.3	2.5	4.0	6.6	9.7	10.8	10.8	10.7	11.3	11.9	11.9	12.1	11.9	10.1	7.4	5.4	4.6	4.5	3.8	7.2
3	3.5	3.2	3.5	3.1	3.0	3.6	3.8	6.1	8.6	13.0	14.1	14.4	14.2	13.0	13.4	15.1	13.2	12.5	11.4	10.8	7.6	9.0	7.8	6.4	8.9
4	2.9	3.2	4.8	5.4	6.5	4.2	2.8	4.0	6.2	12.6	15.7	14.9	13.6	13.2	13.3	13.2	14.4	13.7	6.9	6.1	7.3	8.1	7.7	5.7	8.6
5	4.7	3.6	3.6	4.6	4.1	4.0	5.5	6.8	12.2	10.7	10.2	9.5	8.8	9.8	10.1	9.7	10.1	11.0	9.1	7.2	3.9	3.2	3.3	2.6	7.0
6	2.3	3.9	3.5	3.7	2.3	2.0	2.5	2.9	3.5	5.9	5.8	4.6	5.6	4.7	4.7	5.4	4.9	3.5	8.7	5.2	1.7	4.3	2.2	3.1	4.0
7	4.6	4.6	5.0	4.7	4.4	4.5	5.1	6.0	7.0	8.8	7.8	6.8	5.8	4.4	4.6	5.5	4.3	5.5	6.0	4.4	1.2	1.3	2.2	1.6	4.8
8	1.3	3.0	3.7	3.7	3.6	4.2	6.1	5.7	7.8	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Bad<
9	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
10	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
11	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	6.0	4.0	7.4	4.1	8.6	7.9	8.2	8.5	5.3
12	4.3	3.9	3.6	4.3	3.6	2.2	5.7	9.1	10.5	11.2	11.4	10.9	10.7	10.3	9.6	9.6	9.7	9.2	8.2	9.1	10.2	8.9	6.8	5.8	7.8
13	5.2	4.7	5.5	5.9	6.6	6.2	5.6	6.9	8.2	9.9	10.9	10.1	9.4	7.9	7.5	7.8	7.5	6.0	5.1	6.2	5.3	5.2	6.6	6.0	6.9
14	5.4	5.4	5.4	5.3	4.3	3.5	4.3	6.6	8.8	9.4	8.5	7.7	8.4	10.9	12.5	11.1	11.6	9.7	7.3	4.6	5.4	6.5	7.4	6.1	7.3
15	5.3	5.2	4.4	4.7	4.8	4.1	2.6	5.3	5.3	7.9	7.0	5.6	5.7	4.6	4.2	4.7	3.8	1.9	2.3	3.2	4.6	2.9	1.8	1.6	4.3
16	1.2	2.3	3.1	2.9	2.4	1.8	2.0	3.3	6.6	7.9	7.0	6.9	5.4	5.6	4.6	3.4	6.9	7.0	6.0	PwrF	PwrF	PwrF	PwrF	PwrF	4.5
17	PwrF	Miss	2.0	3.0	4.0	4.0	3.0	4.0	4.0	4.5	3.0	4.0	6.0	PwrF	5.2	6.0	5.6	5.4	PwrF	2.5	1.5	1.4	4.1	4.6	3.9
18	3.3	1.8	0.7	1.7	2.9	2.9	3.6	3.2	5.1	6.2	7.0	6.6	9.4	9.7	9.1	9.6	10.6	10.3	6.3	3.9	2.3	2.6	1.8	1.4	5.1
19	1.6	2.8	2.5	1.5	1.6	1.7	1.0	1.2	1.4	0.9	4.2	2.9	2.7	3.3	5.8	9.5	9.6	9.1	7.3	4.8	5.7	3.1	2.8	3.1	3.7
20	2.7	3.7	2.3	2.4	3.3	1.4	1.1	3.0	5.0	4.9	3.9	3.0	3.9	4.4	5.8	5.5	4.6	6.3	9.4	7.4	4.2	3.0	1.5	2.0	3.9
21	2.9	4.6	3.7	3.2	5.3	4.4	1.8	2.4	6.1	10.9	11.1	11.7	12.0	11.5	12.7	11.9	10.3	9.5	7.5	4.7	4.0	4.0	3.5	0.7	6.7
22	0.8	0.3	0.4	0.9	1.0	1.4	1.0	1.4	3.8	3.8	4.7	5.5	4.8	5.5	7.1	7.6	7.2	9.3	6.7	4.2	2.8	0.7	1.4	3.2	3.5
23	3.0	2.4	2.7	3.8	4.5	4.9	4.4	6.3	6.8	6.7	5.9	10.3	13.3	16.7	17.0	13.7	9.9	7.8	3.7	1.4	4.0	5.4	10.9	6.3	7.1
24	1.9	2.9	3.0	2.6	2.5	2.1	2.0	3.3	7.7	9.8	11.8	12.7	10.2	10.4	9.1	9.2	8.1	6.7	4.5	3.9	4.0	3.2	2.1	1.5	5.6
25	1.3	1.7	2.0	1.2	1.3	2.3	2.3	2.7	3.9	5.3	5.2	3.9	3.7	2.3	2.3	12.2	9.2	8.4	7.2	6.6	7.1	6.5	4.2	4.0	4.4
26	2.4	7.2	4.8	3.1	4.2	6.0	2.3	5.4	7.6	6.4	6.1	4.6	4.8	3.9	2.7	2.3	1.2	0.7	1.1	2.0	2.7	3.1	1.8	2.8	3.7
27	3.6	4.7	3.5	2.2	3.3	3.7	4.7	5.1	6.1	7.1	8.3	8.3	6.5	6.1	4.9	3.4	3.5	3.9	3.2	2.9	2.7	2.0	1.9	2.7	4.3
28	2.5	2.5	2.6	3.7	3.5	4.4	5.7	7.9	9.4	9.2	8.7	8.0	8.7	7.4	6.6	5.5	4.1	2.8	5.0	3.7	3.2	1.2	0.8	2.0	4.9
29	4.3	5.9	5.2	5.5	6.7	5.7	5.3	12.0	9.8	10.7	10.0	9.0	6.9	5.6	6.0	6.1	6.0	3.5	2.6	2.8	2.8	1.9	2.6	6.0	5.9
30	4.5	6.1	5.1	3.1	4.6	3.4	3.7	5.3	6.7	7.3	8.0	6.9	6.5	5.5	5.8	6.0	5.3	5.3	5.4	4.5	2.8	1.9	1.4	2.6	4.9

TOTAL HOURS 720 TOTAL GOOD HOURS 633 DATA CAPTURE 87.9%

MAX. 1HR AVG 17.0 04/23/91 14:00:00 2ND MAX. 1 HR AVG 16.7 04/23/91 13:00:00

MIN. 1HR AVG 0.3 04/22/91 01:00:00 ARITHMETIC MEAN 5.6 STANDARD DEV. 3.2

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR WIND SPEED IN MILES PER HOUR

		MAY, 1991																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1		1.4	1.4	1.5	1.3	2.3	2.2	2.8	4.9	6.0	5.3	4.2	4.9	3.9	4.4	4.8	4.3	4.4	4.3	6.4	4.1	2.6	1.3	1.9	2.5	3.4
2		2.3	1.8	2.2	2.9	1.9	2.2	2.4	3.9	3.1	3.0	5.3	7.1	7.6	6.1	6.7	6.3	5.6	4.9	3.2	2.2	3.4	7.7	6.7	6.7	4.4
3		7.1	6.0	4.5	3.9	4.1	3.5	3.9	5.2	6.4	7.4	8.4	8.7	7.2	6.8	5.9	5.1	4.7	4.8	8.1	6.6	8.4	8.7	8.2	6.0	6.2
4		5.5	5.7	5.6	5.6	4.8	4.5	5.0	6.2	7.0	7.0	6.1	4.4	5.0	4.2	3.0	3.5	2.9	2.4	1.1	3.2	4.9	7.1	2.0	3.1	4.5
5		4.2	2.8	3.4	2.8	2.6	3.1	4.5	4.3	5.2	7.7	6.2	4.7	5.1	5.5	5.5	5.2	5.3	4.6	3.6	4.8	3.7	5.8	5.2	3.4	4.5
6		6.2	6.3	3.8	1.5	2.2	2.8	2.7	4.1	7.9	9.0	7.1	8.5	7.5	6.0	3.4	4.7	7.4	6.9	9.1	6.7	7.9	5.2	4.1	3.0	5.6
7		2.4	2.2	2.9	4.6	5.1	4.3	5.7	5.6	5.9	7.4	5.7	6.1	6.4	8.0	6.3	6.6	8.0	8.2	9.1	9.3	9.0	8.1	8.1	5.4	6.2
8		5.7	6.5	7.5	6.5	6.7	6.3	7.8	9.3	10.1	10.5	11.0	9.9	9.5	8.8	9.4	9.5	9.6	9.0	10.6	10.7	10.7	8.9	7.7	7.2	8.7
9		6.8	7.2	7.7	5.6	5.2	5.1	6.0	7.4	8.2	8.3	7.9	7.7	8.1	6.6	6.4	4.6	5.0	7.0	8.5	10.4	10.9	7.0	7.4	7.1	7.1
10		6.4	7.2	5.4	3.6	4.9	4.6	5.9	5.9	7.1	8.0	6.5	6.0	4.6	5.8	7.6	6.7	8.5	7.2	8.1	5.8	6.2	5.9	5.9	5.6	6.2
11		4.9	6.1	5.2	6.6	4.8	3.1	4.2	5.1	7.7	8.0	7.1	6.8	7.1	8.4	7.9	7.9	7.7	8.8	8.7	7.2	8.5	7.4	7.5	5.9	6.7
12		4.7	3.5	2.9	3.6	3.9	3.9	3.1	5.4	5.8	6.3	5.5	4.5	4.3	4.2	4.5	4.4	3.7	4.7	3.9	5.4	6.2	7.6	8.0	6.8	4.8
13		4.5	6.3	4.6	2.8	3.2	4.2	4.0	4.5	6.0	6.0	5.7	5.3	6.2	3.7	4.4	6.8	2.6	3.1	1.6	3.2	3.0	2.4	2.8	3.8	4.2
14		3.5	3.3	2.4	2.5	1.8	1.5	2.8	3.5	3.8	6.0	2.4	8.5	6.8	6.4	7.7	5.2	2.1	4.8	5.3	4.2	1.8	1.7	1.2	1.2	3.7
15		0.5	2.6	1.4	1.0	0.8	1.2	2.0	3.9	5.0	5.7	5.4	6.1	5.2	6.6	7.3	7.6	5.7	7.1	5.3	3.9	3.9	2.3	1.3	1.1	3.8
16		1.4	0.9	1.0	2.2	2.1	0.8	1.2	2.6	4.1	3.5	3.8	2.5	5.4	4.1	11.2	7.4	6.8	5.0	2.1	2.6	2.8	2.7	1.1	1.3	3.3
17		1.7	1.5	1.4	1.4	2.8	4.6	4.2	5.7	5.8	6.3	5.9	5.4	4.3	5.5	4.7	5.7	5.0	8.6	8.0	2.2	1.8	1.9	2.0	1.9	4.1
18		1.7	1.7	2.5	1.5	3.2	2.5	2.0	4.4	5.6	5.7	5.8	5.9	5.6	4.9	4.7	10.2	3.5	6.5	7.1	5.4	5.7	4.8	5.7	5.2	4.6
19		4.9	4.0	5.1	4.9	5.4	5.8	5.9	7.9	8.5	8.0	8.3	7.2	6.3	5.9	5.6	10.2	11.8	11.5	7.0	3.9	3.5	1.7	5.7	7.3	6.5
20		7.6	4.9	6.2	6.7	6.8	6.5	7.1	8.1	9.0	11.0	11.8	10.8	7.7	6.1	7.7	8.6	9.5	9.3	7.1	5.1	5.8	8.0	6.3	8.6	7.7
21		8.2	7.4	7.7	8.4	9.5	9.0	10.5	11.3	12.1	12.2	13.1	Down	Down	Down	12.5	12.0	10.0	10.6	9.3	10.6	10.0	11.3	11.9	11.6	10.4
22		11.6	11.5	11.6	13.9	11.8	11.0	11.2	12.4	16.3	14.7	12.6	11.6	14.9	14.8	15.4	12.1	11.8	10.1	12.1	11.5	11.8	9.1	9.9	9.5	12.2
23		8.0	5.3	4.8	7.2	9.1	5.2	4.0	6.1	6.6	6.4	6.8	7.0	6.0	7.3	11.3	9.6	7.4	5.5	5.0	4.4	5.2	5.3	6.0	6.0	6.4
24		5.8	6.1	6.4	5.8	5.5	4.7	4.5	5.6	6.0	5.8	7.9	7.5	6.8	5.0	8.1	9.3	4.4	3.3	2.1	1.3	3.8	6.0	8.2	8.9	5.8
25		7.9	6.0	5.8	6.0	5.7	5.5	7.8	10.3	11.0	11.0	10.4	10.8	9.3	9.0	9.5	8.5	9.1	8.9	8.6	5.4	4.4	1.9	2.8	3.2	7.4
26		3.3	3.8	4.2	4.4	4.4	5.7	4.7	5.0	7.3	7.3	7.3	7.6	7.0	10.5	4.1	2.4	2.6	4.1	5.7	5.1	3.8	4.5	4.2	5.9	5.2
27		5.7	4.6	5.6	5.4	5.7	5.2	5.1	7.8	6.9	8.1	8.1	7.9	6.8	4.8	5.3	3.8	3.1	2.5	2.4	1.9	2.0	2.5	2.9	4.8	4.9
28		5.4	4.9	4.6	4.8	5.3	5.6	6.5	7.9	8.9	8.5	7.2	7.2	7.8	7.4	7.4	7.4	5.6	5.1	3.6	3.5	2.2	6.3	5.9	5.9	6.0
29		5.7	2.8	2.4	0.9	1.4	1.0	2.7	2.5	3.4	3.8	3.6	3.6	4.3	4.1	3.9	4.8	4.7	4.2	2.2	1.0	2.6	2.8	2.2	2.1	3.0
30		1.7	1.5	1.1	0.8	1.3	1.6	2.0	2.6	3.3	3.0	3.5	3.2	3.1	2.9	3.2	7.9	10.5	5.3	4.2	2.9	3.5	2.8	3.4	1.6	3.2
31		1.7	2.1	1.7	0.9	1.1	2.8	2.0	1.5	1.3	3.4	3.7	3.9	5.2	5.1	3.0	4.3	3.2	4.2	4.3	2.2	2.3	3.0	1.0	1.0	2.7

TOTAL HOURS 744 TOTAL GOOD HOURS 741 DATA CAPTURE 99.6%

MAX. 1HR AVG 16.3 05/22/91 08:00:00 2ND MAX. 1 HR AVG 15.4 05/22/91 14:00:00

MIN. 1HR AVG 0.5 05/15/91 00:00:00 ARITHMETIC MEAN 5.6 STANDARD DEV. 2.8

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration
BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data
Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

11.11-64

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR WIND SPEED IN MILES/HOUR

		JUNE, 1991																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1		0.8	1.0	0.8	1.2	1.7	3.0	2.2	3.0	3.8	4.2	4.9	5.6	5.2	5.0	7.3	6.2	5.7	3.6	3.5	1.2	1.9	3.6	3.1	3.0	3.4
2		1.5	1.1	1.4	1.6	1.2	1.0	2.3	3.3	5.3	7.2	8.2	8.7	8.0	8.1	9.0	6.1	8.1	8.5	8.1	5.9	5.1	3.5	2.5	3.4	4.9
3		3.5	3.0	3.3	3.3	3.7	5.0	4.8	6.3	9.3	9.4	10.3	9.9	11.0	10.1	10.5	10.2	10.6	9.4	8.5	5.6	3.8	3.5	2.9	3.3	6.7
4		4.0	3.7	2.8	2.3	1.6	4.2	2.9	6.8	8.4	8.3	8.0	9.9	11.7	12.3	11.3	8.6	5.6	7.1	6.4	4.8	3.7	4.5	5.6	3.9	6.2
5		2.8	3.7	3.0	3.6	3.0	4.9	2.7	4.4	9.2	7.7	9.6	10.9	9.9	7.5	8.9	9.7	7.6	5.6	4.9	4.5	7.0	5.4	3.7	2.8	5.9
6		3.6	2.4	2.4	1.2	2.0	2.0	2.0	2.8	3.3	4.6	6.7	9.2	9.1	10.4	10.5	10.1	12.2	9.1	5.3	4.5	6.9	7.9	8.0	6.7	5.9
7		6.7	5.0	4.5	4.8	3.4	3.1	4.4	5.7	6.8	6.6	4.8	4.0	4.1	4.4	4.5	5.0	6.2	10.0	8.5	8.5	9.4	8.2	7.9	6.1	5.9
8		6.2	6.0	4.8	4.3	4.4	3.9	3.9	7.3	9.4	10.1	10.5	9.9	11.5	11.1	11.1	10.4	10.4	11.2	9.4	6.1	5.2	4.7	5.1	5.9	7.6
9		5.6	4.9	5.1	4.7	4.6	4.8	6.2	9.1	9.4	9.7	10.6	9.9	9.5	9.5	8.8	8.8	9.5	9.8	8.2	7.2	6.3	5.7	4.6	4.6	7.4
10		4.6	4.3	4.1	4.0	3.7	3.2	3.9	5.7	7.6	9.2	9.3	9.1	8.5	9.0	9.4	10.0	10.6	9.9	11.6	8.3	5.2	3.8	3.3	2.6	6.7
11		2.3	1.6	2.0	1.8	1.4	2.4	2.6	4.9	8.6	9.7	8.9	7.5	7.1	7.6	6.8	7.1	8.1	7.1	7.5	5.2	7.3	8.0	6.5	4.9	5.7
12		3.8	3.5	2.5	2.5	2.9	2.6	3.7	5.2	5.0	4.1	4.6	4.8	4.6	4.3	4.4	4.0	4.1	3.6	3.4	1.9	6.3	8.6	6.1	5.6	4.2
13		4.1	4.6	4.3	4.4	3.5	3.4	3.5	4.0	3.6	4.2	5.7	5.1	5.2	5.3	4.5	4.9	4.3	4.7	3.0	3.1	4.3	5.1	5.5	4.2	4.3
14		3.1	3.0	2.7	2.1	1.0	1.8	0.9	3.2	5.2	5.5	5.2	6.0	5.1	4.6	3.5	4.2	2.4	5.4	3.6	1.9	1.3	1.1	1.5	1.4	3.1
15		1.8	1.6	2.6	2.5	3.5	2.3	2.2	5.5	6.5	4.4	3.0	4.5	5.2	7.8	4.2	3.8	4.4	3.5	2.7	1.9	1.9	3.4	1.8	0.7	3.4
16		0.7	1.3	1.0	1.2	1.7	1.8	1.7	1.6	2.5	2.9	3.2	3.2	4.7	4.2	4.9	7.6	4.6	4.2	4.8	3.4	2.8	2.7	1.7	2.0	2.9
17		2.3	1.9	1.9	1.4	0.8	0.9	1.0	2.0	3.3	2.1	4.1	3.8	7.0	3.3	5.0	6.4	4.6	PwrF	PwrF	1.8	1.0	1.0	1.6	1.5	2.6
18		1.8	0.9	1.1	0.7	0.8	0.9	1.1	1.7	3.4	4.5	6.6	3.3	2.8	5.9	6.9	5.1	1.4	1.2	1.5	1.9	2.5	2.2	2.0	1.8	2.6
19		2.1	2.0	2.3	2.2	1.8	1.1	1.3	3.0	3.0	4.4	5.1	4.0	7.4	6.6	5.6	8.4	6.1	3.9	1.6	8.4	6.4	2.6	2.4	1.8	3.9
20		1.1	1.2	0.8	1.6	0.7	1.1	1.7	2.5	4.1	3.3	4.0	4.8	3.6	2.6	3.1	2.6	5.4	6.6	4.1	2.6	PwrF	PwrF	PwrF	PwrF	2.8
21	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	4.5	4.3	3.9	3.2	3.6	3.6	3.6	7.1	6.8	8.7	2.9	2.8	1.9	1.4	Bad<
22		1.9	1.6	1.5	1.8	0.9	1.2	1.7	2.9	3.4	3.3	4.2	3.8	2.9	4.6	3.9	4.3	3.9	3.3	5.2	2.4	1.9	2.0	2.7	0.4	2.7
23		0.8	0.9	1.1	1.9	1.5	1.1	1.8	2.5	2.6	2.9	3.3	3.3	3.1	4.1	4.5	6.1	4.6	6.1	8.4	6.5	3.8	3.7	3.0	1.0	3.3
24		1.2	1.2	1.8	0.9	1.7	0.7	1.2	1.8	2.0	3.7	3.5	4.4	3.9	7.5	8.7	4.0	5.4	5.2	3.6	2.5	2.8	2.8	1.6	1.8	3.0
25		1.3	1.5	0.3	0.9	0.9	2.4	2.4	4.7	3.7	4.4	4.0	4.0	3.7	3.7	2.8	2.2	2.6	5.7	6.5	4.0	3.0	1.6	1.5	1.0	2.8
26		1.0	0.8	0.9	0.7	0.7	0.9	0.7	2.2	2.3	2.3	2.7	2.6	2.9	4.4	4.1	8.6	7.7	5.7	2.9	2.5	4.3	3.4	2.1	3.4	2.9
27		3.1	5.0	4.0	3.5	3.6	3.4	4.1	4.4	3.7	4.0	3.1	2.1	2.8	7.9	4.5	3.5	5.0	3.6	1.1	0.9	1.2	1.4	1.2	0.6	3.2
28		2.2	1.9	1.1	0.6	1.3	1.2	1.8	3.7	5.3	4.8	4.4	3.7	3.2	3.2	4.1	4.1	4.0	4.6	5.3	2.4	3.4	6.5	3.6	1.8	3.2
29		2.6	1.9	1.2	0.9	0.4	1.0	0.6	1.9	3.5	3.5	2.9	2.9	2.9	3.3	2.3	2.2	7.5	8.2	4.5	5.0	2.8	4.0	2.2	2.6	2.9
30		2.2	3.2	1.6	0.9	0.6	0.6	1.5	3.4	4.9	3.6	2.9	3.0	2.9	3.6	4.2	5.0	6.8	4.7	2.4	1.0	1.2	1.1	1.1	2.2	2.7

TOTAL HOURS 720 TOTAL GOOD HOURS 704 DATA CAPTURE 97.8%

MAX. 1HR AVG 12.3 06/04/91 13:00:00 2ND MAX. 1 HR AVG 12.2 06/06/91 16:00:00

MIN. 1HR AVG 0.3 06/25/91 02:00:00 ARITHMETIC MEAN 4.2 STANDARD DEV. 2.7

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

HOURLY AVERAGES FOR WINDSPEED IN MILES/HOUR

**DAILY
AVG**

DAY	HOUR (EST)																							DAILY AVG	
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22		23
1	3.5	4.2	3.5	3.5	3.8	3.4	2.5	2.2	3.0	4.2	4.4	5.0	3.9	4.9	6.8	8.4	7.8	5.1	4.9	3.7	2.6	1.4	3.2	3.4	4.1
2	3.7	4.0	3.2	3.1	2.7	3.2	2.2	2.8	4.2	8.8	4.5	4.9	5.7	5.3	4.3	8.0	7.7	7.8	5.9	4.5	3.0	3.2	2.2	0.8	4.4
3	1.5	1.5	2.0	2.7	2.6	2.3	2.2	4.1	5.4	6.2	5.8	5.8	6.8	6.4	6.0	5.8	5.4	5.3	7.0	6.0	1.6	0.9	1.7	1.8	4.0
4	2.2	2.1	2.3	3.2	3.5	4.2	3.4	4.5	6.1	6.7	5.7	6.8	7.3	9.0	6.1	3.9	4.1	3.0	1.1	2.4	2.8	2.7	3.1	1.9	4.1
5	1.4	2.5	2.6	2.1	1.4	1.6	2.6	4.1	4.2	5.0	4.4	3.7	3.2	2.7	12.6	5.0	2.7	1.7	1.7	3.4	0.9	1.5	4.3	3.5	3.3
6	3.4	3.8	6.1	3.4	3.0	2.5	3.9	2.9	3.1	3.0	3.4	4.1	3.3	4.3	3.7	7.3	9.0	3.9	3.1	2.3	2.1	3.3	1.8	1.1	3.6
7	0.8	1.4	0.8	1.8	1.1	2.1	1.2	2.0	3.7	4.5	3.3	3.8	3.7	3.5	2.5	2.8	2.1	2.7	3.9	2.8	4.8	10.1	2.4	1.4	2.9
8	2.0	1.1	1.5	1.6	1.2	0.5	0.9	1.7	3.1	3.0	2.9	2.0	3.2	2.4	3.5	3.0	5.2	4.8	3.8	4.2	3.0	2.0	0.9	0.4	2.4
9	0.5	0.5	0.5	0.6	1.0	0.7	0.9	2.4	2.6	3.3	5.8	8.1	4.1	1.6	1.3	2.0	3.0	4.4	4.6	2.7	2.2	2.2	1.6	1.4	2.4
10	1.1	1.2	1.8	1.4	2.7	2.0	2.3	3.6	6.0	7.9	7.6	7.6	5.0	5.0	6.0	3.0	3.0	4.0	3.0	2.0	2.0	2.0	2.0	2.0	3.5
11	1.5	2.4	2.3	2.3	3.2	1.8	1.2	3.2	4.6	6.0	6.0	6.0	5.0	PwrF	3.0	3.0	4.0	4.0	3.0	3.0	3.0	4.0	4.0	3.0	3.4
12	1.5	1.5	1.0	1.0	3.0	1.5	1.5	2.0	4.0	5.0	6.0	4.0	6.0	5.0	5.0	5.0	4.0	3.5	3.5	5.0	3.0	3.0	2.0	3.0	3.3
13	2.0	3.0	3.0	3.5	4.0	3.0	3.0	7.0	5.0	4.0	4.0	4.0	4.0	4.0	8.0	6.0	Miss	6.0	5.0	5.0	2.0	3.0	3.5	2.0	4.1
14	2.0	2.0	2.0	2.0	2.0	3.0	4.0	4.0	3.5	4.0	6.0	8.0	7.0	5.5	13.0	9.0	5.0	3.5	4.0	2.0	3.0	3.0	1.5	2.0	4.2
15	3.0	2.0	2.0	2.0	2.0	3.5	5.0	5.0	6.0	8.0	8.0	8.0	8.0	4.0	5.0	4.0	5.0	5.0	5.0	5.0	6.0	6.0	3.0	2.0	4.7
16	5.0	5.0	3.0	3.0	4.0	4.0	5.0	5.0	7.0	6.0	7.0	7.0	7.0	7.0	6.0	2.0	4.0	6.0	7.0	4.0	3.0	5.0	5.0	3.0	5.0
17	2.0	2.0	2.0	3.5	3.0	4.0	4.0	5.0	6.0	6.0	8.0	8.0	7.0	7.0	6.0	5.0	5.0	7.0	11.0	4.0	4.0	3.0	7.0	4.0	5.1
18	3.0	4.0	4.0	4.0	4.0	2.5	3.0	4.0	5.0	6.0	6.5	6.0	5.0	5.0	4.0	4.0	4.0	4.0	3.0	9.0	10.0	5.0	3.0	4.0	4.7
19	1.3	1.5	2.2	2.2	2.7	3.1	2.4	4.4	5.5	5.5	4.0	4.2	4.0	4.0	5.0	13.0	5.0	5.0	6.0	6.0	4.0	4.0	3.0	2.0	4.2
20	2.8	3.0	3.4	3.3	2.9	2.4	2.1	3.4	4.7	6.0	5.0	4.0	13.0	6.0	6.0	7.0	5.0	3.0	5.0	2.0	2.0	3.0	2.0	2.0	4.1
21	3.0	3.0	3.0	3.0	3.0	2.0	2.0	3.0	4.0	5.0	5.0	5.0	6.0	6.0	6.0	6.0	10.0	5.0	2.0	5.0	4.0	4.0	4.0	5.0	4.3
22	2.7	1.1	3.1	2.7	1.4	1.6	2.0	3.0	4.0	4.0	5.0	5.0	6.0	6.0	6.0	5.0	5.0	7.0	10.0	7.0	3.0	3.0	2.0	2.0	4.0
23	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	3.0	3.0	4.0	3.0	3.0	4.0	4.0	9.2	7.6	4.7	3.4	2.2	1.9	1.0	1.8	1.9	3.1
24	1.6	1.6	0.9	0.8	0.9	1.2	2.3	4.1	3.1	2.7	2.3	2.6	2.1	2.4	15.3	3.3	6.5	3.6	3.1	3.4	4.0	2.4	2.3	1.7	3.1
25	2.1	2.8	3.1	2.9	2.9	2.0	2.1	3.2	3.3	4.8	4.8	2.8	3.5	5.0	6.1	5.9	4.0	4.7	2.7	2.4	2.4	2.0	4.8	1.5	3.4
26	1.3	0.9	1.2	2.0	2.4	1.4	1.6	3.5	4.7	4.5	3.9	4.9	5.1	6.8	2.4	1.9	2.8	3.6	3.9	1.8	2.0	3.2	3.8	2.6	3.0
27	2.7	2.6	1.3	1.0	1.2	0.6	1.2	2.3	1.5	1.4	1.9	2.6	2.6	3.2	4.4	2.2	3.2	2.6	3.0	3.3	1.9	2.4	3.7	2.5	2.3
28	1.1	1.8	0.8	1.7	1.9	2.2	2.6	3.4	4.8	5.1	5.1	5.0	6.3	5.0	4.3	6.0	9.6	8.9	2.8	1.3	0.6	2.0	3.6	2.8	3.7
29	2.2	2.5	3.1	3.7	1.8	1.6	2.3	4.0	5.5	6.7	7.0	6.7	7.4	7.1	7.9	5.5	1.6	1.5	2.5	3.0	2.1	3.3	6.1	5.2	4.2
30	3.7	2.2	2.9	4.1	2.9	3.9	4.0	5.2	6.7	7.7	6.8	6.8	8.6	4.8	5.8	6.1	4.3	3.3	4.6	2.3	3.0	4.2	6.1	5.2	4.8
31	4.5	3.4	4.4	3.8	3.0	3.1	4.6	5.7	6.1	7.5	8.3	10.7	13.1	5.2	5.6	5.9	6.8	7.6	8.1	3.7	3.2	3.2	5.7	4.1	5.7

MIN. 1HR AVG 0.4 07/08/91 23:00:00 ARITHMETIC MEAN 3.8 STANDARD DEV. 2.1

Badc - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration
 BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data
 Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg

10-29-91

11.11-66

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR WINDSPEED IN MILES/HOUR

		AUGUST, 1991																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1		3.5	4.6	4.8	4.3	3.9	4.1	3.6	4.5	5.2	6.2	6.2	6.2	3.7	3.4	5.0	2.6	6.4	3.8	2.7	2.3	1.7	1.9	3.7	3.1	4.0
2		2.7	2.9	2.4	1.8	2.6	4.2	3.4	2.9	5.4	6.6	6.3	5.9	6.6	6.2	5.3	10.2	2.6	2.4	1.0	2.2	2.5	1.2	1.2	1.6	3.7
3		2.0	2.4	1.9	0.9	1.7	1.1	1.0	1.7	3.7	3.5	2.8	2.8	2.8	4.7	3.1	4.9	4.4	5.0	5.0	2.9	1.8	1.3	2.2	4.1	2.8
4		1.8	2.8	2.8	1.3	1.5	0.8	0.9	1.0	3.0	3.3	3.5	3.9	4.4	5.4	5.6	6.2	5.5	4.2	4.3	4.2	3.6	2.9	1.6	2.0	3.2
5		1.1	2.1	1.6	1.2	0.9	0.6	0.5	1.0	1.8	2.3	1.7	3.0	3.7	3.7	4.9	8.9	5.5	4.7	2.8	1.0	4.4	2.5	1.5	1.9	2.6
6		1.2	0.8	1.5	0.9	1.3	2.4	3.1	2.1	3.2	4.8	5.5	5.8	5.8	6.3	6.1	4.8	5.3	2.3	1.9	3.2	3.8	1.1	2.4	2.0	3.2
7		2.0	1.6	2.4	2.2	2.5	3.5	3.7	5.4	7.0	8.0	8.0	7.5	6.3	7.2	5.0	6.5	4.2	4.8	6.4	3.7	3.0	3.5	3.0	3.9	4.6
8		3.9	3.9	3.3	2.3	1.1	3.1	2.5	4.1	4.1	3.9	3.7	4.3	3.8	3.3	2.0	1.9	2.2	1.5	2.5	2.5	1.9	2.9	3.8	2.5	2.9
9		2.4	2.0	0.4	0.6	0.9	1.2	1.2	1.4	2.4	2.9	3.4	3.0	3.8	3.2	11.5	4.6	2.9	5.5	4.6	6.8	5.6	3.0	1.6	2.9	3.2
10		1.9	2.5	1.9	0.9	2.3	1.7	1.2	2.8	3.2	3.4	4.5	4.5	6.4	7.0	8.5	8.5	7.6	7.5	6.7	4.7	3.4	2.0	2.1	1.1	4.0
11		1.4	2.3	1.8	0.7	0.7	1.2	1.1	1.1	3.5	2.8	3.1	3.5	3.3	7.5	5.8	5.8	9.0	6.4	7.3	4.9	5.2	3.4	1.2	1.1	3.5
12		0.6	1.1	1.9	1.8	3.0	1.6	1.7	2.9	2.8	4.5	4.8	5.1	4.7	5.9	6.0	6.9	7.9	6.6	3.2	2.1	3.2	4.1	3.3	4.4	3.7
13		3.0	2.8	1.1	1.9	2.3	2.0	1.1	2.8	2.7	4.3	4.6	2.9	3.8	4.4	5.7	8.2	6.7	5.7	2.9	1.7	2.1	4.1	2.2	3.4	3.4
14		1.9	1.6	1.1	1.8	2.1	2.5	1.5	3.4	5.9	7.1	6.7	6.4	5.9	7.0	9.0	3.7	3.9	2.0	1.9	1.9	1.7	0.7	0.5	0.5	3.3
15		4.0	4.1	2.0	2.0	1.9	1.5	1.5	1.7	3.0	3.0	3.4	3.4	6.7	5.7	1.5	3.9	3.8	1.7	1.5	2.1	6.2	3.1	2.3	1.7	3.0
16		2.0	1.7	1.0	1.1	1.4	1.0	1.6	1.2	2.0	3.5	3.2	3.2	4.1	3.9	3.3	3.8	5.1	3.8	2.9	1.7	1.8	3.9	4.6	1.3	2.6
17		1.0	0.7	0.8	1.8	1.0	1.9	1.4	1.7	3.6	3.3	4.2	4.7	4.0	5.1	4.8	4.5	3.5	3.6	6.0	5.1	3.4	3.5	2.3	4.0	3.1
18		2.9	3.8	3.1	2.2	1.0	1.2	2.2	3.2	4.9	5.8	6.6	6.8	3.5	6.4	5.1	2.9	4.1	4.1	2.9	2.7	3.1	2.6	2.5	1.6	3.5
19		2.5	2.1	1.6	1.6	1.4	1.8	1.6	2.4	3.7	4.4	5.9	7.4	9.0	4.1	6.3	7.3	2.2	2.6	3.6	1.9	2.1	2.3	2.5	2.0	3.4
20		2.7	2.6	2.9	2.6	2.4	6.0	3.0	3.2	2.2	5.4	2.6	1.8	2.5	3.6	6.6	5.9	5.6	1.8	2.0	1.7	2.2	2.2	1.9	2.0	3.1
21		1.2	1.3	1.5	2.3	1.9	2.8	2.6	1.5	1.8	4.4	5.2	7.4	7.8	7.3	10.2	9.7	8.6	8.3	5.5	3.4	4.2	3.1	3.5	6.1	4.6
22		7.6	3.6	3.8	2.5	1.9	1.5	2.2	4.6	4.1	2.8	2.9	5.1	6.2	6.0	5.4	2.7	5.2	5.1	4.9	5.3	5.1	3.9	3.7	4.6	4.2
23		3.6	4.0	4.1	2.9	4.0	4.4	4.9	5.8	5.7	6.9	6.7	6.8	6.7	6.4	5.6	3.5	11.5	9.3	7.3	6.1	5.1	2.6	1.2	3.8	5.3
24		3.3	2.9	3.1	3.3	1.4	2.2	2.4	5.3	6.1	5.7	5.9	7.4	6.7	3.3	1.9	2.3	2.4	6.5	3.2	2.8	1.9	2.7	3.8	4.7	3.8
25		4.0	3.9	3.7	3.9	3.3	2.1	2.2	4.6	5.3	5.7	5.4	8.0	9.2	9.2	9.1	8.5	6.9	2.3	2.4	7.1	10.2	7.4	4.2	2.9	5.5
26		2.6	0.9	0.7	0.7	0.5	0.7	0.6	1.8	3.1	3.6	3.9	3.1	3.7	3.5	3.3	4.0	4.2	4.3	5.4	4.2	2.6	4.3	4.5	4.7	2.9
27		3.6	1.5	2.1	2.7	2.2	1.7	1.7	3.4	4.7	4.3	4.9	6.7	6.4	6.6	5.6	7.0	3.6	4.8	2.7	1.7	1.8	3.0	3.1	4.3	3.7
28		2.5	1.1	1.1	2.3	2.6	1.6	2.5	4.4	4.9	4.7	4.2	3.8	4.4	8.4	6.2	6.4	5.6	5.5	2.4	2.3	1.0	2.8	4.8	3.2	3.7
29		3.7	2.6	1.3	2.6	2.9	2.9	3.1	5.0	5.5	7.1	6.1	6.1	6.7	8.0	7.7	6.0	6.1	4.1	5.2	5.3	4.6	3.6	2.9	3.3	4.7
30		3.4	4.0	3.7	2.9	2.8	3.2	3.5	4.6	5.8	6.9	6.7	6.3	5.7	5.5	5.8	3.4	9.8	5.2	2.3	2.7	1.5	2.3	1.6	3.5	4.3
31		4.1	2.4	1.4	2.6	2.4	1.5	1.5	2.5	4.5	5.0	4.7	4.5	3.5	2.9	2.8	1.8	1.5	2.5	3.3	2.1	0.9	2.0	3.9	3.7	2.8

TOTAL HOURS 744 TOTAL GOOD HOURS 744 DATA CAPTURE 100.0%

MAX. 1HR AVG 11.5 08/23/91 16:00:00 2ND MAX. 1 HR AVG 11.5 08/09/91 14:00:00

MIN. 1HR AVG 0.4 08/09/91 02:00:00 ARITHMETIC MEAN 3.6 STANDARD DEV. 2.0

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

10-21-91

11.11-67

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR WINDSPEED IN MILES/HOUR

SEPTEMBER, 1991																									
DAY	HOUR (EST)																							DAILY AVG	
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22		23
1	3.1	3.5	2.0	1.3	1.7	1.8	1.9	1.9	2.6	2.0	2.6	3.8	3.7	3.5	3.8	3.9	10.2	8.2	5.1	2.8	2.2	3.5	3.2	1.3	3.3
2	1.5	0.8	0.9	2.0	1.1	1.3	1.3	2.7	3.8	4.9	6.2	6.7	6.4	6.5	5.6	5.9	6.1	5.1	5.0	3.8	4.6	2.5	2.7	2.6	3.7
3	2.3	2.3	1.5	2.2	2.1	2.4	2.0	3.4	4.9	6.6	6.8	7.5	8.7	9.3	6.8	8.6	8.4	7.7	5.8	3.8	4.0	3.6	3.4	2.1	4.8
4	3.1	3.0	3.5	3.4	2.9	2.8	2.2	4.1	6.2	8.4	7.9	9.5	8.9	9.6	9.4	8.4	9.4	7.3	5.3	4.7	4.6	3.6	2.7	3.3	5.6
5	3.1	2.9	2.7	2.7	1.9	2.4	1.5	3.3	4.4	5.4	5.9	4.6	4.0	2.8	3.1	3.0	2.7	1.3	5.2	5.4	2.7	2.5	2.6	2.4	3.2
6	1.5	1.1	1.2	1.0	1.6	1.5	2.9	2.4	4.2	4.0	3.8	3.5	3.6	4.5	4.8	4.4	3.9	2.7	6.2	3.2	5.3	2.2	1.9	1.5	3.0
7	1.4	2.5	1.8	2.5	2.2	2.4	2.2	3.4	4.9	5.6	6.2	5.4	5.3	5.4	5.0	4.7	6.3	6.8	3.8	2.6	3.2	3.4	3.5	2.0	3.8
8	1.9	1.7	3.1	2.8	2.3	2.0	3.5	5.1	7.6	7.8	6.7	9.6	11.0	9.3	9.3	9.9	4.8	2.0	1.8	3.0	3.5	3.2	3.7	3.5	4.9
9	1.9	2.5	2.6	3.2	3.7	5.3	6.1	6.0	9.5	7.9	8.8	9.2	10.9	9.2	8.4	8.4	7.9	7.7	8.1	6.1	5.3	3.3	3.7	4.2	6.2
10	4.6	5.0	4.6	3.5	3.1	2.7	2.6	4.1	5.3	6.1	4.9	4.6	3.7	6.8	5.3	8.3	4.8	6.5	5.9	4.6	4.0	4.9	4.4	3.0	4.7
11	2.6	2.7	2.6	2.7	2.9	2.4	3.1	4.6	5.7	4.9	4.9	4.3	3.7	3.8	3.9	4.1	3.5	3.8	2.5	3.3	2.4	1.3	4.6	4.6	3.5
12	3.0	2.7	1.6	2.2	1.6	1.4	2.5	3.1	2.3	2.3	3.1	3.9	3.2	3.1	2.8	3.6	3.2	3.3	0.7	0.8	4.3	6.3	5.7	4.7	3.0
13	2.8	2.1	0.5	0.4	0.9	0.9	0.6	0.8	1.6	1.9	3.4	4.0	4.3	4.0	4.2	4.2	3.5	4.0	3.2	2.6	3.9	5.3	4.9	3.9	2.8
14	3.2	1.9	2.2	2.9	1.3	1.5	1.7	1.6	2.1	2.2	3.8	5.0	5.7	5.1	5.6	5.1	4.6	3.2	1.0	1.2	4.5	6.2	6.3	4.7	3.4
15	4.1	2.7	1.1	1.3	1.3	1.6	3.0	3.5	3.3	2.9	4.2	5.7	6.3	5.9	5.4	6.1	5.0	5.3	5.9	7.6	6.4	5.2	4.6	4.0	4.2
16	3.8	2.6	1.8	1.7	2.0	1.7	2.0	2.9	5.6	5.4	5.1	5.6	5.5	6.6	5.8	5.7	6.3	4.7	5.7	5.0	5.6	3.2	2.9	1.5	4.1
17	0.8	1.2	1.0	1.4	1.6	1.6	1.8	3.1	4.8	5.0	5.0	5.3	4.0	4.0	4.9	4.2	5.2	6.1	4.8	4.6	2.9	2.9	2.6	3.1	3.4
18	3.7	4.1	4.1	1.9	2.5	3.6	2.7	3.4	4.7	4.9	5.2	4.9	4.9	6.9	11.1	9.4	3.4	2.6	1.7	2.3	1.0	2.5	3.6	4.0	4.1
19	4.1	5.2	3.0	1.3	2.2	2.8	3.7	4.9	5.3	5.5	5.4	3.5	4.4	3.7	3.1	3.2	3.3	6.3	4.3	4.0	3.1	1.9	1.4	1.1	3.6
20	1.0	1.3	0.9	2.1	1.2	1.3	0.4	0.7	2.2	2.2	3.4	3.6	3.0	3.1	3.2	3.0	2.8	4.1	4.0	7.0	2.0	2.5	1.3	3.0	2.5
21	2.6	2.4	1.6	4.3	4.2	4.4	4.0	5.5	5.9	7.0	7.0	6.1	5.4	4.7	4.3	5.3	4.6	7.8	8.3	6.9	4.3	2.7	1.2	2.6	4.7
22	2.9	2.6	1.7	1.9	2.4	3.2	3.4	2.9	4.6	6.1	7.1	7.2	7.1	7.3	8.5	10.2	9.7	8.1	7.5	5.8	6.5	5.5	5.6	4.8	5.5
23	4.9	3.6	2.8	3.2	3.8	3.3	3.0	4.3	6.5	6.9	6.5	6.3	6.3	6.3	6.4	5.9	7.4	6.6	4.1	4.2	4.4	2.9	2.7	2.5	4.8
24	2.5	1.6	2.4	3.2	2.4	3.0	2.9	4.3	6.0	6.0	5.4	5.1	4.7	5.0	4.2	3.5	3.9	2.9	3.0	3.9	5.8	2.7	1.6	0.6	3.6
25	0.6	1.1	2.6	2.3	2.3	3.2	2.8	4.4	7.1	7.8	8.5	6.1	3.3	5.9	4.9	8.1	8.7	7.2	3.6	1.8	3.1	2.3	3.1	0.8	4.2
26	0.8	0.9	1.2	1.2	1.8	1.4	3.6	1.2	3.9	5.2	4.5	4.9	6.3	6.9	7.3	8.2	7.7	5.9	4.0	2.4	1.9	1.8	1.7	1.1	3.6
27	1.6	2.4	2.3	2.7	2.4	1.8	2.7	2.8	3.6	3.8	3.9	4.1	3.7	3.5	4.8	4.5	3.9	3.3	3.2	2.9	2.7	2.5	1.7	1.5	3.0
28	2.6	3.2	3.2	3.9	3.4	3.5	4.1	4.3	6.4	9.7	9.8	9.1	8.7	8.5	9.1	10.0	10.4	8.4	5.9	6.1	6.7	3.7	4.9	5.5	6.3
29	4.6	3.3	3.1	3.2	2.2	3.1	3.5	4.6	6.2	7.0	8.2	7.4	5.9	5.7	5.0	4.2	8.8	4.8	5.8	6.2	7.5	7.0	8.1	7.4	5.5
30	5.0	5.3	5.2	5.3	5.8	6.9	6.7	6.4	5.6	8.0	10.4	9.8	8.1	9.8	6.7	9.2	9.9	8.1	8.3	8.7	5.3	5.9	5.9	4.5	7.1

TOTAL HOURS 720 TOTAL GOOD HOURS 720 DATA CAPTURE 100.0X

MAX. 1HR AVG 11.1 09/18/91 14:00:00 2ND MAX. 1 HR AVG 11.0 09/08/91 12:00:00

MIN. 1HR AVG 0.4 09/13/91 03:00:00 ARITHMETIC MEAN 4.2 STANDARD DEV. 2.2

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

10-21-91

11.11-68

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR WIND SPEED IN MILES/HOUR

		OCTOBER, 1991																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1		4.8	4.3	3.2	4.0	5.2	4.7	4.8	4.5	6.8	9.7	8.3	9.5	8.9	5.3	4.8	8.7	5.9	6.8	5.1	4.0	2.3	3.0	3.0	2.4	5.4
2		2.1	2.2	2.2	1.7	1.4	1.4	3.3	2.7	5.5	5.6	7.2	9.8	7.3	9.2	13.2	12.7	11.0	7.5	5.3	3.3	2.0	2.7	2.6	2.5	5.2
3		1.4	2.9	2.1	1.7	1.1	1.3	2.2	2.7	3.9	5.3	6.1	5.5	6.2	6.2	6.1	6.9	3.7	5.2	3.9	3.6	4.4	2.3	3.8	3.7	3.8
4		3.0	1.4	1.4	0.4	1.3	1.5	2.1	3.2	3.7	4.2	4.6	5.3	5.6	5.3	2.6	5.1	3.6	2.2	2.2	2.0	2.9	3.9	2.9	3.0	3.0
5		4.0	3.2	3.4	2.4	2.0	3.6	2.8	3.8	2.8	6.1	6.0	5.4	5.6	4.9	6.4	1.5	5.7	2.1	1.4	1.1	2.6	1.8	1.6	1.9	3.4
6		1.1	2.9	1.7	1.6	2.6	1.1	1.0	0.5	3.0	4.2	4.1	4.7	6.9	6.4	3.7	1.8	0.7	2.5	2.9	2.4	4.8	7.0	5.6	3.7	3.2
7		4.9	4.7	5.0	5.4	4.5	4.2	4.5	4.2	5.3	5.4	6.7	6.9	7.2	7.7	7.3	6.6	9.7	9.3	9.3	7.4	6.7	6.7	7.2	7.6	6.4
8		6.9	6.7	7.1	5.8	6.5	5.9	5.8	6.3	7.7	10.0	11.6	10.1	9.2	10.4	9.4	8.8	9.6	7.9	5.7	4.7	5.1	4.7	5.9	4.8	7.3
9		4.3	4.9	4.9	4.5	4.9	3.6	4.1	4.9	6.2	7.4	8.9	9.1	9.0	9.7	9.1	8.4	6.9	5.1	3.7	4.4	6.7	5.9	5.0	4.5	6.1
10		4.2	3.1	3.9	3.0	3.6	3.4	4.1	5.4	5.5	5.7	5.0	4.1	3.9	3.2	3.1	3.5	3.3	2.0	Down	Bad<	1.4	2.1	2.2	1.3	3.5
11		1.2	1.2	0.8	0.9	1.1	1.1	1.5	1.5	3.8	4.1	4.6	4.3	4.1	2.9	3.6	4.3	4.7	5.4	4.7	1.9	2.0	1.3	1.7	1.9	2.7
12		2.1	1.0	0.5	0.3	0.5	0.1	0.6	1.3	2.7	2.8	5.4	6.9	7.4	6.4	9.9	10.8	10.1	6.2	3.2	1.6	1.9	1.5	1.3	1.4	3.6
13		1.6	1.4	0.9	1.3	0.8	0.4	0.5	1.5	2.3	3.8	4.9	3.7	3.7	4.2	3.7	2.8	2.1	0.4	1.4	2.4	2.2	2.1	3.9	3.0	2.3
14		4.3	5.4	4.2	3.6	3.6	2.5	2.2	3.3	3.6	5.9	7.6	7.7	8.2	6.2	6.5	5.4	2.6	1.2	2.3	4.5	4.3	4.0	4.2	3.8	4.4
15		3.3	2.8	3.2	3.3	2.8	2.6	2.2	2.6	3.4	2.9	5.8	5.5	5.3	6.0	5.0	5.5	4.6	4.2	3.5	4.4	2.3	1.6	2.0	2.0	3.6
16		2.7	3.1	2.8	1.0	4.3	5.3	5.0	3.8	5.7	6.7	6.3	6.3	6.6	6.3	6.1	6.1	5.3	3.4	2.3	2.5	2.3	1.7	1.5	2.1	4.1
17		2.6	4.3	3.9	2.5	2.8	1.2	1.3	1.9	4.2	5.9	6.6	5.7	5.7	5.3	4.9	4.5	4.2	1.8	1.7	2.1	2.1	3.4	4.3	4.2	3.6
18		3.3	2.2	2.8	2.3	3.1	3.7	3.5	4.0	7.0	8.3	9.0	8.6	8.5	8.8	7.4	7.5	7.1	6.6	5.2	5.6	5.2	4.2	3.9	4.1	5.5
19		3.7	3.5	3.2	3.4	3.6	3.9	4.3	4.3	6.7	7.4	6.9	6.2	4.9	5.2	5.8	5.1	4.5	2.5	2.4	2.9	3.7	4.4	4.5	3.5	4.4
20		3.6	4.4	3.6	3.6	4.7	4.4	3.8	4.6	6.3	6.3	5.0	3.6	4.2	3.7	4.6	6.3	4.1	3.5	3.9	4.6	4.6	6.0	5.8	4.1	4.5
21		5.2	4.4	3.7	3.5	3.0	3.7	3.6	3.5	5.2	6.7	7.2	6.3	6.0	5.0	4.3	5.1	5.5	5.2	6.3	6.8	7.6	5.5	2.9	3.0	4.9
22		3.5	4.7	4.2	4.0	3.5	4.3	3.8	4.1	5.3	7.1	8.6	6.9	6.8	6.5	6.9	6.6	5.7	4.3	4.0	4.2	4.4	2.6	1.8	1.5	4.8
23		0.8	1.4	2.4	3.1	3.2	2.8	2.4	3.7	6.3	9.6	10.7	10.1	8.7	10.9	9.6	12.6	13.1	Down	Bad<	Down	5.4	6.0	4.2	4.9	6.3
24		4.8	5.1	5.4	4.3	3.9	5.0	4.8	6.3	8.1	10.3	11.9	12.1	12.4	13.5	12.3	11.1	10.7	9.1	8.2	7.2	8.0	7.4	5.3	4.4	8.0
25		4.3	3.5	4.2	4.3	5.7	4.5	4.6	6.2	8.0	10.4	12.5	13.5	12.6	12.3	11.7	8.7	7.4	4.4	5.0	3.7	5.2	6.1	4.3	4.9	7.0
26		4.1	4.4	4.0	4.0	3.3	4.7	4.6	4.9	6.3	8.6	10.1	12.3	13.1	11.0	9.2	6.9	5.8	2.3	4.3	7.6	5.6	4.6	3.7	3.5	6.2
27		4.8	4.8	4.4	3.5	3.4	3.7	3.4	4.1	6.1	8.0	8.7	10.1	7.9	7.5	7.0	7.9	7.5	4.6	4.3	4.6	4.1	4.4	3.4	3.3	5.4
28		3.6	3.2	3.2	2.6	2.6	2.1	2.3	2.5	5.1	4.6	5.4	PwrF	PwrF	6.1	6.5	6.9	6.5	4.4	4.1	5.1	5.7	4.7	5.2	4.7	4.4
29		4.2	3.2	1.8	2.5	2.2	2.5	2.7	2.9	5.1	5.9	8.6	10.3	9.7	6.3	4.1	8.8	10.7	10.0	8.6	6.8	4.1	5.2	5.0	3.6	5.6
30		4.1	4.3	4.5	4.1	4.6	4.0	4.5	5.2	9.5	11.7	13.1	13.1	9.6	9.2	9.7	9.5	8.0	Down	5.5	6.2	6.5	5.6	4.2	3.6	6.9
31		PwrF	PwrF	PwrF	PwrF	PwrF	2.1	2.4	3.7	3.1	4.0	3.8	3.1	3.2	3.8	3.0	3.3	2.4	1.9	1.9	1.4	2.2	2.7	3.6	Bad<	

TOTAL HOURS 744 TOTAL GOOD HOURS 730 DATA CAPTURE 98.1%

MAX. 1HR AVG 13.5 10/25/91 11:00:00 2ND MAX. 1 HR AVG 13.5 10/24/91 13:00:00

MIN. 1HR AVG 0.1 10/12/91 05:00:00 ARITHMETIC MEAN 4.8 STANDARD DEV. 2.6

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

02/17/92

11.11-69

HOURLY AVERAGES FOR WIND SPEED IN MILES/HOUR

NOVEMBER, 1991

TOTAL HOURS	720	TOTAL GOOD HOURS	716	DATA CAPTURE	99.4%
MAX. 1HR AVG	15.9	11/29/91 12:00:00	2ND MAX. 1 HR AVG	14.3	11/29/91 11:00:00
MIN. 1HR AVG	0.3	11/11/91 07:00:00	ARITHMETIC MEAN	4.9	STANDARD DEV. 2.3

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration
BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data
Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg

02/17/92

11.11-70

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR WIND SPEED IN MILES/HOUR

		DECEMBER, 1991																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1		3.9	3.3	5.1	6.0	4.6	4.7	5.2	6.2	5.5	7.2	8.1	8.2	7.1	7.6	6.8	6.1	4.4	3.5	3.3	3.3	3.8	3.9	4.8	3.7	5.2
2		2.7	2.8	3.1	4.1	4.6	4.5	5.0	5.1	5.5	8.2	10.7	10.3	10.4	9.9	8.3	7.9	6.4	4.4	1.7	3.4	2.7	1.0	3.5	4.3	5.4
3		4.0	5.9	6.0	7.0	5.7	6.1	5.3	7.6	8.9	9.9	10.1	10.6	12.2	11.7	12.0	11.7	10.2	8.4	7.7	7.0	4.4	7.1	6.3	4.8	7.9
4		5.9	5.0	3.9	5.1	6.0	7.5	6.0	5.5	5.1	5.5	4.4	5.2	6.8	6.0	4.8	4.4	4.9	2.5	1.5	1.9	1.9	3.2	4.4	3.5	4.6
5		3.5	4.0	4.1	4.6	5.0	6.1	4.6	4.6	5.5	7.0	7.0	6.9	7.3	7.8	7.9	7.0	5.6	3.0	3.1	3.6	3.4	3.0	3.2	3.7	5.0
6		3.6	4.7	5.6	5.0	3.3	4.5	3.7	3.0	3.4	5.9	5.2	6.6	6.1	6.4	5.7	5.2	4.0	1.4	2.0	3.9	6.3	3.6	2.8	3.8	4.4
7		4.1	3.5	3.5	4.3	4.3	2.6	1.9	2.4	3.0	3.2	4.5	5.8	6.0	6.5	6.2	4.7	3.3	2.1	2.2	2.0	2.5	3.1	3.3	5.5	3.7
8		6.4	4.6	6.0	2.6	2.1	3.8	3.1	2.6	3.9	6.4	8.3	8.4	6.7	4.9	4.0	5.1	5.2	2.6	2.9	3.5	3.7	4.4	3.7	3.5	4.5
9		2.2	1.5	1.2	2.1	1.8	1.7	1.5	1.5	1.7	2.2	4.1	4.8	4.7	4.1	3.9	2.2	0.7	0.6	1.1	3.9	2.0	2.0	1.2	0.6	2.2
10		0.3	0.5	0.5	0.4	0.2	0.8	1.0	1.1	1.7	4.1	5.8	7.4	6.8	6.6	7.2	7.1	6.0	5.9	4.8	3.3	1.7	1.6	1.3	3.4	3.3
11		2.8	3.3	1.7	2.3	3.0	2.4	2.4	3.4	4.1	4.0	4.3	4.3	4.6	4.2	3.4	4.1	2.9	1.9	1.9	2.1	3.1	3.8	3.7	3.6	3.2
12		3.6	3.1	5.0	5.0	4.4	4.4	3.8	3.7	4.0	5.1	5.2	5.1	7.8	7.2	5.9	8.1	7.8	5.6	4.1	4.2	5.3	6.1	5.6	4.1	5.2
13		3.3	2.7	2.8	2.7	2.5	2.4	2.4	3.1	3.5	5.0	6.0	7.2	6.8	6.5	5.3	3.9	3.3	0.5	1.2	2.2	2.4	1.9	2.0	4.0	3.5
14		3.1	2.4	2.7	2.1	2.2	1.5	1.5	0.7	2.1	5.3	7.1	6.4	7.7	7.6	7.1	7.7	7.2	5.2	3.5	2.3	2.0	2.2	2.9	2.4	3.9
15		4.1	5.0	5.0	3.7	3.4	4.7	4.1	4.7	7.0	9.0	9.3	8.4	9.0	8.9	8.1	7.8	7.5	6.9	6.5	5.4	5.8	6.0	5.8	3.9	6.2
16		4.9	5.2	4.7	5.1	6.6	7.2	7.0	7.8	8.5	7.8	7.8	8.5	8.3	8.0	7.8	6.8	4.9	4.2	4.2	4.1	4.2	4.6	4.9	4.5	6.1
17		4.2	4.8	4.4	3.4	5.3	5.2	3.5	3.6	5.1	6.0	6.4	7.1	7.7	7.3	7.1	6.9	5.3	2.2	2.1	2.4	2.3	2.5	2.9	3.8	4.6
18		3.3	4.5	4.2	4.2	4.3	4.4	4.3	3.7	3.0	4.2	5.4	5.1	4.1	4.0	4.3	3.1	2.7	2.0	2.5	2.7	3.3	3.8	4.5	3.4	3.8
19		3.1	4.3	4.9	6.1	5.6	6.1	7.3	6.5	8.6	9.2	9.7	12.3	14.8	14.7	15.2	15.3	13.7	11.6	11.8	12.4	11.3	10.5	10.6	9.6	9.8
20		8.0	6.8	5.9	6.3	5.9	5.6	3.8	4.3	4.9	7.3	12.2	16.9	16.5	17.2	16.8	12.6	11.8	9.7	6.4	3.9	4.4	4.7	2.9	1.7	8.2
21		2.5	2.6	2.4	2.8	2.8	2.0	2.0	2.1	3.3	4.5	6.6	4.9	4.4	4.5	3.6	2.3	2.3	1.2	1.8	1.8	1.7	2.9	3.8	3.4	3.0
22		2.7	2.6	2.3	2.5	2.1	2.2	1.9	1.4	1.2	1.6	2.4	3.8	4.5	4.7	3.4	3.7	3.5	1.6	2.6	2.2	1.9	1.4	1.7	1.5	2.4
23		1.6	1.1	1.3	1.2	0.9	0.4	1.1	0.9	0.9	2.4	4.5	8.0	8.9	9.5	8.9	9.4	8.4	5.3	2.8	2.3	2.2	1.8	2.3	2.8	3.7
24		5.3	5.3	4.0	3.4	4.5	3.8	2.7	1.4	3.7	6.4	6.7	6.4	6.4	5.7	6.4	4.8	3.3	3.4	3.1	2.9	4.1	3.8	3.8	2.9	4.3
25		2.4	2.5	2.5	2.3	2.2	2.1	2.2	2.0	3.2	3.3	5.2	3.0	3.0	2.1	3.0	2.7	1.8	0.7	0.9	1.2	1.6	2.5	2.3	2.8	2.4
26		2.2	1.6	2.5	2.7	3.0	2.6	3.5	4.8	4.2	4.0	5.4	4.9	5.4	6.0	6.7	5.6	3.3	1.7	2.1	3.4	3.1	2.5	1.5	0.9	3.5
27		1.2	1.4	2.4	2.5	2.7	2.3	3.8	3.0	2.8	4.3	6.3	8.0	7.6	5.9	6.1	5.1	3.4	1.8	2.2	2.7	4.3	1.5	0.9	1.2	3.5
28		0.4	1.9	3.0	2.4	3.6	3.3	2.3	2.1	2.4	2.9	4.2	6.0	7.2	8.1	6.7	5.6	6.8	3.9	4.7	4.7	2.8	2.1	1.3	1.6	3.7
29		1.6	1.4	1.5	2.9	4.6	1.9	2.4	1.5	2.7	4.6	5.5	6.7	8.2	7.0	5.2	6.5	4.9	3.1	1.6	1.6	2.2	1.3	1.0	0.9	3.3
30		0.8	1.3	0.9	0.4	0.9	0.8	1.6	1.7	1.5	3.5	4.3	5.2	6.5	6.5	6.0	5.2	3.5	2.7	3.9	2.8	2.1	3.0	3.0	2.4	2.9
31		2.8	3.9	3.0	3.5	4.2	3.5	2.8	3.0	3.9	3.4	4.5	5.7	6.4	7.3	6.6	6.0	5.4	5.6	4.2	5.5	6.6	5.6	6.5	5.9	4.8

TOTAL HOURS 744 TOTAL GOOD HOURS 744 DATA CAPTURE 100.0%

MAX. 1HR AVG 17.2 12/20/91 13:00:00 2ND MAX. 1 HR AVG 16.9 12/20/91 11:00:00

MIN. 1HR AVG 0.2 12/10/91 04:00:00 ARITHMETIC MEAN 4.5 STANDARD DEV. 2.7

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

02/17/92

11.11-71

TEC AQ - 1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR WIND SPEED IN MILES/HOUR

DAY	JANUARY 1992																								DAILY AVG
	HOUR (EST) 00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1	4.8	5.1	5.3	3.9	3.7	3.5	4.0	6.0	6.3	7.2	6.9	8.0	7.2	6.9	6.6	5.8	3.9	5.0	5.8	4.9	4.8	4.3	3.2	3.4	5.2
2	3.2	4.6	5.1	4.8	4.4	5.5	4.7	4.0	3.8	5.4	6.9	7.0	7.1	7.8	6.5	6.3	6.9	5.0	2.2	1.8	2.1	3.7	3.4	3.2	4.8
3	3.1	2.7	2.7	1.8	2.3	5.0	4.9	5.7	4.3	5.6	7.7	9.3	10.2	9.8	11.4	13.5	12.2	9.0	5.8	3.1	1.2	1.6	2.9	3.7	5.8
4	3.6	3.6	4.2	6.7	7.8	7.0	5.1	5.2	7.8	11.1	10.8	10.3	9.6	13.0	11.7	12.6	10.4	8.6	6.8	5.5	4.1	4.2	3.4	1.6	7.2
5	2.1	2.1	2.6	2.1	2.1	2.2	1.8	1.7	1.7	3.6	4.0	5.3	4.7	5.2	6.2	4.6	5.8	5.7	4.2	3.6	2.9	2.0	1.4	0.8	3.2
6	0.6	1.4	1.4	0.8	1.0	0.5	0.7	1.8	2.4	4.7	6.9	8.9	8.9	8.5	8.9	8.9	8.3	6.5	4.9	5.0	4.1	3.0	2.3	1.6	4.2
7	1.8	2.5	2.1	2.4	2.3	2.2	1.6	1.9	2.3	3.7	3.7	3.9	3.3	3.3	3.1	4.3	2.9	1.6	1.6	2.0	1.5	2.2	3.8	4.4	2.7
8	3.7	3.7	1.9	1.6	3.4	4.3	4.3	5.2	5.5	5.0	5.8	8.0	7.2	6.6	6.7	7.3	5.9	3.9	2.1	2.1	5.1	5.0	5.1	3.6	4.7
9	3.9	3.0	0.9	1.6	1.1	1.3	1.1	0.7	2.0	4.1	7.4	8.4	8.9	9.2	9.1	8.5	9.3	5.9	3.2	2.9	Cal	2.6	3.1	3.2	4.4
10	3.0	3.1	3.6	3.5	2.8	3.6	3.1	3.4	4.1	5.0	6.3	8.0	9.5	9.7	9.3	7.7	6.7	4.7	4.7	4.8	2.7	3.1	3.4	2.4	4.9
11	4.4	5.8	5.5	4.8	4.2	3.4	2.8	3.1	4.7	4.8	5.9	6.4	4.9	6.3	6.4	6.0	5.1	3.1	1.7	0.7	2.2	2.2	2.1	2.9	4.1
12	3.6	3.7	4.9	5.7	4.7	5.8	6.0	5.9	6.4	7.2	9.4	10.1	8.6	8.2	7.9	6.2	4.9	4.3	3.6	4.5	5.1	7.6	6.1	5.3	6.0
13	3.7	3.4	2.9	4.8	4.3	3.3	4.0	3.9	5.8	9.1	10.9	11.1	12.1	10.3	11.5	12.3	12.0	9.5	7.2	6.8	6.0	6.0	6.2	6.1	7.2
14	7.3	7.9	8.1	8.9	10.9	11.6	7.3	6.9	7.9	8.4	10.3	10.4	13.5	13.4	13.5	12.0	10.8	8.6	8.1	5.4	3.7	1.3	1.5	1.3	8.3
15	1.5	1.4	1.5	2.5	4.0	4.8	3.7	3.6	5.5	6.5	5.1	4.1	4.9	6.6	6.2	5.1	5.0	3.5	1.9	2.2	1.8	1.1	1.3	1.6	3.5
16	2.0	2.4	3.2	3.8	2.5	3.5	4.9	4.5	5.9	7.3	7.0	7.3	7.9	8.1	8.6	6.4	5.4	3.2	2.8	2.1	2.0	1.9	2.7	2.3	4.5
17	3.7	3.8	3.8	3.6	3.6	4.0	3.2	3.5	4.3	5.3	4.3	4.1	4.2	4.6	3.2	2.9	2.8	2.3	1.9	3.0	3.1	3.1	3.9	3.2	3.5
18	2.9	3.9	3.1	2.6	2.8	2.1	2.0	2.4	3.4	4.4	5.2	5.5	4.8	5.3	4.8	4.9	3.2	1.2	1.3	0.6	1.8	1.6	1.4	3.0	3.1
19	2.2	2.0	1.5	1.9	2.8	3.8	4.4	4.8	4.1	5.0	4.8	3.8	4.8	7.9	7.0	5.7	5.1	7.1	7.1	6.2	6.8	7.0	7.1	6.4	4.9
20	7.6	6.4	6.1	6.5	6.3	5.5	5.2	4.1	4.5	4.9	5.8	5.4	5.9	6.3	6.5	5.5	5.9	4.3	2.9	3.7	3.1	3.0	2.9	3.1	5.0
21	2.9	3.0	2.2	2.5	3.8	3.3	4.2	3.3	2.8	4.3	6.0	5.6	5.0	5.7	4.3	5.0	4.5	2.7	2.7	2.1	4.0	4.6	5.1	4.0	3.9
22	4.2	4.3	4.3	4.7	4.6	4.2	3.4	4.6	5.2	7.5	9.3	10.2	9.9	8.7	8.4	7.7	7.3	5.4	5.4	6.3	7.9	8.5	7.4	7.1	6.5
23	7.3	7.7	4.7	3.6	6.8	9.0	10.3	10.5	10.1	11.6	12.0	13.0	15.3	15.7	14.3	8.6	8.9	6.1	4.2	4.4	4.7	5.0	8.1	6.1	8.6
24	4.1	4.8	5.0	5.0	4.4	4.5	4.5	4.1	5.5	5.5	4.5	4.4	4.9	5.4	7.8	7.7	5.6	3.7	1.9	2.1	2.0	1.5	2.0	2.1	4.3
25	2.7	4.2	3.8	3.6	4.7	3.2	3.0	3.2	3.4	5.4	7.3	7.0	6.8	5.6	3.8	2.6	2.7	2.9	3.5	3.4	3.7	3.1	2.9	3.3	4.0
26	3.6	2.4	1.8	5.1	3.9	3.7	1.6	3.3	4.3	4.7	5.5	7.0	8.0	9.0	9.9	9.3	6.6	4.6	2.7	2.5	2.9	2.9	3.7	3.8	4.7
27	4.5	4.7	5.2	4.8	3.6	3.5	3.9	3.5	4.2	7.0	7.8	11.6	10.1	10.8	8.6	8.0	5.4	4.5	4.8	3.1	2.9	3.1	3.5	3.8	5.5
28	4.7	3.6	3.8	3.5	4.0	4.1	3.9	4.2	3.3	4.3	6.7	7.6	7.0	5.8	7.2	4.4	3.8	3.2	4.7	4.2	2.6	2.1	3.0	2.8	4.3
29	2.7	2.5	2.0	2.0	2.7	1.8	2.3	2.6	2.1	1.9	2.3	2.0	3.7	4.9	5.2	4.0	6.1	5.3	3.8	2.7	4.0	4.4	5.1	4.4	3.3
30	2.8	3.9	2.1	2.0	2.2	3.3	2.4	2.4	3.9	2.9	5.9	7.7	6.9	8.9	11.0	12.0	13.1	12.0	9.3	8.4	8.7	7.2	7.3	7.1	6.4
31	7.5	7.8	9.1	8.9	7.5	5.1	6.0	4.3	4.5	7.4	8.0	8.5	8.3	9.1	9.2	7.9	9.6	9.5	7.9	6.6	4.3	3.7	3.5	3.8	7.0

TOTAL HOURS 744 TOTAL GOOD HOURS 743 DATA CAPTURE 99.9%

MAX. 1HR AVG 15.7 01/23/92 13:00:00 2ND MAX. 1 HR AVG 15.3 01/23/92 12:00:00

MIN. 1HR AVG 0.5 01/06/92 05:00:00 ARITHMETIC MEAN 5.0 STANDARD DEV. 2.7

KEY FOR MISSING CODES

Bad< - To few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, Pwrf - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

11.11-72

TEC AQ - 1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR WIND SPEED IN MILES/HOUR

		FEBRUARY 1992																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1		4.0	4.3	3.1	3.1	2.8	2.6	2.6	2.0	2.2	3.9	5.4	7.0	7.2	8.0	9.1	9.3	9.1	7.0	5.3	3.3	2.4	2.6	2.1	1.9	4.6
2		2.5	1.5	1.4	2.3	3.3	3.1	1.7	1.8	2.2	5.6	7.4	7.0	5.2	5.9	6.6	6.2	5.3	4.5	4.0	5.3	6.2	6.7	6.0	6.2	4.5
3		5.9	5.1	4.6	3.8	2.6	3.0	3.3	3.4	5.5	6.7	5.7	6.2	4.2	4.8	4.1	4.4	5.6	3.9	1.9	3.0	5.2	5.0	3.8	4.0	4.4
4		4.5	4.3	4.0	1.9	2.1	1.9	2.8	3.5	4.9	7.4	8.6	8.8	8.2	8.8	8.2	8.4	6.5	3.9	2.5	4.1	4.5	5.0	5.5	6.2	5.3
5		7.8	7.3	7.6	9.7	8.1	8.0	1.8	4.1	7.2	9.0	8.3	10.9	10.8	10.3	10.8	11.3	10.0	9.7	8.9	6.5	7.4	5.2	3.7	5.8	7.9
6		4.6	4.5	4.7	4.1	5.3	4.4	4.8	5.7	5.5	10.3	12.9	13.2	14.5	16.0	15.9	12.9	11.4	9.6	7.8	7.6	7.5	8.2	7.5	7.6	8.6
7		7.6	6.9	6.8	6.0	6.0	5.6	5.9	4.5	5.8	4.6	6.0	5.7	4.7	7.1	11.7	10.3	9.3	8.8	6.1	5.9	5.0	3.9	2.4	3.5	6.2
8		5.1	3.7	3.6	2.5	2.8	2.5	1.4	1.3	2.1	4.1	5.6	6.7	9.6	9.3	8.8	10.6	9.0	6.3	5.6	5.4	2.8	2.8	2.5	1.8	4.8
9		2.3	2.8	3.1	3.9	4.0	3.8	4.4	3.9	5.5	8.8	7.7	6.4	6.3	5.1	5.4	5.4	4.8	3.8	3.2	3.7	4.3	5.5	5.9	5.1	4.8
10		5.7	5.6	4.8	4.8	4.6	4.3	4.3	4.7	5.7	5.9	7.3	8.4	9.7	8.4	8.3	7.1	6.9	5.5	3.9	4.2	3.7	3.8	3.2	5.2	5.6
11		4.6	4.0	5.2	4.9	4.8	4.9	4.7	4.0	5.0	4.9	4.9	4.4	4.6	5.1	6.1	5.0	5.0	3.6	3.0	3.0	3.2	3.7	6.9	4.0	4.5
12		3.0	3.0	2.7	2.7	4.9	5.0	4.2	4.7	4.8	5.7	5.0	5.9	6.8	6.2	5.9	4.2	3.7	2.2	1.0	1.3	1.5	1.1	2.0	1.5	3.7
13		1.9	1.3	0.7	1.3	1.6	0.9	1.7	2.0	3.4	3.6	3.5	4.7	3.4	5.1	4.3	4.1	5.2	4.6	2.7	1.8	2.1	1.1	0.8	0.9	2.6
14		1.0	1.8	1.1	1.5	2.4	2.7	2.6	2.2	2.4	4.0	5.6	5.4	5.0	5.2	3.6	2.4	6.0	3.2	2.6	2.6	2.4	3.2	1.0	2.6	3.0
15		2.6	2.6	2.5	2.0	2.0	2.4	2.8	2.4	2.8	7.0	11.0	9.6	9.0	9.0	9.6	10.4	10.8	10.6	7.6	2.6	2.6	2.8	3.8	4.4	5.6
16		3.2	3.0	2.4	2.0	2.4	2.6	2.4	2.7	4.8	4.4	5.0	6.8	9.6	9.0	9.0	6.0	9.0	7.0	2.6	2.6	2.4	2.0	2.0	2.2	4.4
17		1.4	1.0	1.6	3.0	2.4	2.0	4.0	5.0	7.0	7.6	11.0	11.0	9.2	9.2	9.6	9.0	7.0	6.6	3.0	7.0	3.6	2.0	2.6	5.2	5.5
18		3.6	5.0	4.0	3.0	2.8	3.6	2.8	2.4	5.0	7.0	7.6	8.0	7.0	7.0	7.0	7.0	6.4	5.6	7.6	6.0	5.0	3.0	3.0	5.0	5.2
19		4.0	3.6	4.2	4.2	6.0	6.0	7.4	7.2	8.0	7.0	8.4	9.6	9.6	9.8	9.8	9.6	5.0	3.0	1.4	1.6	2.2	2.2	1.0	1.0	5.5
20		1.0	1.4	1.4	3.2	3.0	3.0	4.2	8.0	10.0	10.0	10.0	9.2	8.2	8.2	7.0	7.0	6.0	6.4	7.4	7.6	7.4	6.0	6.0	7.0	6.2
21		5.0	5.0	5.0	6.0	6.0	5.6	6.0	5.7	7.0	7.4	9.0	11.0	8.4	8.0	8.0	9.0	9.2	10.0	7.0	7.0	7.2	7.2	7.6	8.0	7.3
22		8.0	5.0	4.2	4.6	5.0	3.0	5.0	5.2	5.6	9.0	9.0	8.0	8.0	7.2	7.6	5.0	5.0	7.0	5.2	3.3	3.0	3.0	3.0	1.8	5.4
23		2.0	4.0	2.2	2.2	1.6	3.0	5.6	5.8	5.8	7.0	9.0	9.0	8.0	7.8	7.8	8.4	9.0	8.0	6.0	3.6	3.0	3.0	1.4	1.4	5.2
24		1.6	2.4	2.0	2.0	3.4	3.0	2.4	3.0	4.8	4.0	6.0	6.0	5.0	5.0	7.0	5.0	5.6	7.0	5.0	3.0	2.8	3.0	6.0	6.4	4.2
25		7.9	3.1	2.5	5.6	6.4	6.4	5.8	4.6	PwrF	7.2	8.1	8.4	4.9	6.1	7.2	12.1	11.1	5.1	4.2	6.2	9.2	8.1	3.5	2.4	6.3
26		2.6	3.6	3.4	5.4	5.8	5.2	5.1	7.4	8.5	7.7	11.3	14.7	PwrF	PwrF	16.1	16.3	14.5	12.7	12.5	9.6	9.7	7.7	7.9	8.3	8.9
27		9.2	7.3	5.9	6.2	5.0	5.1	4.5	4.7	4.0	4.6	8.2	10.5	10.0	9.2	11.1	11.0	10.1	9.0	5.9	3.1	3.2	1.6	1.1	1.3	6.3
28		1.5	1.6	2.7	2.6	3.1	1.1	0.9	1.3	3.2	4.9	6.2	10.1	10.0	10.8	11.5	12.1	11.4	9.9	6.3	4.7	4.6	4.8	4.3	2.9	5.5
29		3.9	3.0	5.2	5.5	3.2	2.1	2.2	2.5	5.2	7.6	12.4	10.2	9.1	8.1	8.6	9.4	9.7	9.2	6.0	4.5	4.5	3.5	2.2	2.1	5.8

TOTAL HOURS 696 TOTAL GOOD HOURS 693 DATA CAPTURE 99.6%

MAX. 1HR AVG 16.3 02/26/92 15:00:00 2ND MAX. 1 HR AVG 16.1 02/26/92 14:00:00

MIN. 1HR AVG 0.7 02/13/92 02:00:00 ARITHMETIC MEAN 5.4 STANDARD DEV. 2.9

KEY FOR MISSING CODES

Bad< - To few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

TEC AQ - 1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR WIND SPEED IN MILES/HOUR

		MARCH 1992																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1		2.7	2.4	3.0	2.6	2.1	1.5	1.9	1.7	1.8	2.8	3.7	4.1	4.5	4.9	4.6	3.6	2.6	1.7	2.2	3.7	2.6	2.3	1.9	1.8	2.8
2		2.1	2.4	2.7	2.4	3.3	3.2	3.0	2.8	3.4	5.3	5.4	5.6	6.0	5.2	4.2	3.6	3.4	2.7	1.6	1.2	3.0	3.3	3.6	4.0	3.4
3		4.1	3.8	3.1	3.0	3.1	2.5	3.2	1.5	2.2	4.1	4.5	6.6	5.4	6.5	6.0	6.3	4.9	2.9	4.8	6.9	7.4	6.1	5.6	4.3	4.5
4		4.1	3.2	2.9	3.1	2.7	2.9	2.7	2.7	3.0	5.4	10.1	9.5	7.3	6.7	5.2	5.4	6.0	6.2	5.9	5.2	3.1	5.4	6.7	7.8	5.1
5		8.1	7.2	6.8	6.7	6.2	6.3	5.8	5.7	7.5	9.5	10.3	10.4	9.7	10.4	9.0	8.4	7.4	5.0	5.2	7.8	7.7	6.3	6.3	6.2	7.5
6		6.5	5.8	6.1	5.0	4.0	4.2	4.0	4.9	7.4	9.1	9.8	7.9	8.7	8.0	6.1	8.4	11.2	10.2	7.8	5.6	4.5	2.6	1.8	2.0	6.3
7		2.6	1.4	2.5	2.1	3.3	3.4	3.8	4.0	4.2	4.6	6.1	6.7	9.5	10.8	11.2	11.7	10.0	8.3	7.1	5.9	4.9	6.1	5.7	5.5	5.9
8		4.7	4.8	4.8	3.4	2.8	2.8	2.3	1.2	2.5	3.0	3.7	3.7	4.6	4.9	3.1	4.5	3.4	3.0	5.9	3.7	3.2	2.5	2.8	2.9	3.5
9		2.2	2.5	3.0	2.5	1.8	2.1	3.1	3.5	4.2	5.7	8.0	8.5	8.7	8.5	7.9	7.5	5.3	7.0	4.2	1.7	2.6	1.6	1.0	3.1	4.4
10		2.8	3.2	2.9	2.0	2.8	2.8	3.9	5.1	7.4	8.9	9.7	10.9	12.0	12.3	13.2	13.5	12.5	12.5	10.7	9.2	8.4	4.7	3.2	3.9	7.4
11		3.2	4.3	6.4	5.9	5.8	7.0	6.2	6.5	6.8	6.2	5.8	5.1	4.7	6.5	6.4	5.4	5.4	8.0	6.6	4.0	2.4	1.6	1.4	2.4	5.1
12		2.0	2.3	3.4	4.1	2.7	2.9	3.4	3.1	3.1	4.5	4.9	3.5	2.2	3.4	3.4	2.7	2.0	1.7	1.8	2.4	2.5	2.1	1.8	2.9	2.9
13		1.4	1.5	1.3	1.9	1.4	1.3	1.4	1.2	2.4	3.9	4.7	5.4	6.2	6.3	6.3	8.2	8.6	7.0	5.7	4.8	3.6	1.7	2.2	1.9	3.7
14		2.5	1.8	1.5	2.0	0.9	1.3	1.5	2.7	4.3	4.5	3.7	4.7	4.4	4.9	4.5	4.5	6.4	6.7	5.5	5.2	4.7	3.0	2.3	2.9	3.6
15		3.4	3.0	2.9	3.0	2.9	2.3	2.2	3.2	5.0	7.1	7.8	7.8	6.9	7.2	8.4	11.2	11.1	10.2	7.4	6.2	5.3	4.3	4.9	5.5	5.8
16		5.8	5.8	4.9	4.1	3.1	2.9	1.9	4.5	7.1	8.9	8.2	7.4	7.3	6.8	6.2	5.8	5.5	4.6	5.0	7.6	7.3	8.2	6.7	5.0	5.8
17		4.8	4.1	4.2	4.2	4.8	5.7	4.1	4.9	6.9	8.4	8.1	6.3	5.7	5.3	5.0	3.8	4.1	3.0	3.8	4.3	3.0	4.9	3.4	3.1	4.8
18		4.2	4.8	4.3	3.6	4.2	2.6	3.1	5.1	7.0	9.9	10.6	9.6	10.1	9.3	7.7	6.6	8.4	8.2	7.0	3.2	3.3	3.6	3.2	2.0	5.9
19		2.6	4.4	5.0	4.6	2.8	3.9	5.0	5.0	8.1	12.7	16.6	15.8	16.5	15.3	17.0	15.2	12.9	12.5	9.4	7.1	6.9	6.1	7.6	8.3	9.2
20		8.4	10.1	8.2	6.0	5.6	6.4	6.7	7.3	7.7	10.6	13.3	15.7	15.2	15.4	14.1	12.3	12.8	12.6	9.6	5.6	4.7	4.3	3.6	3.8	9.1
21		1.6	3.9	3.4	3.8	1.7	2.2	3.3	4.7	5.1	6.1	7.0	5.7	4.8	5.3	4.4	3.1	2.5	2.0	2.5	3.0	3.1	2.8	2.3	2.0	3.6
22		2.7	2.6	1.9	3.1	2.9	1.5	2.2	3.3	4.9	5.5	6.4	8.1	9.0	8.1	5.9	3.8	3.7	1.8	1.4	2.4	4.2	4.1	4.8	5.2	4.1
23		4.1	5.5	5.3	7.0	6.2	4.9	4.4	4.0	8.4	11.9	12.3	11.8	12.3	12.1	12.3	11.0	11.0	7.6	4.2	2.9	3.0	3.4	4.2	2.8	7.2
24		0.5	1.4	3.0	3.7	5.7	4.8	4.6	5.9	7.4	8.0	8.4	8.5	8.3	7.7	7.3	8.0	9.4	9.2	9.8	10.6	9.3	7.3	6.4	6.3	6.7
25		6.4	7.1	6.7	5.6	5.1	5.2	4.8	6.1	10.7	12.8	13.2	13.3	12.8	13.0	12.5	12.7	11.2	11.3	9.1	5.2	4.5	3.0	2.5	2.4	8.2
26		3.8	3.0	2.8	1.3	1.7	2.3	2.2	2.0	4.4	6.1	6.8	7.5	8.4	8.0	9.4	9.2	8.5	6.6	5.7	3.3	3.7	2.2	1.8	2.6	4.7
27		1.1	1.8	2.1	1.7	2.2	1.7	2.2	0.6	3.0	4.1	4.1	4.2	4.2	4.6	5.0	7.0	7.2	7.5	6.3	5.8	4.9	3.5	1.6	2.0	3.7
28		1.5	2.3	2.4	2.1	1.6	1.8	4.1	4.1	6.7	7.6	7.1	6.6	4.8	5.1	5.1	4.6	4.1	3.4	2.6	3.0	3.3	3.0	3.8	4.9	4.0
29		5.1	4.5	4.5	5.4	4.6	4.1	4.6	5.8	5.7	5.2	5.8	5.9	6.7	6.9	5.4	5.7	6.4	3.9	1.3	1.9	2.0	1.5	1.7	3.6	4.5
30		3.7	1.3	2.0	2.4	4.4	2.2	1.8	2.8	4.2	5.4	7.6	7.6	8.5	10.3	10.7	12.2	9.6	4.8	6.5	7.7	5.7	6.0	5.3	5.7	5.7
31		6.4	5.3	5.7	6.6	5.9	5.0	4.9	6.6	8.2	9.4	Cal	Cal	11.2	11.7	10.5	10.5	10.4	10.4	8.0	5.7	5.0	2.4	2.6	1.4	7.0

TOTAL HOURS 744 TOTAL GOOD HOURS 742 DATA CAPTURE 99.7%

MAX. 1HR AVG 17.0 03/19/92 14:00:00 2ND MAX. 1 HR AVG 16.6 03/19/92 10:00:00

MIN. 1HR AVG 0.5 03/24/92 00:00:00 ARITHMETIC MEAN 5.3 STANDARD DEV. 3.1

KEY FOR MISSING CODES

Bad< - To few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

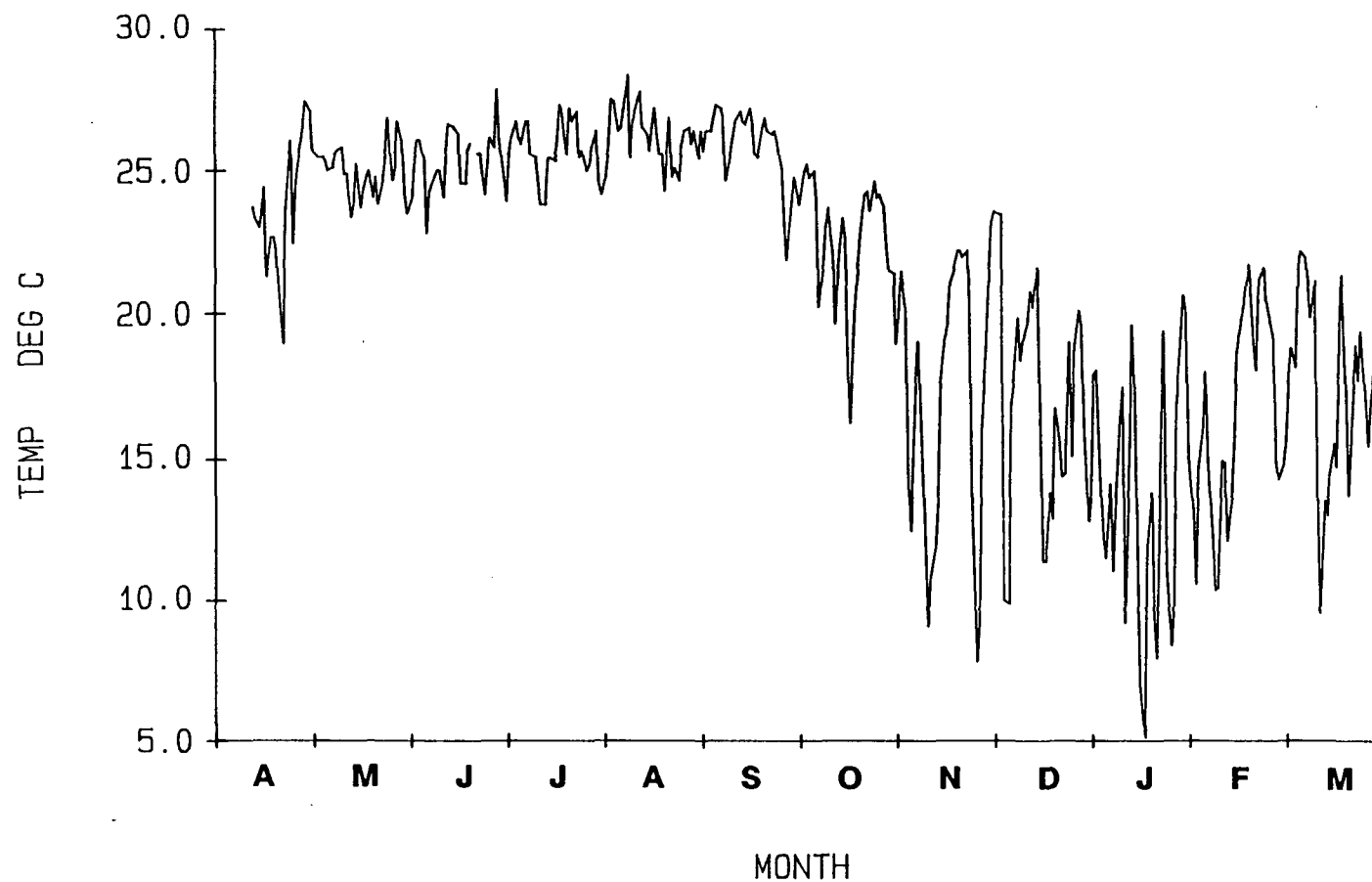
Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

11.11-74

HOURLY AVERAGES FOR TEMPERATURE (DEGREES CELSIUS)

11.11-76

TIME PLOT FOR 04/01/91 00:00:00 TO 03/31/92 00:00:00

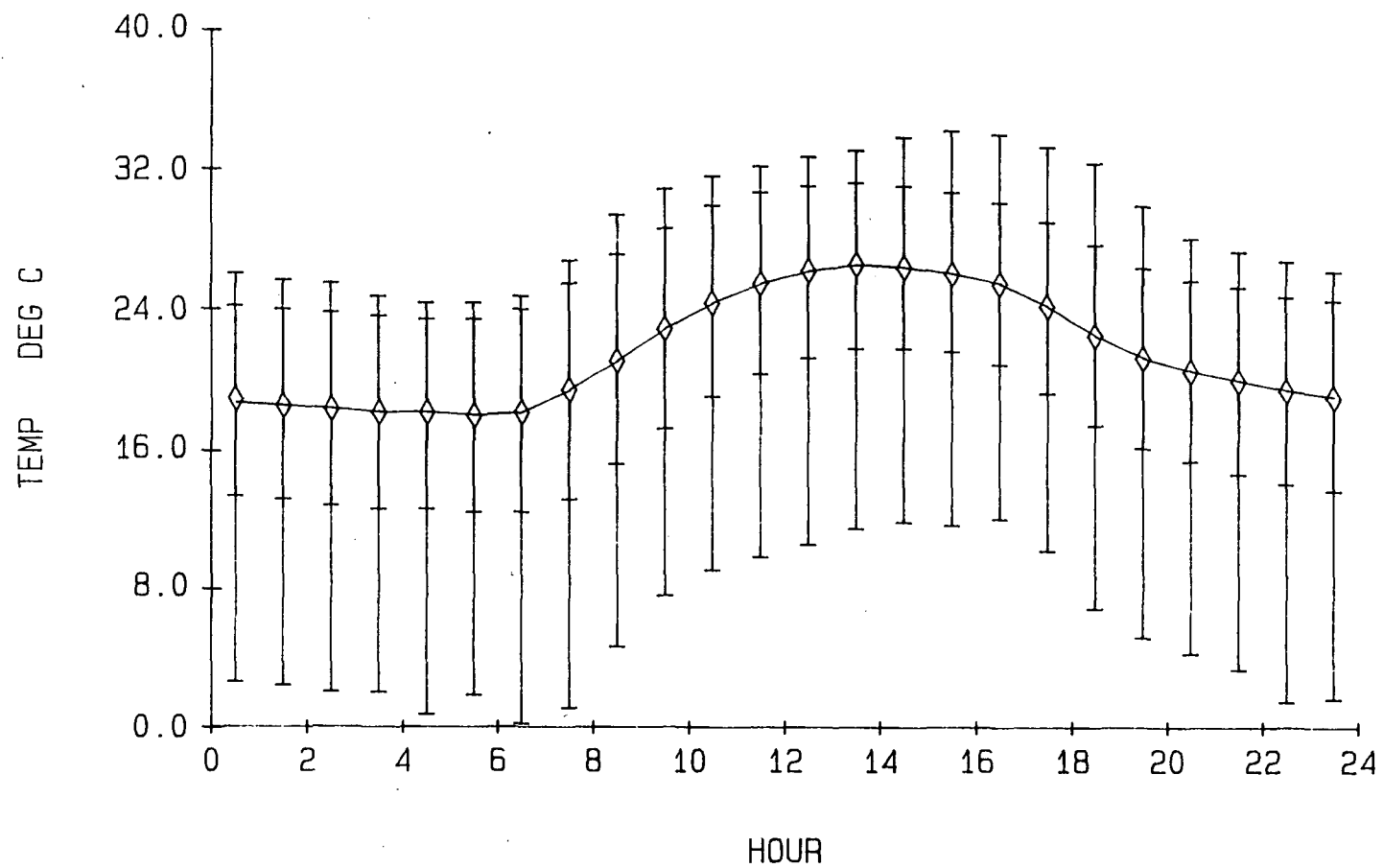


Tampa Electric Station AQ-1

Averaging Time: 24 Hour

11.11-77

DIURNAL PLOT 04/01/91 TO 03/31/92



Tampa Electric Station AQ-1

Averaging Time: 3600 sec

APRIL, 1991

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration
BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data
Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR TEMPERATURE IN DEGREES CELSIUS

DAY	MAY, 1991																								DAILY AVG
	HOUR (EST)	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	24.1	23.2	22.8	22.1	22.0	22.5	22.9	24.6	26.4	27.5	28.5	29.5	30.3	30.9	31.2	31.5	31.3	30.0	28.2	24.8	22.8	21.9	21.7	22.8	26.0
2	22.3	22.1	21.7	21.7	20.9	21.1	21.5	23.5	25.0	26.6	28.5	29.3	29.9	30.6	31.4	31.4	31.0	30.5	28.9	25.8	24.5	25.5	24.4	23.6	25.9
3	22.8	22.1	21.5	21.1	20.8	20.4	21.3	23.2	24.8	26.6	27.9	29.1	29.6	30.6	31.0	31.2	31.2	30.6	29.0	27.1	25.8	24.6	23.9	23.2	25.8
4	22.8	22.3	21.9	21.5	21.6	21.4	21.7	23.3	25.2	26.8	27.9	28.6	29.4	30.0	30.3	30.7	30.9	30.5	28.9	26.8	26.4	25.4	23.3	22.5	25.8
5	22.7	21.8	21.2	20.5	20.1	20.0	20.9	22.8	24.5	26.4	27.7	28.4	29.2	30.0	30.5	30.6	30.6	30.2	28.5	27.3	26.6	26.6	25.4	24.0	25.7
6	23.7	22.7	22.1	21.9	21.7	21.2	22.0	24.1	26.2	27.8	29.0	29.9	30.8	30.9	31.1	30.0	29.9	28.9	24.3	22.8	22.2	21.4	21.9	21.6	25.3
7	20.6	19.8	20.0	20.8	21.4	21.4	22.1	24.3	26.3	27.6	28.5	29.6	30.4	31.4	31.3	31.8	29.7	25.5	26.3	26.1	25.6	24.9	24.2	23.3	25.5
8	22.7	22.6	22.6	22.8	22.7	22.1	22.7	24.0	25.6	27.3	27.9	28.7	29.9	30.1	30.7	30.4	29.7	28.9	27.8	25.5	24.8	23.8	23.3	23.4	25.8
9	23.1	22.8	22.7	22.4	22.0	21.8	22.1	23.9	25.7	26.9	28.1	29.3	30.3	30.5	30.5	30.3	30.7	29.9	27.2	25.2	25.1	24.4	24.5	24.1	26.0
10	23.8	23.5	23.1	22.9	22.5	22.2	22.6	24.3	25.8	27.1	28.1	28.9	29.8	30.3	30.8	30.7	30.6	29.7	28.3	26.7	25.5	24.0	23.1	22.5	26.1
11	21.7	21.6	21.2	21.1	20.8	20.2	21.0	23.3	25.3	26.6	27.2	28.5	29.2	29.9	30.2	30.2	30.1	28.8	27.7	25.9	25.1	24.3	23.3	22.3	25.2
12	21.5	20.9	20.4	20.5	20.3	20.3	21.2	23.2	24.7	26.1	27.6	28.6	29.6	30.0	30.7	30.6	30.3	29.5	28.3	27.5	26.4	23.3	22.2	21.7	25.2
13	21.4	21.5	21.9	21.6	20.8	20.8	21.4	23.0	25.3	27.5	28.8	26.1	23.1	25.2	25.9	25.9	24.6	23.8	23.3	22.7	22.2	22.0	21.9	23.6	25.2
14	21.6	21.1	20.7	20.4	20.0	19.4	20.6	23.3	25.8	26.1	23.9	27.4	27.5	28.3	29.2	27.3	28.0	29.0	27.9	25.6	23.6	22.3	21.6	21.2	24.2
15	21.1	21.3	21.1	20.3	19.9	20.2	21.3	23.4	25.9	27.3	28.4	29.8	31.1	32.0	32.5	32.5	32.0	30.9	29.0	26.3	24.6	23.0	22.2	21.7	25.7
16	21.7	21.1	20.7	20.8	20.9	20.1	21.5	24.5	26.6	28.5	29.7	30.9	31.9	32.8	28.4	25.1	23.1	22.0	22.1	21.9	21.6	21.6	21.0	20.8	24.1
17	20.7	20.7	20.1	19.9	20.3	21.2	21.7	23.6	25.5	27.1	28.3	29.4	30.2	30.9	31.4	31.7	31.3	28.1	24.3	22.5	22.3	22.2	21.7	21.4	24.8
18	21.1	21.1	21.3	20.3	20.8	21.1	21.9	24.4	26.3	27.6	28.9	29.9	30.7	31.4	32.1	27.4	24.8	25.9	25.3	24.9	24.8	23.9	23.6	23.4	25.1
19	23.2	22.8	22.8	22.9	22.8	22.8	23.2	25.0	26.6	28.2	29.1	30.2	30.4	30.5	29.9	27.3	26.6	24.8	22.8	22.9	23.2	23.0	23.0	23.1	25.3
20	23.0	23.0	23.1	22.9	23.0	23.1	23.3	23.6	25.0	26.5	27.7	27.6	24.0	25.1	24.0	24.2	24.8	24.8	24.1	23.8	23.7	23.3	23.2	23.3	24.1
21	23.3	23.2	23.1	23.2	23.3	23.3	23.7	24.3	24.6	25.2	26.1	27.2	Down	27.6	27.3	26.3	25.6	25.7	25.0	24.5	24.6	24.6	24.7	24.6	24.8
22	24.6	24.5	24.4	24.5	24.2	24.1	24.4	25.0	26.3	25.9	24.6	23.3	23.5	23.2	23.7	23.7	23.5	23.5	23.0	22.8	22.7	22.7	22.9	23.0	23.9
23	23.1	23.2	23.3	23.3	23.4	23.3	23.3	23.9	25.0	25.9	27.5	28.7	29.3	27.2	26.3	24.6	24.6	24.4	23.8	24.0	24.1	24.0	23.9	23.8	24.7
24	23.6	23.7	23.6	23.6	23.6	23.7	23.9	24.3	25.9	27.2	28.7	29.9	30.0	29.6	28.8	24.1	24.8	24.9	25.0	25.1	25.3	25.1	25.0	24.7	25.6
25	24.5	24.1	23.8	23.7	23.6	23.4	23.9	25.2	26.6	27.8	28.7	29.8	30.5	31.0	31.6	31.6	31.3	30.9	28.9	27.5	26.4	25.0	25.0	24.7	27.0
26	24.5	24.4	24.4	24.3	24.2	24.2	24.6	25.4	27.2	29.1	30.3	29.8	27.7	23.8	22.5	22.8	22.9	23.1	23.4	23.4	23.3	23.5	23.8	23.5	24.8
27	23.3	23.3	23.3	23.6	23.6	23.6	24.1	25.5	26.3	27.7	27.5	28.8	29.6	30.0	29.7	25.8	24.4	24.2	23.9	23.7	23.7	23.8	23.7	23.8	25.3
28	23.7	23.7	23.4	23.5	23.5	23.3	23.9	25.2	26.6	27.9	28.5	29.5	30.2	31.0	31.5	31.1	31.2	30.8	29.5	27.5	25.7	25.9	25.1	24.6	26.9
29	24.0	23.2	22.2	21.0	20.4	20.0	22.2	24.7	25.9	27.1	28.4	29.9	30.6	30.9	31.3	31.2	31.7	31.4	29.6	25.3	24.7	25.7	24.5	23.6	26.2
30	23.1	22.5	22.0	21.5	21.1	21.2	22.8	24.3	26.4	28.1	29.7	30.7	31.1	31.6	31.7	28.3	21.8	21.7	21.8	21.7	21.7	21.4	21.6	20.8	24.5
31	20.3	20.1	19.9	19.6	19.3	20.0	21.2	23.3	25.7	27.1	28.5	29.9	26.6	26.1	27.6	28.0	27.8	27.4	25.2	23.3	22.3	21.8	21.0	20.2	23.8

TOTAL HOURS 744 TOTAL GOOD HOURS 743 DATA CAPTURE 99.9%

MAX. 1HR AVG 32.8 05/16/91 13:00:00 2ND MAX. 1 HR AVG 32.5 05/15/91 15:00:00

MIN. 1HR AVG 19.3 05/31/91 04:00:00 ARITHMETIC MEAN 25.2 STANDARD DEV. 3.3

KEY FOR MISSING CODES

BadC - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration
BadS - Bad Analyzer Status, Pwrf - Power Failure, Down - Operator downed channel, Miss - Missing Data
Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

11.11-79

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR TEMPERATURE IN DEGREES CELSIUS

		JUNE, 1991																							DAILY		
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG	
DAY																											
1		19.8	19.4	19.3	19.2	19.0	19.8	21.1	24.3	26.6	28.0	29.0	29.8	30.4	29.5	26.7	27.7	27.3	27.0	26.6	24.7	23.4	23.6	23.3	22.4	24.5	
2		21.8	21.0	20.9	21.1	21.0	20.8	22.9	24.9	26.5	27.4	28.8	29.5	29.8	30.0	30.4	29.2	30.0	29.2	28.0	26.2	25.2	23.9	23.3	22.9	25.6	
3		22.6	22.2	22.3	22.4	22.6	23.0	23.8	25.9	27.5	28.6	29.4	30.0	30.7	30.7	31.0	30.8	30.0	29.1	27.7	26.0	24.7	24.2	23.6	23.4	26.3	
4		23.5	23.1	22.7	22.6	21.9	22.8	23.6	25.6	27.5	28.7	29.9	30.1	29.7	28.7	29.0	29.8	29.9	29.5	27.7	26.3	25.4	25.1	24.6	24.3	26.3	
5		23.8	23.8	23.4	23.7	22.1	21.7	21.9	23.7	26.2	27.1	27.6	28.7	29.8	31.1	30.9	30.3	29.8	29.9	26.8	24.5	23.0	22.1	21.7	21.8	25.6	
6		21.7	21.6	21.3	21.0	20.9	21.2	21.9	22.9	24.1	25.1	26.3	26.3	26.5	25.4	24.2	23.1	22.8	22.1	22.5	22.7	22.3	21.7	21.7	21.4	22.9	
7		21.2	20.9	20.4	20.2	19.7	19.1	20.2	22.7	24.6	26.1	27.2	28.5	29.2	29.6	30.6	30.8	30.1	26.7	25.3	24.5	24.1	23.8	23.4	22.5	24.6	
8		22.0	21.9	21.6	21.5	21.3	20.9	21.9	23.9	25.7	26.8	27.8	28.6	29.0	28.5	29.1	29.1	28.9	28.4	27.1	25.2	24.0	23.1	22.7	22.5	25.0	
9		22.1	21.8	21.7	21.6	21.4	21.3	22.2	24.2	25.8	27.1	28.2	29.0	29.6	30.1	29.7	28.9	28.7	27.9	26.9	26.0	24.7	23.6	22.8	22.5	25.3	
10		22.2	22.0	21.6	21.3	21.2	21.0	22.4	24.4	26.0	27.2	28.3	29.1	29.8	30.1	30.6	30.2	29.7	28.7	27.3	25.7	24.1	22.8	22.0	20.9	25.3	
11		20.1	18.7	18.2	17.9	17.5	17.4	20.0	23.3	25.4	26.9	27.7	28.4	29.2	29.6	30.2	30.0	29.8	29.1	27.9	26.1	25.0	24.1	23.4	22.7	24.5	
12		22.0	21.6	20.7	20.3	20.5	20.2	21.9	24.0	26.0	27.4	28.8	29.8	30.6	30.8	31.2	31.3	31.7	31.2	29.7	25.6	25.9	25.1	24.0	23.2	25.9	
13		22.8	22.4	22.2	22.4	22.2	22.0	23.3	25.2	27.1	28.9	30.0	30.4	31.7	31.9	32.1	31.9	32.1	31.1	29.3	27.0	26.2	25.8	25.0	24.5	26.9	
14		24.4	23.9	23.3	22.9	21.9	21.3	22.9	25.4	27.0	28.3	29.6	30.7	31.7	31.8	31.7	32.3	32.0	30.2	28.2	26.8	25.4	24.5	23.6	24.0	26.8	
15		24.0	23.7	23.4	23.4	23.2	23.1	24.0	25.9	27.7	29.0	29.7	30.6	31.8	29.1	25.6	28.8	29.5	30.1	29.7	27.6	26.1	25.6	24.6	24.0	26.6	
16		23.7	22.9	22.8	22.3	22.2	22.4	23.1	25.4	28.4	30.0	30.6	31.6	32.7	33.1	32.0	31.4	29.8	28.8	26.5	25.6	24.4	23.9	23.4	23.0	26.6	
17		23.0	22.6	22.5	22.5	22.0	21.9	22.6	25.3	28.0	28.8	27.0	29.4	29.7	27.8	27.1	23.1	26.3	PwrF	PwrF	23.3	22.9	23.0	23.3	23.2	24.8	
18		22.9	22.4	22.1	21.9	22.0	21.9	23.5	26.1	28.1	29.4	27.9	27.7	29.2	26.4	24.4	23.9	24.5	25.0	25.2	24.5	23.7	23.5	23.3	22.8	24.7	
19		22.7	22.7	22.6	22.5	22.5	22.2	23.2	25.6	27.7	29.1	30.2	30.9	30.5	30.8	32.1	30.5	26.7	26.2	25.4	25.1	24.5	23.9	23.7	23.4	26.0	
20		23.0	23.0	23.1	23.0	22.4	22.1	23.3	25.2	27.0	28.5	29.6	30.6	31.4	31.5	32.1	31.6	26.3	23.5	23.4	23.5	PwrF	PwrF	PwrF	PwrF	26.2	
21		PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	29.5	30.5	31.1	32.0	32.2	31.7	32.1	28.5	25.2	24.5	24.0	23.5	22.9	22.6	Bad<
22		22.5	22.4	22.7	22.9	22.4	22.2	23.5	25.2	27.0	28.3	29.5	30.7	31.2	29.6	27.2	28.0	29.0	29.5	27.3	24.8	24.1	24.0	24.0	23.3	25.9	
23		22.9	22.7	22.7	23.0	22.5	22.4	23.6	25.3	27.5	29.3	30.1	31.2	31.4	31.0	30.2	30.6	30.6	29.2	24.2	23.0	22.8	22.1	21.7	21.9	25.9	
24		21.6	21.2	21.5	21.3	21.3	21.1	22.7	25.3	27.8	29.5	30.6	31.3	31.9	30.2	24.0	24.3	22.9	22.6	23.2	23.0	22.9	22.9	22.2	21.9	24.4	
25		21.7	21.7	21.3	21.6	21.5	22.1	23.4	24.6	25.8	26.8	27.5	29.0	30.2	31.0	31.7	31.9	32.6	29.9	27.0	23.4	22.2	22.3	22.3	22.1	25.5	
26		22.0	22.1	22.1	22.4	22.7	22.8	23.3	24.9	26.0	27.7	29.3	30.2	30.5	31.3	31.8	31.7	30.0	29.6	28.5	26.9	25.1	24.8	24.3	23.8	26.4	
27		23.5	23.3	23.2	23.0	23.1	22.8	23.6	25.3	27.0	28.6	30.1	31.1	31.7	27.9	26.4	27.2	27.7	28.4	27.0	26.4	25.0	24.4	24.1	23.7	26.0	
28		24.4	24.0	23.3	23.0	23.0	22.7	24.4	26.7	28.1	29.9	31.0	32.0	32.9	33.2	33.9	34.3	34.2	33.4	31.3	29.0	28.3	26.0	25.7	25.2	28.3	
29		24.9	24.7	24.1	23.6	23.1	23.0	24.1	26.6	28.3	29.3	31.1	31.5	32.2	32.9	32.8	33.4	30.5	24.2	22.9	22.7	22.5	22.5	22.3	22.4	26.5	
30		22.3	22.4	21.7	21.2	21.0	21.0	22.6	24.9	26.7	28.1	29.4	30.1	31.2	32.0	32.4	30.5	22.6	22.6	23.0	23.1	23.1	23.1	23.1	23.3	25.1	

TOTAL HOURS 720 TOTAL GOOD HOURS 704 DATA CAPTURE 97.8%

MAX. 1HR AVG 34.3 06/28/91 15:00:00 2ND MAX. 1 HR AVG 34.2 06/28/91 16:00:00

MIN. 1HR AVG 17.4 06/11/91 05:00:00 ARITHMETIC MEAN 25.7 STANDARD DEV. 3.6

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration
BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data
Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

11.11-80

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR TEMPERATURE IN DEGREES CELSIUS

		JULY, 1991																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1		23.0	23.0	22.9	22.8	22.7	22.7	23.0	23.5	24.0	23.5	23.3	23.9	24.8	25.8	27.2	27.2	24.5	25.2	25.6	25.1	23.9	23.4	23.8	23.7	24.1
2		23.4	23.6	23.6	23.6	23.9	24.1	24.7	25.9	27.9	29.3	26.9	24.2	27.4	27.1	26.3	27.1	27.8	28.4	27.8	26.7	25.6	25.2	24.6	23.6	25.8
3		23.6	23.5	23.5	23.8	23.7	23.5	24.3	26.3	28.3	29.7	30.0	30.8	31.5	31.7	31.1	31.2	28.2	26.4	24.5	23.1	23.2	23.6	24.0	24.2	26.4
4		24.3	24.2	24.5	24.4	24.2	23.7	23.7	25.4	27.1	28.4	29.5	30.5	31.1	31.4	29.9	29.3	28.1	27.9	28.0	27.7	26.9	26.0	25.6	25.1	26.9
5		24.7	24.5	24.4	24.1	23.9	23.8	24.7	26.4	28.3	29.2	30.0	30.4	31.2	31.6	28.3	24.4	25.5	26.0	25.9	25.7	25.1	25.0	24.8	24.2	26.3
6		23.8	23.6	23.5	23.2	22.4	21.6	22.6	25.0	27.9	29.5	30.4	31.2	31.8	32.3	32.8	30.6	28.4	24.0	24.6	24.4	24.0	24.4	24.1	23.8	26.2
7		23.4	23.4	23.0	22.9	23.0	22.8	23.9	26.2	27.7	29.0	30.3	31.1	31.8	32.2	33.3	33.6	33.1	30.7	28.7	27.1	26.5	24.3	21.6	22.2	27.1
8		22.7	22.7	22.4	22.0	21.8	21.7	23.2	25.8	28.1	29.6	30.4	30.7	31.8	33.0	33.0	32.2	30.1	30.2	29.5	27.6	26.4	25.7	24.8	23.9	27.0
9		23.7	23.3	23.0	22.7	22.8	22.7	23.8	26.0	28.2	29.5	30.7	30.9	24.7	24.8	26.3	27.9	28.4	28.4	27.3	26.2	25.0	24.4	24.3	23.8	25.8
10		23.8	23.6	23.5	23.4	23.4	23.6	24.3	26.2	28.3	29.8	30.5	30.5	26.0	26.0	26.0	24.0	26.0	26.0	26.0	26.0	25.0	25.0	25.0	24.0	25.6
11		24.3	24.1	24.0	24.1	24.0	23.9	24.3	26.0	27.6	29.0	30.0	31.0	26.0	PwrF	22.0	22.0	23.0	25.0	25.0	25.0	24.0	24.0	23.0	23.0	25.0
12		23.0	22.0	21.5	21.5	22.0	23.0	23.0	24.5	26.0	28.0	29.0	30.5	29.5	24.5	23.0	23.0	22.0	22.5	22.5	23.0	23.0	23.0	23.0	22.5	24.0
13		23.0	23.0	23.0	23.0	23.0	24.0	23.5	24.5	23.0	23.0	23.0	23.0	23.0	23.0	25.0	26.5	Miss	27.0	26.0	25.0	24.5	24.0	24.0	23.5	23.9
14		23.0	23.0	23.0	23.0	23.0	23.5	23.5	24.0	25.0	26.0	27.5	29.0	30.0	31.0	28.0	27.0	27.0	26.0	26.5	26.5	25.5	25.0	24.5	24.0	25.6
15		24.5	24.0	24.0	23.0	23.5	24.0	24.0	25.0	27.0	28.0	29.5	30.5	29.5	28.0	26.0	25.5	25.5	25.5	25.5	25.0	24.0	24.0	24.0	24.0	25.6
16		23.5	24.0	23.0	23.0	23.0	23.0	24.0	25.0	27.0	28.5	30.0	30.5	31.5	31.5	26.0	23.0	25.5	27.0	26.0	25.0	24.0	24.0	23.5	23.0	25.6
17		23.0	22.5	22.5	23.0	23.0	23.5	23.5	24.5	26.0	28.0	30.0	30.5	31.5	32.0	32.0	32.5	31.0	27.5	24.5	23.0	25.0	26.5	24.0	23.5	26.4
18		24.0	24.0	23.5	23.5	23.5	23.5	23.0	25.0	27.0	29.0	30.0	31.0	31.0	32.0	32.0	32.0	32.0	32.5	32.5	30.0	25.0	26.0	25.0	25.0	27.6
19		24.4	24.1	24.3	24.4	24.2	24.1	24.7	26.2	27.9	28.9	29.8	30.8	31.5	32.0	33.0	31.0	26.0	27.0	27.0	27.0	26.0	26.0	26.0	25.0	27.1
20		24.8	24.6	24.4	24.4	24.4	24.1	24.9	26.7	27.8	28.5	29.5	30.0	29.0	23.0	24.0	26.0	27.0	27.0	27.0	25.5	24.0	24.0	24.0	24.0	25.8
21		24.0	24.0	24.0	24.0	23.5	24.0	23.5	25.5	27.5	28.0	29.0	30.5	31.0	31.5	32.5	33.0	32.0	29.5	29.5	28.5	26.5	26.0	26.0	26.0	27.5
22		25.1	24.1	24.4	24.2	23.5	23.1	23.0	25.0	27.0	28.0	30.0	30.5	31.0	31.5	32.5	32.5	33.0	32.0	27.0	26.0	25.0	24.0	24.0	23.0	27.1
23		23.5	24.0	23.5	23.0	23.0	23.0	23.0	24.5	26.5	28.0	30.0	31.5	32.0	32.0	32.5	32.5	31.0	30.7	29.6	27.6	26.2	26.0	26.1	26.2	27.3
24		25.5	25.1	24.5	24.3	24.6	24.5	24.9	26.1	28.3	29.5	30.0	31.3	32.0	32.6	25.1	21.8	23.0	23.3	23.9	23.9	23.5	23.3	23.0	23.0	25.7
25		23.1	23.0	22.9	22.7	22.5	22.1	22.6	24.4	26.4	28.3	29.3	29.4	31.0	31.7	29.0	28.0	28.5	28.4	27.4	25.9	24.4	24.0	25.0	24.0	26.0
26		23.5	23.3	23.1	23.0	22.8	22.7	23.5	25.4	27.4	28.9	30.1	31.3	32.0	24.5	23.8	25.6	25.7	25.1	25.1	24.4	24.0	23.8	23.3	23.0	25.2
27		22.8	22.5	22.3	22.2	22.2	22.0	22.5	24.6	26.1	28.0	29.0	30.1	30.3	31.2	29.0	26.7	26.4	26.4	25.9	25.0	24.3	24.2	23.9	23.7	25.4
28		23.3	23.2	22.7	22.5	22.4	22.7	22.9	24.0	26.4	27.6	28.2	29.4	30.6	31.3	31.5	31.7	30.4	27.6	24.5	24.6	24.8	24.9	24.6	24.4	26.1
29		24.1	23.9	23.7	23.6	23.4	23.2	23.7	25.2	27.1	28.5	29.7	30.6	31.0	31.4	31.5	28.0	28.0	27.6	27.4	25.8	25.5	26.0	25.4	25.0	26.6
30		24.2	23.6	23.4	23.3	22.9	23.2	23.6	24.8	26.9	28.6	29.8	29.8	25.5	24.3	24.0	24.2	23.8	24.3	24.2	24.0	24.0	24.0	23.9	23.6	24.7
31		23.2	22.9	22.9	23.0	22.6	22.6	23.2	23.8	24.5	26.9	28.7	29.7	22.3	22.8	23.9	24.8	26.8	27.6	24.5	22.5	23.0	23.3	24.0	23.8	24.3

TOTAL HOURS 744 TOTAL GOOD HOURS 742 DATA CAPTURE 99.7%

MAX. 1HR AVG 33.6 07/07/91 15:00:00 2ND MAX. 1 HR AVG 33.3 07/07/91 14:00:00

MIN. 1HR AVG 21.5 07/12/91 02:00:00 ARITHMETIC MEAN 25.9 STANDARD DEV. 3.0

KEY FOR MISSING CODES

BadC - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

10-29-91

11.11-81

11.11-82

		AUGUST, 1991																							DAILY AVG	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22		23
DAY																										
1	23.6	23.6	23.4	23.5	23.5	23.7	24.0	25.0	26.1	28.3	29.3	28.3	26.7	25.6	25.4	24.4	25.1	25.0	25.2	24.5	24.1	23.8	24.2	23.9	25.0	
2	23.6	23.2	23.0	22.8	23.0	23.2	23.1	24.1	26.6	28.6	29.9	30.8	31.8	32.1	31.6	26.5	25.2	25.8	26.1	25.7	25.1	24.7	24.4	24.3	26.0	
3	24.2	23.9	23.7	23.3	23.1	23.2	23.8	26.5	28.0	29.0	30.2	30.9	31.6	32.3	32.0	32.8	32.9	32.2	30.7	28.3	26.9	26.2	25.8	25.7	27.8	
4	24.9	24.3	23.7	23.5	22.9	22.8	23.2	25.7	28.4	29.6	30.9	31.4	32.2	33.0	33.3	33.1	32.7	32.1	30.4	27.9	26.5	25.7	24.3	24.0	27.8	
5	23.3	23.5	23.2	22.9	23.4	23.2	23.1	25.6	28.4	29.5	30.3	30.9	31.4	31.0	31.6	28.7	26.9	28.8	28.1	26.9	26.2	25.2	24.4	24.1	26.7	
6	23.7	23.4	23.3	22.9	22.6	22.7	23.5	25.1	26.4	27.8	29.1	30.2	30.9	31.9	32.3	32.6	29.7	28.4	29.4	27.6	25.4	24.5	24.5	24.1	26.7	
7	23.9	23.6	23.8	24.0	24.3	24.4	24.9	26.5	28.2	29.5	30.5	31.3	32.1	32.7	32.2	29.8	25.7	27.8	28.6	27.4	26.4	26.5	26.5	26.2	27.3	
8	26.1	25.8	25.5	24.8	24.1	24.4	24.9	26.4	28.1	29.5	30.5	31.5	32.1	32.4	32.3	33.2	33.3	33.1	31.5	28.6	28.0	27.4	26.8	26.1	28.6	
9	25.4	24.9	24.6	24.3	24.2	24.3	24.4	26.9	29.4	30.9	31.8	32.2	32.4	31.7	25.8	22.5	23.1	23.3	23.1	23.2	22.8	22.7	22.7	22.6	25.8	
10	22.9	22.9	22.7	22.8	22.8	22.8	23.4	25.1	27.5	29.2	30.5	31.4	28.2	29.5	31.8	32.3	32.2	31.7	30.1	28.1	26.9	25.6	25.0	24.5	27.1	
11	24.1	24.0	23.7	23.4	23.1	23.4	23.9	26.3	28.6	30.2	30.8	31.4	32.5	32.2	32.7	32.8	31.7	31.1	29.9	28.2	27.1	26.5	25.2	24.8	27.8	
12	24.4	24.3	24.3	24.1	24.3	24.1	24.0	26.1	28.4	29.9	30.9	31.9	32.5	33.3	32.7	33.1	32.6	31.9	29.5	27.7	26.8	26.2	25.3	24.7	28.0	
13	24.4	24.3	23.8	24.1	23.6	23.2	23.5	25.4	27.8	29.4	30.4	31.7	32.1	33.1	33.4	30.9	26.2	25.8	25.4	24.7	24.3	24.7	24.7	24.7	26.7	
14	24.0	23.6	22.9	23.1	22.9	22.7	23.1	24.8	27.4	29.1	30.2	30.8	31.7	32.1	27.2	28.4	29.6	29.6	28.7	26.9	25.1	24.7	24.0	23.9	26.5	
15	24.3	23.8	23.4	23.0	22.7	22.4	22.7	24.9	27.2	29.2	30.5	31.1	28.4	24.6	26.8	28.4	28.1	28.4	28.0	26.1	25.4	24.4	23.5	23.2	25.8	
16	22.5	22.2	21.9	21.7	21.9	21.6	22.5	25.3	27.8	29.6	30.6	31.4	32.1	32.9	32.9	33.0	29.7	28.1	28.7							

MAX. 1HR AVG 33.4 08/17/91 14:00:00 2ND MAX. 1 HR AVG 33.4 08/13/91 14:00:00

KEY FOR MISSING CODES

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

10-21-91

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR TEMPERATURE IN DEGREES CELSIUS

		SEPTEMBER, 1991																								DAILY AVG
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
DAY																										
1		24.7	24.4	23.9	23.0	22.8	22.8	23.6	25.5	27.3	28.4	29.9	30.6	31.2	32.0	32.4	31.7	26.9	24.2	23.2	23.2	23.0	23.7	23.1	22.8	26.0
2		23.0	22.6	22.4	22.6	22.0	21.7	22.2	24.5	26.2	27.8	29.1	30.3	31.1	31.5	32.1	31.9	31.5	30.5	28.9	27.3	26.6	25.5	24.7	24.5	26.7
3		24.4	24.2	23.6	23.7	23.3	23.4	23.5	24.9	26.9	28.1	29.5	30.5	30.4	31.2	28.4	30.0	30.1	28.7	27.6	26.6	26.3	25.4	24.7	23.8	26.6
4		23.4	23.4	23.3	23.5	23.6	23.7	23.7	25.2	26.9	28.4	29.5	30.7	31.0	31.6	32.0	31.6	31.2	30.0	28.4	27.2	26.4	25.7	25.1	25.0	27.1
5		24.6	24.5	24.3	24.2	23.7	23.6	23.5	25.4	27.4	28.9	29.7	30.8	31.7	32.3	32.6	33.2	33.3	32.1	29.3	27.0	26.4	25.4	24.7	24.2	27.6
6		23.8	23.3	23.2	23.0	23.1	23.0	23.8	25.3	27.3	29.2	31.0	32.2	32.9	33.3	34.0	34.2	34.2	33.0	29.4	27.7	26.3	22.9	23.4	23.8	27.6
7		23.9	24.5	24.2	24.1	24.0	24.0	24.3	25.6	27.2	28.6	29.7	31.0	32.0	32.7	33.2	33.2	32.1	25.2	25.6	25.4	25.9	25.2	25.5	25.5	27.2
8		24.8	24.9	24.9	24.9	24.2	23.8	24.2	25.1	25.2	26.3	27.6	29.4	29.9	30.5	29.8	21.9	21.0	21.3	21.8	22.3	22.8	23.0	23.4	23.4	24.8
9		22.7	22.8	22.6	22.9	23.0	23.3	23.3	23.7	24.2	25.3	27.4	28.6	29.4	30.0	30.1	30.3	28.9	28.1	26.2	25.7	25.2	24.9	24.7	24.6	25.7
10		24.4	24.1	23.9	23.7	23.5	23.4	23.4	25.1	26.9	28.1	29.1	29.8	30.7	30.9	28.6	26.7	28.5	28.4	26.7	25.8	25.4	25.2	24.9	24.5	26.3
11		24.2	24.4	24.2	24.2	23.9	23.8	23.8	24.8	26.4	27.9	29.1	30.5	30.9	31.2	31.5	31.5	31.3	30.1	27.9	26.0	25.4	24.5	25.6	25.4	27.0
12		24.7	24.5	23.7	23.6	23.1	22.6	23.3	25.0	26.8	29.1	30.9	31.3	31.8	32.0	32.5	32.9	32.5	30.3	27.6	26.0	26.8	26.4	25.8	25.0	27.4
13		24.3	23.7	22.7	22.4	22.2	22.0	22.1	24.9	27.2	29.6	31.1	31.9	32.2	31.9	31.8	31.6	31.5	30.3	28.4	26.5	26.1	26.2	25.3	24.6	27.1
14		24.0	23.5	22.6	22.8	22.1	21.6	22.3	24.2	26.1	28.3	30.2	31.3	32.0	32.3	32.5	32.4	32.0	30.7	27.0	24.9	25.9	26.4	26.0	25.3	26.9
15		25.0	24.2	23.4	22.7	23.0	22.5	23.2	24.9	26.6	28.5	30.5	31.4	32.0	32.5	32.8	32.7	32.2	31.1	29.5	28.2	27.1	26.1	25.5	25.2	27.5
16		24.7	24.3	23.4	23.2	22.9	23.2	23.2	25.0	26.8	28.3	29.2	30.0	30.6	31.7	32.0	31.5	30.8	29.6	28.3	27.0	26.1	24.9	24.3	23.3	26.8
17		22.2	21.7	21.3	21.2	21.0	21.5	21.7	23.9	26.1	28.0	29.2	30.0	30.9	31.0	31.1	30.9	29.7	28.4	27.4	27.0	25.7	25.0	24.2	24.2	25.9
18		24.8	24.5	24.0	23.0	22.9	23.4	23.5	24.8	26.3	27.8	29.3	29.9	30.6	31.1	29.8	27.7	26.6	24.2	24.2	24.6	23.2	22.9	23.5	23.6	25.6
19		23.4	23.4	23.2	22.6	22.3	22.6	23.1	24.3	26.6	28.1	29.6	30.7	31.6	32.3	32.4	32.8	32.8	28.9	27.2	26.5	26.0	25.1	24.1	23.8	26.8
20		23.3	23.0	22.7	22.9	23.1	22.6	22.9	25.3	27.7	29.4	30.6	31.8	32.4	32.6	33.4	33.6	32.5	29.4	28.5	26.4	25.9	25.3	23.9	24.0	27.2
21		24.0	24.2	23.3	23.7	23.9	23.9	23.9	24.6	26.2	27.8	28.8	29.9	30.7	31.6	31.9	32.2	30.7	28.7	26.3	25.7	25.3	25.0	23.9	24.3	26.7
22		24.1	23.4	22.6	22.5	22.4	22.4	22.5	23.9	26.2	27.9	29.3	30.3	31.1	31.8	31.4	30.1	29.3	28.7	27.6	26.7	26.3	25.9	25.6	25.1	26.5
23		24.8	24.5	24.2	24.1	24.0	23.9	23.9	25.2	26.9	28.4	29.7	30.5	31.0	31.3	31.7	30.9	30.8	26.2	25.5	25.0	24.9	24.6	24.4	24.0	26.7
24		23.9	23.1	23.1	23.3	23.2	22.8	22.7	23.9	25.6	26.7	28.6	29.7	30.7	31.6	32.0	31.9	31.9	30.7	28.1	26.7	23.1	22.5	22.7	22.8	26.3
25		22.7	22.5	22.8	22.9	23.0	22.8	23.0	24.1	26.3	28.4	29.5	25.9	25.5	25.2	26.1	28.9	29.1	28.1	26.2	24.4	24.5	24.2	23.8	23.1	25.1
26		22.6	22.7	22.5	22.4	22.7	22.8	22.6	23.0	23.2	25.2	26.7	27.1	27.9	28.1	28.4	28.1	27.2	25.5	23.0	21.2	19.8	18.4	17.7	16.9	23.6
27		16.8	17.0	16.9	16.9	16.4	15.7	15.9	19.2	22.6	25.0	26.7	27.4	28.1	28.9	29.1	29.3	28.8	27.4	24.7	23.0	22.1	21.6	20.7	19.3	22.5
28		20.2	20.2	19.6	19.5	19.2	19.1	19.3	20.8	23.9	25.9	27.6	28.6	29.3	29.9	29.9	29.2	28.2	27.1	25.8	25.1	24.4	23.1	22.7	22.8	24.2
29		22.3	21.8	21.5	21.3	21.2	21.5	21.6	22.5	24.8	26.5	27.8	28.9	29.4	30.0	30.9	30.8	27.3	25.5	25.2	24.5	24.2	23.9	23.7	23.1	25.0
30		22.4	22.1	21.9	22.1	22.5	22.5	22.5	22.8	23.8	25.2	26.8	27.5	27.2	26.7	25.4	27.0	26.8	26.2	25.2	24.7	24.0	23.8	23.4	23.1	24.4

TOTAL HOURS 720 TOTAL GOOD HOURS 720 DATA CAPTURE 100.0%

MAX. 1HR AVG 34.2 09/06/91 16:00:00 2ND MAX. 1 HR AVG 34.2 09/06/91 15:00:00

MIN. 1HR AVG 15.7 09/27/91 05:00:00 ARITHMETIC MEAN 26.2 STANDARD DEV. 3.5

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, Pwrf - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

10-21-91

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR TEMPERATURE IN DEGREES CELSIUS

DAY	OCTOBER, 1991																								DAILY AVG
	HOUR (EST) 00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1	23.0	22.9	22.4	22.3	22.9	23.0	22.9	23.4	25.4	27.0	26.8	26.9	26.1	24.7	23.4	24.1	24.2	24.4	23.7	23.2	22.9	22.7	22.8	22.8	23.9
2	22.8	22.7	22.7	22.7	22.6	22.8	22.7	22.8	23.7	25.7	28.4	28.7	25.9	28.7	30.0	29.9	29.1	28.0	26.0	24.7	23.9	23.4	23.3	23.1	25.2
3	22.7	22.6	22.6	22.4	22.3	22.2	22.5	24.3	26.6	28.0	29.2	29.0	29.8	29.5	30.3	30.3	27.9	26.8	25.5	24.5	23.9	23.5	23.1	22.8	25.5
4	22.6	22.1	21.5	21.0	21.2	21.2	21.7	23.5	24.2	25.5	28.2	29.3	29.7	30.1	29.3	28.4	28.0	26.5	24.9	24.5	24.6	24.2	23.9	23.2	24.9
5	23.5	23.6	23.5	23.3	22.8	23.4	23.2	24.0	26.1	28.0	29.4	30.3	31.1	31.4	25.9	26.1	25.4	24.0	23.8	23.4	23.8	23.7	22.9	22.9	25.2
6	22.7	23.3	23.3	23.0	22.8	22.5	22.3	22.7	24.3	26.8	28.7	29.8	27.7	25.0	24.3	25.0	25.7	25.7	24.6	24.1	24.1	22.4	20.3	20.1	24.2
7	19.5	19.0	18.5	17.9	17.6	17.4	16.9	17.0	17.9	18.9	21.0	23.1	25.0	25.5	26.3	26.2	24.9	22.7	21.3	20.3	19.4	18.8	18.6	18.7	20.5
8	18.3	18.3	18.2	18.2	18.7	18.6	18.6	19.9	21.3	23.2	24.5	26.1	26.6	27.3	26.7	26.1	25.9	24.3	23.1	22.1	21.6	21.0	20.9	20.5	22.1
9	20.2	20.1	19.9	20.0	20.2	20.1	20.6	21.7	23.5	24.4	26.2	26.9	27.3	27.0	25.9	26.2	26.0	25.3	24.6	24.2	23.4	22.9	22.5	22.2	23.4
10	22.0	21.5	21.0	20.8	20.7	20.6	20.2	20.5	22.1	23.2	25.6	27.1	28.3	28.6	29.5	29.2	28.9	27.1	25.1	23.7	Down	Down	21.6	20.8	24.0
11	20.4	19.5	18.8	18.5	19.3	20.1	19.6	20.5	22.5	23.9	26.2	27.3	27.4	28.0	28.3	28.1	27.7	25.6	23.1	21.1	19.9	19.0	17.4	17.2	22.4
12	17.0	15.6	14.8	14.7	14.9	15.1	14.9	17.5	20.8	23.7	25.6	26.3	27.4	27.4	27.9	27.2	26.2	24.4	21.4	18.0	17.5	16.8	16.2	15.7	20.3
13	15.9	15.4	14.6	14.9	14.9	14.3	15.0	18.2	22.8	25.6	27.2	28.1	29.1	29.6	29.5	29.6	29.2	25.5	23.9	23.8	23.0	22.5	21.7	20.6	22.3
14	20.6	21.0	20.6	20.3	19.6	19.1	17.8	19.7	22.1	24.8	26.4	27.8	28.5	28.9	29.3	29.1	28.2	26.7	24.6	24.8	23.5	22.7	22.2	21.8	23.7
15	21.7	21.7	21.3	21.6	21.6	21.3	21.2	21.8	22.8	24.5	26.1	27.1	27.5	26.4	27.0	23.4	22.6	22.4	21.4	21.3	21.3	21.0	20.6	20.4	22.8
16	20.3	19.6	18.8	17.9	18.7	18.3	17.4	17.2	18.5	20.5	22.4	23.4	24.1	24.4	24.8	24.1	23.0	20.4	16.7	15.7	14.9	14.3	13.5	13.4	19.2
17	12.7	13.2	12.4	11.3	10.2	8.9	8.9	12.6	17.1	19.7	21.1	22.6	23.7	24.5	25.2	25.3	24.8	21.9	16.5	14.7	14.3	15.6	17.0	16.8	17.1
18	16.3	15.3	14.7	13.4	13.8	15.6	15.8	17.8	20.5	23.1	24.4	25.4	26.4	26.9	27.0	27.0	26.2	24.5	22.3	21.1	20.3	19.6	18.6	18.3	20.6
19	17.8	17.4	16.9	16.7	16.5	16.4	16.3	18.1	20.9	22.9	24.5	26.2	27.3	28.1	28.4	28.2	27.8	25.4	21.7	21.1	21.7	21.2	20.2	19.4	21.7
20	19.1	18.8	18.5	18.2	18.2	18.1	17.8	19.2	21.6	23.6	25.5	26.9	27.8	28.7	28.8	28.4	28.0	26.5	24.8	24.0	23.3	22.8	22.2	21.6	23.0
21	21.7	21.4	21.1	20.9	20.7	20.5	20.5	21.2	24.0	26.2	27.6	28.1	28.5	28.1	28.0	28.3	27.6	26.3	25.5	24.7	24.3	23.9	23.6	23.0	24.4
22	22.8	22.8	22.7	22.4	22.3	22.2	22.1	22.4	23.5	25.1	27.1	28.7	29.5	30.0	30.0	29.8	28.9	27.0	24.6	23.7	22.4	21.3	19.6	19.9	24.6
23	18.8	18.5	18.7	19.6	20.7	20.8	20.7	22.5	24.5	26.9	28.5	29.2	29.5	26.8	29.1	29.9	28.4	Down	Bad<	Down	23.4	23.0	22.5	22.3	24.0
24	22.1	22.0	22.0	21.9	21.7	21.8	21.8	22.6	24.4	26.3	27.7	29.1	29.2	29.8	29.8	29.6	28.5	26.2	24.5	24.0	24.1	23.1	22.5	22.4	24.9
25	22.1	21.9	22.2	22.3	22.4	22.1	21.9	22.9	24.3	26.2	27.7	28.6	28.9	27.8	25.8	25.6	24.9	23.7	23.5	23.4	23.6	23.6	23.3	23.3	24.2
26	23.2	22.9	22.8	22.4	21.9	21.9	21.9	22.5	24.4	26.4	27.7	28.4	28.2	28.6	27.3	27.6	25.8	24.8	23.9	23.9	23.3	22.7	22.3	21.8	24.4
27	21.7	21.6	21.5	21.0	21.0	21.0	21.1	21.9	23.8	25.6	26.8	28.1	28.9	28.9	28.8	29.1	28.1	26.4	24.2	22.8	21.9	21.4	20.9	20.5	24.0
28	20.5	20.1	19.7	18.8	17.7	17.6	17.5	19.5	21.9	24.7	26.6	PwrF	PwrF	28.5	28.4	28.4	27.8	26.2	24.6	24.4	23.6	22.6	22.1	21.8	22.8
29	21.3	20.6	19.1	18.9	18.3	18.3	18.5	19.7	22.7	24.3	25.8	24.4	22.2	22.2	24.1	25.0	25.1	23.9	22.8	22.0	20.8	20.8	21.2	20.3	21.7
30	20.0	19.7	19.1	18.7	19.2	18.7	18.6	20.4	22.8	24.6	25.8	26.5	26.6	26.2	25.7	25.9	25.3	Down	21.5	20.4	19.6	18.7	17.8	16.8	21.7
31	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	11.7	14.4	18.2	20.9	22.6	24.3	25.7	26.4	26.6	26.1	25.3	21.6	17.1	15.6	14.8	14.0	14.2	15.7	Bad<

TOTAL HOURS 744 TOTAL GOOD HOURS 730 DATA CAPTURE 98.1%

MAX. 1HR AVG 31.4 10/05/91 13:00:00 2ND MAX. 1 HR AVG 31.1 10/05/91 12:00:00

MIN. 1HR AVG 8.9 10/17/91 06:00:00 ARITHMETIC MEAN 22.9 STANDARD DEV. 4.0

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

02/17/92

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR TEMPERATURE IN DEGREES CELSIUS

		NOVEMBER, 1991																								DAILY AVG
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
DAY																										
1		16.9	16.3	14.9	14.3	15.4	14.8	15.8	17.0	20.4	23.1	25.3	25.9	26.5	27.0	27.1	27.2	26.5	24.0	22.4	20.1	19.7	18.0	17.2	16.5	20.5
2		17.0	17.4	17.0	15.9	17.2	17.3	17.7	19.0	21.2	23.7	26.2	26.8	26.8	26.6	25.8	25.7	24.5	23.2	23.3	22.9	22.0	21.1	20.8		21.9
3		20.7	20.4	19.3	18.3	18.1	18.2	18.0	18.7	20.4	22.3	24.3	25.8	26.1	26.6	26.5	24.1	21.6	19.1	17.4	17.0	16.9	17.0	16.9	16.6	20.4
4		16.1	15.8	15.4	15.8	15.2	13.6	12.7	12.6	12.8	13.8	14.7	15.4	16.2	16.7	16.6	16.6	15.7	14.6	13.4	12.7	12.0	11.7	11.8	11.6	14.3
5		11.1	10.7	10.3	10.3	10.3	9.9	9.5	9.2	9.7	11.0	13.4	14.6	14.6	15.1	15.9	16.4	16.2	15.1	14.1	13.8	13.3	13.2	13.2	13.1	12.6
6		12.7	12.5	12.3	12.5	12.4	13.0	13.5	14.0	15.5	PwrF	21.3	22.8	24.7	25.4	25.0	25.0	24.3	22.0	20.4	19.8	19.0	18.2	17.3	17.0	18.3
7		16.4	16.3	16.6	16.4	16.5	16.6	16.4	16.5	17.0	18.4	21.6	23.4	23.7	24.2	24.6	24.3	23.2	21.6	20.2	19.5	19.6	19.0	17.4	16.3	19.4
8		15.2	14.4	14.1	14.8	15.2	13.9	13.2	13.6	15.1	17.8	20.2	22.1	23.1	23.5	23.0	22.5	21.4	18.7	15.8	14.7	14.0	14.4	13.3	13.9	17.0
9		14.3	13.8	12.4	10.8	10.4	10.1	10.1	10.1	10.6	10.8	11.9	14.4	16.3	17.6	18.0	17.5	16.1	13.1	10.8	9.0	8.0	7.3	7.8	8.5	12.0
10		7.8	6.0	4.3	4.7	5.9	6.5	6.1	5.9	8.8	10.9	12.7	13.5	14.7	15.2	16.4	16.7	15.8	14.0	10.3	9.0	7.9	7.3	7.2	7.3	9.8
11		7.1	6.3	6.2	6.1	5.7	5.6	4.9	7.1	12.8	16.3	18.2	19.5	20.9	21.6	21.7	21.2	19.8	16.7	13.7	12.1	11.2	9.1	7.8	5.9	12.4
12		5.4	4.5	4.8	6.9	6.6	7.8	6.4	8.6	12.6	17.0	19.4	20.9	22.4	23.7	23.9	23.7	21.8	18.0	14.7	13.2	12.0	11.2	10.8	10.3	13.6
13		9.6	10.0	9.8	8.7	7.6	6.9	7.1	8.8	13.2	16.5	18.4	19.8	20.9	21.4	21.6	21.8	21.0	17.9	15.8	16.1	15.6	14.4	13.5	12.6	14.5
14		12.2	12.1	11.3	11.9	11.6	11.6	11.9	13.0	15.8	19.3	22.2	23.7	24.5	25.1	25.3	25.4	24.7	22.2	21.4	20.7	19.6	18.6	17.8	17.2	18.3
15		16.0	13.9	14.3	14.9	14.9	14.3	15.0	17.0	19.1	22.1	24.4	25.7	26.5	27.0	27.2	26.8	25.9	23.5	20.9	20.0	19.1	16.8	15.1	15.5	19.8
16		14.9	14.9	15.4	15.0	15.7	15.1	15.9	17.7	19.8	22.3	24.2	25.7	25.8	26.2	26.0	25.6	24.5	22.9	21.1	20.2	18.1	17.9	18.8	19.4	20.1
17		19.2	19.1	18.5	17.9	17.2	16.8	17.5	18.6	21.0	23.4	25.3	26.5	27.1	27.6	27.0	26.7	25.8	24.0	22.4	21.3	20.0	19.0	18.6	17.6	21.6
18		17.6	16.9	17.0	16.8	16.9	17.3	18.1	18.8	20.9	23.5	25.7	27.1	27.4	27.5	27.8	27.2	26.0	24.6	23.3	22.3	21.1	20.3	19.6	19.2	21.8
19		18.8	18.9	18.9	18.7	18.8	19.4	19.9	20.2	21.8	24.0	25.5	26.8	27.3	27.8	28.0	27.4	26.6	24.7	23.4	21.6	21.1	20.6	20.2	19.6	22.5
20		19.7	20.0	20.1	20.4	20.4	20.6	20.7	20.7	21.3	22.4	23.1	25.2	26.1	26.8	26.2	24.4	24.3	23.3	23.0	22.5	21.9	22.1	21.7	20.8	22.4
21		20.1	19.5	19.2	18.6	18.0	18.4	18.3	18.9	20.7	23.3	25.2	26.3	27.4	28.1	27.7	27.4	26.4	24.4	22.7	22.8	22.1	20.7	19.7	19.2	22.3
22		18.9	18.7	18.5	18.6	19.2	19.2	19.1	19.3	21.5	24.0	25.4	26.9	27.1	27.6	27.3	27.2	26.6	24.8	23.3	22.6	21.8	21.2	20.9	20.6	22.5
23		20.7	20.9	20.8	20.7	20.5	20.4	20.3	20.2	20.6	21.1	22.7	24.1	25.1	25.7	26.6	26.0	23.9	21.6	19.2	17.9	17.0	16.1	15.7	15.1	20.9
24		14.5	14.1	13.2	12.3	11.7	11.6	10.6	12.0	16.1	17.6	16.5	17.0	16.0	17.6	18.9	17.5	16.1	13.5	11.3	10.2	9.4	8.6	8.5	7.7	13.4
25		6.8	7.0	5.6	5.0	4.3	4.1	3.3	3.9	6.5	8.8	11.2	13.5	14.5	15.3	15.2	14.8	13.9	11.6	10.6	9.2	7.2	6.1	6.3	3.6	8.7
26		3.1	4.4	3.4	3.2	3.3	4.7	5.4	6.5	8.7	10.9	14.4	15.6	16.5	16.2	16.8	17.1	16.5	15.2	14.2	13.9	13.3	12.6	12.2	12.0	10.8
27		11.5	11.8	12.2	12.3	12.0	11.6	10.9	11.4	13.3	16.4	18.9	20.7	22.2	23.3	23.8	23.5	22.8	21.4	19.6	18.5	17.5	16.3	15.2	14.6	16.7
28		14.1	14.1	14.3	14.6	14.6	14.5	14.4	15.0	17.5	20.3	23.6	24.8	25.8	26.5	27.1	26.3	24.8	23.0	21.4	20.3	19.7	19.0	18.5	18.7	19.7
29		18.3	18.7	18.8	18.9	18.5	17.9	17.9	18.3	20.1	22.9	23.6	24.1	25.1	26.1	26.1	25.6	24.8	24.1	23.1	21.8	21.0	21.2	21.2	20.8	21.6
30		20.4	20.6	20.4	20.5	20.2	20.7	20.8	21.0	21.5	23.6	25.8	27.4	27.9	28.4	28.5	28.5	27.2	25.5	24.2	23.0	22.2	22.0	21.8	21.8	23.5

TOTAL HOURS 720 TOTAL GOOD HOURS 719 DATA CAPTURE 99.9%

MAX. 1HR AVG 28.5 11/30/91 15:00:00 2ND MAX. 1 HR AVG 28.5 11/30/91 14:00:00

MIN. 1HR AVG 3.1 11/26/91 00:00:00 ARITHMETIC MEAN 17.8 STANDARD DEV. 5.9

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge 02/17/92

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR TEMPERATURE IN DEGREES CELSIUS

		DECEMBER, 1991																								DAILY AVG
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
DAY																										
1		21.6	21.0	21.2	21.3	21.1	20.9	20.9	21.0	22.1	24.4	26.0	27.4	27.9	28.9	29.1	29.0	27.8	25.8	24.1	23.1	22.5	22.2	21.7	21.1	23.8
2		20.5	20.1	19.9	20.2	20.6	20.9	21.1	21.4	22.1	23.7	26.2	27.9	28.2	29.1	28.9	29.2	27.9	25.9	24.5	23.6	22.8	22.5	22.0	21.6	23.8
3		21.3	21.6	22.0	22.2	22.3	22.5	22.7	23.0	23.3	24.1	25.6	27.2	28.2	28.3	28.0	27.6	26.6	25.1	24.3	23.8	23.5	21.8	18.2	16.8	23.7
4		16.4	15.1	14.0	13.5	12.5	9.7	8.2	8.0	8.0	8.6	9.0	10.2	11.0	11.5	12.6	12.9	12.1	10.6	8.1	7.5	7.3	7.9	7.1	6.2	10.3
5		5.6	5.3	4.7	4.5	4.2	4.0	3.4	3.7	6.4	9.8	13.1	15.7	18.1	19.8	21.0	21.0	20.5	17.7	15.9	15.3	14.8	12.7	13.0	13.5	11.8
6		13.5	12.9	12.2	11.8	11.3	11.6	12.7	13.7	14.9	17.0	20.1	22.5	23.8	24.4	24.6	24.4	23.5	19.4	16.6	18.1	18.4	17.4	16.5	16.2	17.4
7		16.1	15.4	14.7	14.6	14.6	13.8	12.4	14.6	16.4	18.3	21.3	23.4	24.8	25.5	25.6	25.4	23.4	19.2	16.5	15.9	14.6	14.8	14.9	16.3	18.0
8		16.8	16.2	16.4	16.0	13.9	15.6	15.5	15.8	18.4	21.5	23.5	25.0	26.0	26.4	26.2	26.4	25.6	22.5	21.1	21.9	21.4	20.6	18.7	18.0	20.4
9		16.4	15.2	14.5	14.2	14.2	13.9	13.7	13.8	18.0	20.8	23.2	24.3	25.3	25.9	25.9	25.4	24.5	21.8	18.2	19.3	18.5	16.9	15.4	14.5	18.9
10		14.1	13.9	13.8	13.2	14.3	15.5	14.6	14.5	17.7	22.1	24.8	26.6	26.3	26.9	27.2	26.4	25.3	23.1	21.3	20.3	19.5	18.8	16.8	18.5	19.8
11		18.6	18.7	17.4	16.2	17.4	17.2	16.8	16.7	17.5	18.1	21.2	24.1	24.8	25.8	25.9	25.9	25.6	22.2	18.9	17.8	17.5	19.4	18.8	18.8	20.0
12		18.4	18.1	18.8	18.7	18.8	18.7	18.6	18.4	18.7	19.3	20.8	23.8	25.9	26.5	27.0	25.9	24.6	23.1	21.9	20.8	20.5	20.0	19.3	18.6	21.0
13		18.0	17.3	17.3	16.7	16.0	15.6	15.4	16.1	18.8	20.7	23.4	25.1	26.5	27.1	27.3	27.3	26.8	22.7	20.0	19.6	18.4	19.1	20.2	20.7	20.6
14		20.6	19.9	19.7	19.4	18.8	18.5	17.9	18.2	20.4	22.7	25.2	26.9	27.5	28.0	27.6	27.0	26.0	23.5	21.3	19.3	18.8	19.5	20.1	19.8	21.9
15		19.3	19.1	18.7	17.6	16.7	16.3	15.1	14.3	15.3	16.9	18.4	20.1	20.7	20.9	20.6	20.2	18.6	17.1	15.9	14.3	13.4	12.6	12.0	10.6	16.8
16		9.9	9.6	9.6	9.4	9.6	9.8	9.2	9.6	10.7	12.4	14.1	15.5	16.6	17.4	17.7	17.7	16.7	13.9	11.6	10.1	8.9	8.0	8.1	7.4	11.8
17		6.9	6.8	6.7	5.6	7.3	7.8	6.6	6.5	9.8	14.3	16.6	19.2	20.5	21.3	21.6	21.5	20.7	17.6	12.5	11.0	10.6	9.5	9.8	11.1	12.5
18		10.0	10.3	9.9	9.3	8.8	9.2	9.4	9.8	12.8	16.5	19.3	20.6	21.6	21.9	22.1	22.2	21.9	17.4	15.1	14.6	13.5	12.7	11.6	10.1	14.6
19		8.7	8.9	8.5	9.1	9.3	8.7	8.5	8.3	10.3	13.4	16.5	18.9	19.8	19.9	18.6	17.4	16.0	15.2	15.0	14.8	14.7	14.6	14.7	14.6	13.5
20		14.1	13.5	13.4	13.9	14.0	13.6	12.9	12.7	14.9	17.2	19.7	21.0	21.2	20.6	21.3	21.1	20.6	19.6	18.8	17.6	17.6	17.3	16.8	16.4	17.1
21		14.3	12.4	12.1	11.4	12.9	12.5	11.0	11.3	14.9	18.4	21.3	22.6	23.5	23.5	23.0	22.8	22.3	17.6	14.5	13.6	12.7	12.1	13.4	13.4	16.1
22		10.8	10.5	10.5	10.3	9.5	9.4	8.8	9.3	13.0	17.6	20.8	22.3	23.1	23.7	24.4	24.0	23.4	19.6	17.8	14.6	13.4	11.4	10.4	9.8	15.3
23		9.1	8.8	8.7	8.0	7.9	7.4	8.0	8.6	12.7	17.0	21.2	23.0	23.9	24.5	24.9	24.5	23.1	21.0	18.5	16.5	16.3	15.5	16.1	16.2	15.9
24		16.5	17.7	17.6	17.3	17.4	17.8	17.6	16.6	18.5	20.5	22.9	23.8	23.5	23.1	23.9	23.1	22.3	21.4	20.1	19.5	19.3	17.4	14.5	13.4	19.4
25		12.2	11.8	11.6	12.1	11.7	10.9	10.5	9.8	12.1	14.2	17.4	19.5	20.1	20.3	20.3	20.8	20.7	19.4	17.8	16.9	15.6	15.6	15.5	15.1	15.5
26		14.6	14.1	15.6	16.2	16.0	15.7	15.3	15.8	16.9	18.1	19.9	21.5	23.7	24.4	25.4	25.2	24.3	22.5	20.5	19.9	19.1	18.9	18.2	17.2	19.1
27		15.2	14.6	15.2	16.4	17.0	17.1	17.1	17.2	17.8	20.3	23.3	25.2	25.2	25.9	26.4	26.0	25.4	23.3	20.6	20.3	21.0	21.0	20.5	20.0	20.5
28		19.4	19.0	18.5	18.2	18.8	18.9	18.8	18.7	18.9	19.4	20.0	21.4	23.1	24.1	24.2	24.2	24.5	22.5	20.4	19.4	17.8	15.9	15.0	14.3	19.8
29		14.2	13.4	14.2	14.4	16.2	16.4	16.8	16.6	17.3	17.5	19.6	20.2	20.7	21.3	21.9	20.7	20.4	18.2	15.4	14.4	13.6	11.6	9.5	10.8	16.5
30		9.5	10.1	11.8	11.7	10.1	9.0	9.7	8.7	11.6	14.5	16.5	17.5	18.3	18.9	19.3	18.8	17.8	16.2	13.9	12.2	11.3	10.8	10.5	9.9	13.2
31		9.6	9.9	9.9	9.7	9.7	10.2	10.1	10.2	11.8	13.8	15.0	16.4	17.6	18.0	18.4	18.9	18.5	17.7	17.0	16.5	16.3	15.9	15.5	15.1	14.2

TOTAL HOURS 744 TOTAL GOOD HOURS 744 DATA CAPTURE 100.0%

MAX. 1HR AVG 29.2 12/02/91 15:00:00 2ND MAX. 1 HR AVG 29.1 12/02/91 13:00:00

MIN. 1HR AVG 3.4 12/05/91 06:00:00 ARITHMETIC MEAN 17.5 STANDARD DEV. 5.4

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, Pwrf - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

02/17/92

11.11-86

TEC AQ - 1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR TEMPERATURE IN DEGREES CELSIUS

JANUARY 1992																										
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	DAILY AVG
DAY																										
1		15.0	15.2	15.4	15.8	16.0	15.9	16.4	16.6	17.1	17.7	18.8	20.0	21.5	21.5	21.2	20.9	20.6	19.6	18.7	18.0	17.9	18.1	17.9	17.8	18.0
2		18.0	17.9	17.7	17.8	17.6	17.6	17.5	17.4	17.5	18.1	18.5	20.2	21.6	22.5	22.5	22.3	21.9	20.3	17.8	15.6	13.9	15.0	14.8	14.7	18.2
3		14.3	14.2	14.2	13.2	12.5	13.1	14.3	15.0	15.3	16.2	17.5	18.6	20.1	19.8	19.6	18.7	16.7	15.1	13.5	11.1	8.0	7.5	8.3	10.2	14.4
4		9.5	10.2	11.9	11.8	11.6	10.6	9.6	9.4	11.6	13.4	14.0	14.9	15.3	16.4	16.4	15.1	13.8	13.2	12.9	12.6	12.4	12.2	11.5	9.0	12.4
5		7.9	7.7	6.6	7.3	6.0	6.0	6.3	7.0	9.8	12.5	14.5	16.6	17.9	18.9	19.4	19.0	18.6	17.2	15.9	14.9	13.3	11.8	10.9	11.1	12.4
6		10.9	11.1	11.9	12.2	11.7	11.9	11.9	12.1	13.0	15.2	17.8	19.7	21.2	22.1	22.2	21.3	19.0	16.9	14.6	13.0	12.0	11.3	9.3	9.4	14.6
7		8.7	7.0	7.0	6.4	6.8	6.9	5.9	4.6	8.8	12.9	16.7	19.1	20.8	22.1	22.6	22.4	22.1	18.6	12.4	10.1	8.8	7.7	9.8	10.2	12.4
8		8.5	8.4	6.3	4.5	6.4	8.1	8.6	9.2	10.9	14.4	19.1	21.9	22.5	22.9	23.7	23.6	23.0	20.8	16.0	13.4	14.6	16.3	15.8	14.9	14.7
9		13.9	13.3	11.0	11.2	9.9	9.5	10.0	9.4	13.7	18.3	21.9	23.6	25.1	26.1	26.3	26.2	24.8	22.8	19.3	17.5	16.2	15.1	15.4	15.4	17.3
10		15.1	15.6	16.2	16.9	17.1	17.6	17.6	17.8	18.4	Cal	Cal	22.7	23.0	21.5	21.5	21.8	19.5	17.6	17.0	16.3	15.6	15.1	14.1	13.1	17.8
11		12.2	10.9	9.6	8.2	6.8	5.8	4.1	4.2	6.6	8.9	11.0	13.3	14.8	15.4	15.8	16.6	16.2	14.1	9.4	7.9	6.4	6.6	5.8	6.8	9.9
12		8.8	10.0	10.0	10.0	10.1	10.0	10.0	10.1	12.1	15.8	19.2	21.5	22.3	22.7	23.1	22.8	22.5	21.1	19.8	19.0	18.7	18.9	18.0	17.2	16.4
13		16.5	15.8	14.9	14.9	15.0	14.6	14.7	15.1	17.2	20.4	23.4	25.1	26.2	26.4	26.4	25.9	25.2	23.8	22.2	21.2	20.4	20.0	19.9	19.6	20.2
14		19.6	19.9	20.2	20.7	21.2	20.6	20.2	20.0	19.4	19.4	20.7	21.0	21.0	20.6	20.0	19.1	17.5	15.6	14.8	13.7	12.6	11.1	10.6	10.5	17.9
15		9.6	8.9	8.6	7.7	7.2	6.2	5.6	5.5	6.8	8.1	9.3	9.8	10.5	11.6	12.6	12.2	12.3	10.1	7.6	6.9	5.8	3.3	1.4	1.5	7.9
16		2.5	4.3	4.1	4.2	3.3	4.0	4.5	4.5	6.5	8.2	10.2	12.0	13.3	13.8	13.7	13.7	12.6	10.6	6.8	5.2	4.2	3.6	3.2	1.7	7.1
17		2.5	2.3	2.0	2.2	0.7	1.8	0.1	1.1	4.6	7.6	10.3	12.5	14.5	15.8	16.2	16.8	16.9	14.9	9.5	10.3	9.2	8.4	7.8	7.4	8.1
18		6.9	7.3	7.4	6.6	6.7	6.2	5.6	6.2	9.6	13.3	16.5	18.3	20.2	20.6	20.9	21.1	21.1	19.4	16.1	14.1	13.3	13.0	12.3	12.4	13.1
19		11.7	10.9	10.1	9.6	10.1	12.2	13.5	14.7	15.6	17.4	17.6	17.8	18.7	19.8	20.2	20.5	19.2	14.5	12.5	11.7	11.2	11.0	11.0	11.0	14.3
20		10.7	10.5	9.7	8.7	8.0	7.6	7.3	7.2	7.7	8.3	9.3	10.3	11.6	14.6	16.0	16.4	15.9	14.2	11.2	9.3	7.4	5.8	4.7	4.2	9.8
21		2.8	3.0	2.6	2.0	3.5	2.7	3.1	2.8	5.4	9.0	12.8	15.0	17.4	19.1	20.7	20.9	20.5	17.9	11.1	9.7	11.2	12.7	12.2	11.3	10.4
22		10.0	10.0	9.7	10.9	11.2	11.0	10.8	10.8	13.2	16.5	19.9	22.4	23.7	24.3	24.7	24.0	23.6	22.1	20.9	20.6	20.4	19.3	18.8	18.5	17.4
23		18.7	18.4	17.7	17.9	18.6	18.7	19.2	19.8	20.8	22.4	24.3	24.8	25.6	24.9	19.7	17.8	18.6	18.9	18.2	17.7	17.3	17.7	18.0	17.2	19.7
24		15.8	15.1	14.7	14.1	13.6	13.4	12.8	12.3	11.9	11.3	11.2	11.3	12.4	14.3	16.3	15.4	13.9	12.3	9.1	8.4	6.0	5.0	5.3	5.2	11.7
25		4.7	5.4	4.4	3.3	4.5	3.4	2.7	1.4	6.6	10.5	12.2	14.2	16.2	17.2	18.2	18.3	18.4	16.9	14.9	12.6	11.6	10.3	9.7	8.7	10.2
26		7.6	6.6	4.1	6.6	6.1	5.6	3.8	4.4	7.9	9.9	12.6	14.8	16.7	18.1	19.0	19.0	18.4	17.2	14.8	10.6	9.6	9.3	11.4	12.1	11.1
27		11.9	11.8	12.4	12.1	11.6	11.8	12.2	12.2	13.7	17.0	20.5	22.0	22.1	23.5	24.0	23.6	22.8	21.6	19.5	18.6	18.3	17.3	17.2	17.2	17.3
28		17.1	16.8	16.7	16.7	16.6	16.6	16.9	17.1	17.9	19.1	21.6	22.5	22.7	22.7	22.7	21.6	20.9	20.5	20.2	20.1	20.0	19.4	19.0	19.0	19.3
29		18.6	18.6	18.1	17.5	17.6	17.7	17.4	17.6	18.3	19.7	20.5	21.6	24.6	26.5	27.4	27.1	25.7	24.0	22.8	22.1	21.7	20.7	19.7	19.2	21.0
30		19.1	18.8	18.6	17.4	18.1	17.2	17.3	17.4	17.7	18.6	20.0	22.6	24.7	25.9	26.3	25.4	23.6	22.3	21.5	21.3	20.6	19.0	17.8	16.0	20.3
31		15.0	14.6	14.7	14.7	14.5	14.6	15.0	15.2	15.8	16.3	17.7	18.0	18.1	18.7	20.4	20.6	19.0	17.1	14.3	12.7	11.6	10.6	10.1	10.0	15.4

TOTAL HOURS 744 TOTAL GOOD HOURS 742 DATA CAPTURE 99.7%

MAX. 1HR AVG 27.4 01/29/92 14:00:00 2ND MAX. 1 HR AVG 27.1 01/29/92 15:00:00

MIN. 1HR AVG 0.1 01/17/92 06:00:00 ARITHMETIC MEAN 14.5 STANDARD DEV. 5.8

KEY FOR MISSING CODES

Bad< - To few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

11.11-87

TEC Aq - 1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR TEMPERATURE IN DEGREES CELSIUS

		FEBRUARY 1992																							DAILY AVG
DAY	HOUR (EST)	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	10.0	10.4	10.5	10.4	10.5	10.6	10.3	10.0	11.2	13.1	16.6	18.9	20.3	21.5	21.6	21.1	19.7	17.6	13.8	11.9	10.8	10.2	10.0	9.5	13.7
2	8.0	5.8	4.2	3.8	6.6	4.9	4.4	4.3	8.1	11.7	14.7	16.6	17.7	18.4	19.2	19.7	19.3	18.1	16.8	15.7	14.6	13.8	13.2	12.6	12.1
3	12.2	11.7	10.7	10.2	10.0	10.2	10.6	10.5	12.1	15.0	18.0	19.8	20.8	21.7	22.7	22.6	22.1	20.9	16.1	12.7	14.7	14.7	13.5	12.7	15.2
4	13.0	13.3	13.2	11.2	10.2	8.7	9.5	11.3	13.8	17.0	20.0	21.8	22.8	23.4	23.9	23.6	22.9	21.9	18.4	17.4	17.3	17.0	17.0	17.2	16.9
5	17.2	17.6	17.7	17.6	17.6	15.3	13.7	13.8	14.1	14.5	16.3	20.1	22.8	23.1	24.1	24.8	23.7	22.9	19.2	17.2	17.4	17.4	16.8	16.8	18.4
6	16.0	15.6	15.5	15.3	15.4	14.9	14.7	15.3	15.9	17.7	18.2	18.4	18.8	18.4	17.7	16.1	15.2	14.5	13.5	12.5	11.9	11.5	10.4	10.1	15.1
7	9.3	9.0	9.2	9.3	9.5	9.9	9.9	9.7	10.1	10.9	12.7	13.8	16.9	18.2	18.8	18.5	17.9	16.2	14.6	14.0	12.6	11.5	10.1	8.8	12.5
8	8.9	8.3	7.2	5.9	5.4	6.3	7.5	6.6	10.6	13.3	15.5	17.2	18.3	18.6	18.9	18.3	16.8	15.1	12.4	10.6	8.9	7.5	7.1	6.2	11.3
9	6.7	6.6	6.8	6.5	5.3	5.1	5.1	5.5	8.1	10.4	12.6	14.1	15.4	16.8	17.6	18.0	17.5	16.3	14.6	14.2	13.7	13.6	13.0	11.9	11.4
10	10.9	10.4	10.1	9.4	9.2	9.4	10.1	11.4	12.7	15.2	18.6	20.5	21.7	22.2	23.1	23.0	23.0	21.7	19.3	17.4	16.0	15.1	13.5	13.3	15.7
11	13.0	12.2	12.2	12.2	12.2	12.2	12.3	12.4	12.6	12.9	13.6	16.0	19.7	22.2	22.8	22.7	22.3	21.0	17.5	14.6	12.7	12.7	13.1	11.6	15.3
12	10.7	9.6	10.5	9.9	10.2	10.2	10.1	9.6	9.9	10.6	11.5	12.8	15.5	17.5	19.0	19.9	20.8	20.1	14.5	11.5	10.0	10.0	9.1	8.9	12.6
13	8.1	8.0	7.7	7.8	10.6	10.8	11.1	10.4	11.6	13.0	14.6	18.1	21.7	22.8	23.2	23.2	23.4	21.7	19.3	16.9	15.1	12.5	10.9	10.5	14.7
14	10.3	9.7	9.5	9.1	9.6	10.0	10.0	11.3	14.0	16.0	19.0	22.0	23.0	24.0	25.0	26.0	25.0	24.0	22.0	19.0	18.0	16.0	16.0	15.0	16.8
15	14.0	15.0	15.0	15.0	15.0	12.0	13.0	14.0	15.0	20.0	23.0	25.0	26.0	26.0	27.0	27.0	26.0	25.0	22.0	19.0	17.0	17.0	17.0	16.0	19.2
16	16.0	15.0	15.0	15.0	14.0	14.0	15.0	15.0	16.0	18.0	20.0	22.0	26.0	27.0	27.0	26.0	26.0	25.0	24.0	22.0	21.0	21.0	18.0	18.0	19.8
17	16.0	16.0	16.0	16.0	17.0	17.0	17.0	18.0	19.0	21.0	26.0	26.0	28.0	28.0	29.0	28.0	27.0	25.0	22.0	22.0	20.0	18.0	16.0	17.0	21.0
18	17.0	17.0	17.0	16.0	16.0	16.0	17.0	16.0	20.0	22.0	25.0	26.0	28.0	28.0	28.0	28.0	28.0	26.0	24.0	23.0	22.0	21.0	20.0	20.0	21.7
19	20.0	20.0	20.0	20.0	20.0	20.0	20.0	21.0	22.0	23.0	24.0	25.0	26.0	28.0	26.0	25.0	24.0	24.0	22.0	21.0	19.0	19.0	19.0	18.0	21.9
20	17.0	17.0	17.0	18.0	18.0	18.0	17.0	16.0	17.0	19.0	20.0	21.0	22.0	23.0	24.0	24.0	24.0	22.0	22.0	20.0	18.0	17.0	16.0	15.0	19.3
21	14.0	14.0	13.0	13.0	13.0	14.0	14.0	15.0	15.0	18.0	21.0	23.0	23.0	24.0	24.0	24.0	23.0	22.0	21.0	21.0	20.0	19.0	19.0	19.0	18.6
22	19.0	19.0	18.0	18.0	18.0	18.0	18.0	18.0	20.0	22.0	24.0	25.0	26.0	26.0	26.0	24.0	25.0	24.0	23.0	22.0	22.0	21.0	20.0	20.0	21.5
23	19.0	19.0	20.0	19.0	18.0	18.0	19.0	20.0	20.0	21.0	23.0	26.0	27.0	28.0	28.0	27.0	27.0	26.0	24.0	22.0	20.0	20.0	19.0	18.0	22.0
24	18.0	18.0	19.0	18.0	19.0	19.0	19.0	19.0	20.0	22.0	23.0	24.0	25.0	26.0	27.0	26.0	26.0	20.0	19.0	18.0	18.0	18.0	18.0	18.0	20.7
25	17.6	17.4	17.5	17.9	18.7	18.9	18.8	19.1	PwrF	21.1	22.1	23.1	22.7	23.0	22.7	20.4	19.6	20.8	21.1	21.8	21.6	19.3	19.3	19.2	20.1
26	19.2	19.4	19.4	19.5	19.4	19.4	19.7	20.3	20.1	20.0	21.7	22.4	PwrF	PwrF	22.5	22.6	20.7	19.5	17.8	16.8	16.3	15.5	16.0	15.8	19.3
27	15.2	14.0	14.1	14.2	13.9	14.0	14.2	14.4	15.1	16.2	18.0	18.6	19.6	20.3	19.5	18.7	16.5	15.0	13.4	12.2	11.4	10.9	10.5	11.1	15.0
28	11.5	11.6	11.8	12.4	12.5	11.6	10.0	10.3	13.4	15.5	17.5	19.1	19.8	20.8	21.2	20.9	20.0	18.6	16.0	13.4	12.2	11.9	11.4	10.0	14.7
29	10.2	9.4	10.8	12.1	10.7	8.6	9.1	10.7	15.3	19.0	20.7	21.5	22.2	23.0	23.6	23.2	22.4	20.9	18.4	16.0	14.9	13.5	11.1	10.7	15.7

TOTAL HOURS 696 TOTAL GOOD HOURS 693 DATA CAPTURE 99.6%

MAX. 1HR AVG 29.0 02/17/92 14:00:00 2ND MAX. 1 HR AVG 28.0 02/23/92 14:00:00

MIN. 1HR AVG 3.8 02/02/92 03:00:00 ARITHMETIC MEAN 17.0 STANDARD DEV. 5.3

KEY FOR MISSING CODES

Bad< - To few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

11.11-88

TEC AQ - 1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR TEMPERATURE IN DEGREES CELSIUS

		MARCH 1992																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1		10.7	10.3	10.4	10.3	10.2	9.4	10.3	12.6	14.0	15.5	17.2	21.3	23.1	24.0	24.9	25.2	25.6	24.8	21.1	18.2	17.4	15.0	13.3	13.5	16.6
2		13.4	12.0	12.3	11.0	11.6	12.0	12.2	13.2	16.4	19.3	22.5	24.3	25.2	25.8	26.3	26.3	26.3	25.8	21.4	17.4	18.9	17.3	16.8	17.1	18.5
3		16.0	15.1	13.9	13.0	13.2	12.8	12.1	13.6	18.5	21.4	23.2	24.2	24.8	25.5	25.6	25.8	25.3	24.3	22.7	21.8	20.5	19.3	18.6	17.5	19.5
4		16.4	15.7	15.0	14.8	14.0	13.7	15.2	16.4	18.2	20.9	23.3	23.4	23.6	22.5	20.3	20.6	19.7	19.0	18.5	18.6	18.5	18.6	18.6	18.5	18.5
5		18.6	18.4	18.0	17.7	17.4	17.5	17.3	18.1	19.8	22.0	23.7	25.0	25.7	26.5	26.9	27.2	27.1	25.7	24.0	23.0	22.4	21.6	20.7	20.2	21.8
6		19.6	19.2	19.0	18.7	18.3	18.4	18.6	18.9	20.8	23.5	25.3	25.5	27.0	27.9	27.9	28.6	28.6	26.8	24.6	23.0	22.0	20.8	19.9	19.4	22.6
7		19.5	18.5	18.6	19.2	19.5	19.6	19.6	19.7	20.1	20.8	21.7	24.7	27.8	28.4	28.6	28.2	27.4	25.9	23.7	21.9	20.7	20.8	20.7	20.5	22.3
8		20.6	20.3	20.0	19.4	19.1	18.5	17.8	17.0	18.6	20.6	23.2	25.2	26.8	27.7	28.4	28.7	28.4	27.5	23.5	20.4	18.4	16.4	16.0	16.3	21.6
9		15.2	14.9	15.0	14.6	13.7	13.0	14.1	15.9	19.0	21.2	23.8	25.5	27.3	28.0	28.4	28.8	28.9	27.4	24.0	20.6	20.5	20.5	17.4	18.0	20.6
10		17.9	17.1	17.2	17.3	17.3	17.7	18.2	19.2	21.3	23.1	24.9	26.5	27.6	27.9	27.8	27.1	26.3	25.3	24.3	23.5	22.3	17.8	16.9	15.6	21.6
11		15.0	15.3	15.8	15.7	15.5	15.5	14.8	13.6	13.1	12.7	13.6	15.0	16.5	17.6	17.5	16.4	16.1	14.1	11.8	10.6	9.4	8.3	6.3	6.4	13.6
12		6.0	5.5	6.8	7.3	7.3	8.1	8.4	8.6	9.1	10.1	10.6	10.5	10.8	12.0	11.8	11.7	12.1	12.1	11.5	11.4	11.3	11.0	10.6	9.1	9.7
13		8.9	8.9	8.9	9.3	9.5	9.6	9.9	10.4	12.1	14.7	16.6	18.8	19.1	19.2	19.9	20.6	19.7	18.3	16.8	15.7	14.4	12.8	13.2	12.9	14.2
14		12.8	12.6	12.3	12.0	11.3	10.6	10.8	11.8	12.4	13.0	13.7	14.7	16.8	18.1	19.4	18.9	17.9	16.5	14.8	13.1	12.2	10.9	8.2	7.3	13.4
15		8.2	7.5	9.0	9.2	8.3	7.8	6.7	10.5	14.7	18.8	20.9	22.6	24.1	24.7	24.8	24.1	23.0	21.2	18.9	17.2	16.0	14.8	14.1	14.1	15.9
16		14.3	14.2	14.1	13.3	14.0	14.4	14.2	14.7	15.2	16.1	17.1	18.2	19.5	20.4	20.9	21.4	21.6	20.5	17.8	15.2	13.3	11.8	10.6	9.6	15.9
17		9.1	8.6	8.3	8.4	8.5	8.8	8.6	10.7	14.1	17.3	19.6	20.8	21.9	22.7	23.5	23.9	24.0	23.6	20.9	18.9	16.6	15.6	15.1	12.9	15.9
18		13.7	13.5	13.2	13.0	12.8	12.5	12.7	14.4	17.5	20.2	22.4	23.7	25.0	25.3	25.4	25.3	26.2	25.1	22.6	19.6	18.3	17.8	17.2	15.7	18.9
19		15.5	16.4	17.2	17.4	17.3	17.5	18.5	19.6	22.2	24.6	26.5	27.0	27.3	27.1	27.0	27.7	26.7	25.3	22.9	20.8	19.7	19.2	19.7	19.9	21.8
20		19.4	19.1	18.4	17.5	16.9	16.8	17.0	18.0	19.6	21.3	22.0	21.4	21.2	21.2	20.4	19.9	18.6	16.7	14.7	13.4	13.1	12.7	12.1	11.5	17.6
21		10.8	11.3	10.6	9.9	7.1	7.1	7.6	9.7	12.8	15.6	17.2	18.1	19.5	19.9	20.7	20.7	20.4	19.8	18.1	16.4	15.1	13.4	12.4	11.6	14.4
22		12.9	13.0	13.1	13.1	13.7	13.1	13.4	14.6	16.1	18.0	19.7	20.4	21.1	19.6	17.1	16.7	16.1	15.5	15.3	15.2	15.3	15.3	15.0	15.1	15.7
23		15.5	15.7	15.7	16.5	16.8	16.8	17.0	17.7	19.7	22.4	23.8	24.9	24.5	24.9	24.9	23.8	23.7	23.2	21.4	18.6	16.8	15.5	14.1	13.5	19.5
24		12.6	12.9	14.0	14.1	14.0	13.1	12.8	13.6	15.8	18.1	20.0	21.4	22.8	23.6	24.3	24.4	23.7	22.4	21.0	19.7	18.8	18.4	18.2	18.0	18.2
25		18.0	17.4	17.0	16.7	16.3	16.3	16.5	17.5	19.4	21.2	22.5	22.8	23.4	24.0	24.2	24.1	23.4	21.2	19.5	19.1	18.5	18.5	18.3	16.9	19.7
26		16.7	17.0	16.7	15.3	14.7	14.6	13.5	13.7	15.6	18.0	21.1	22.7	24.0	24.1	24.2	23.9	22.9	21.9	19.5	16.5	14.2	11.7	10.3	9.9	17.6
27		9.0	9.3	8.8	8.6	9.6	10.6	9.9	11.9	16.3	19.6	21.6	23.1	24.0	25.3	25.8	25.8	25.2	23.5	20.7	18.2	16.4	14.2	12.3	11.1	16.7
28		10.7	10.7	11.7	12.1	13.1	12.9	14.1	14.3	16.0	18.1	20.2	21.9	22.8	23.9	24.3	24.9	24.6	23.9	21.6	18.9	17.8	15.5	14.2	15.2	17.6
29		14.5	13.5	13.2	13.7	13.5	13.3	13.4	14.7	17.2	19.9	23.2	24.5	25.0	25.4	24.9	24.5	24.0	23.7	21.0	19.8	19.5	19.1	17.7	17.2	19.0
30		17.4	17.0	17.0	17.0	17.2	16.7	16.7	17.4	19.2	21.5	24.0	25.9	27.3	28.1	28.0	26.3	25.1	23.1	20.5	18.4	18.3	18.1	17.7	17.6	20.6
31		17.6	17.6	17.3	17.7	17.6	17.4	17.7	18.7	20.2	21.3	23.1	24.8	23.9	23.8	23.5	23.0	Cal	20.0	17.5	15.2	14.0	12.9	12.2	11.6	18.6

TOTAL HOURS 744 TOTAL GOOD HOURS 743 DATA CAPTURE 99.9%

MAX. 1HR AVG 28.9 03/09/92 16:00:00 2ND MAX. 1 HR AVG 28.8 03/09/92 15:00:00

MIN. 1HR AVG 5.5 03/12/92 01:00:00 ARITHMETIC MEAN 18.0 STANDARD DEV. 5.2

KEY FOR MISSING CODES

Bad< - To few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

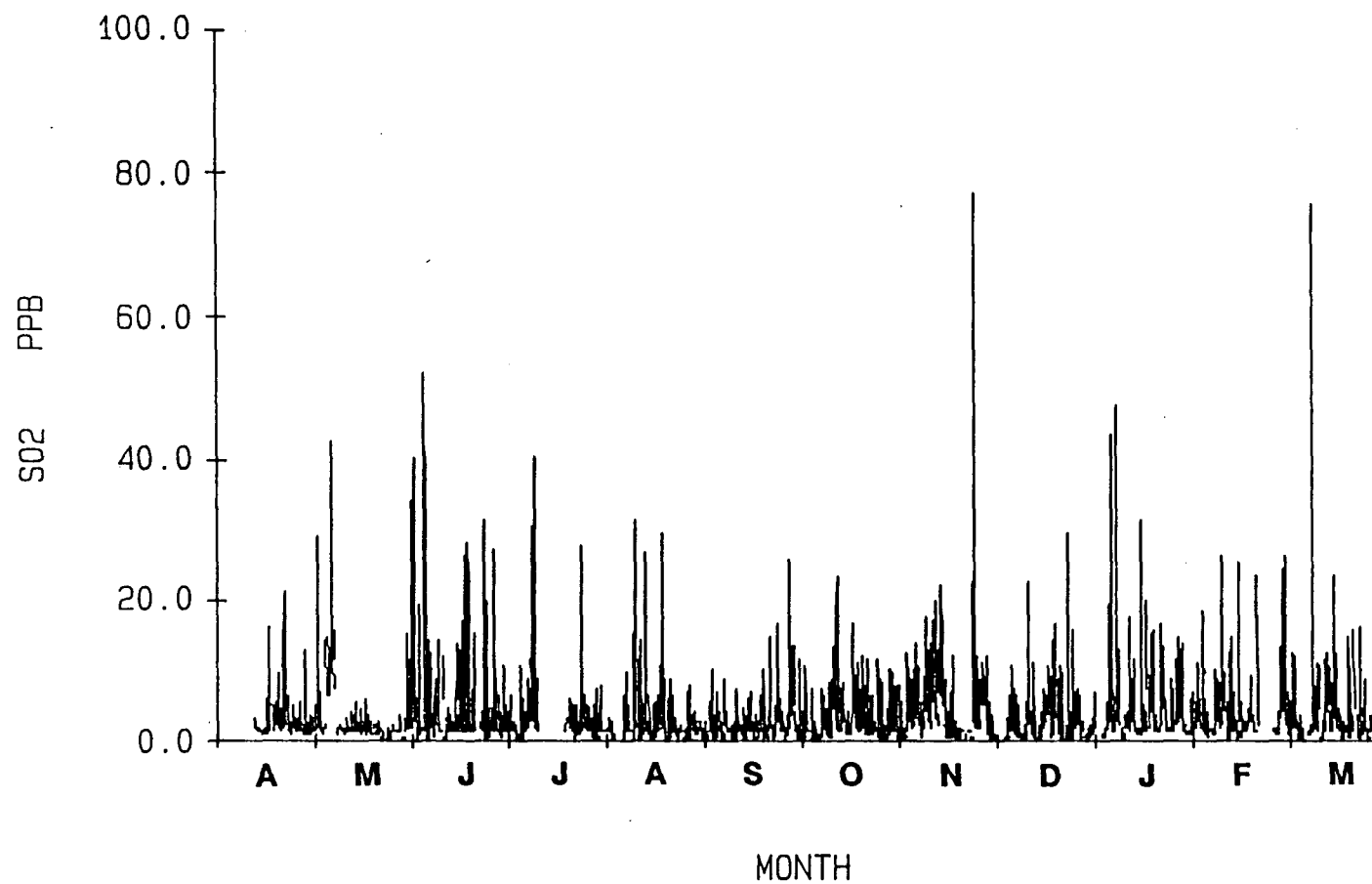
Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

11.11-89

**HOURLY AVERAGES FOR SULFUR DIOXIDE
[PARTS PER BILLION (ppb)]**

11.11-91

TIME PLOT FOR 04/01/91 00:00:00 TO 03/31/92 23:00:00

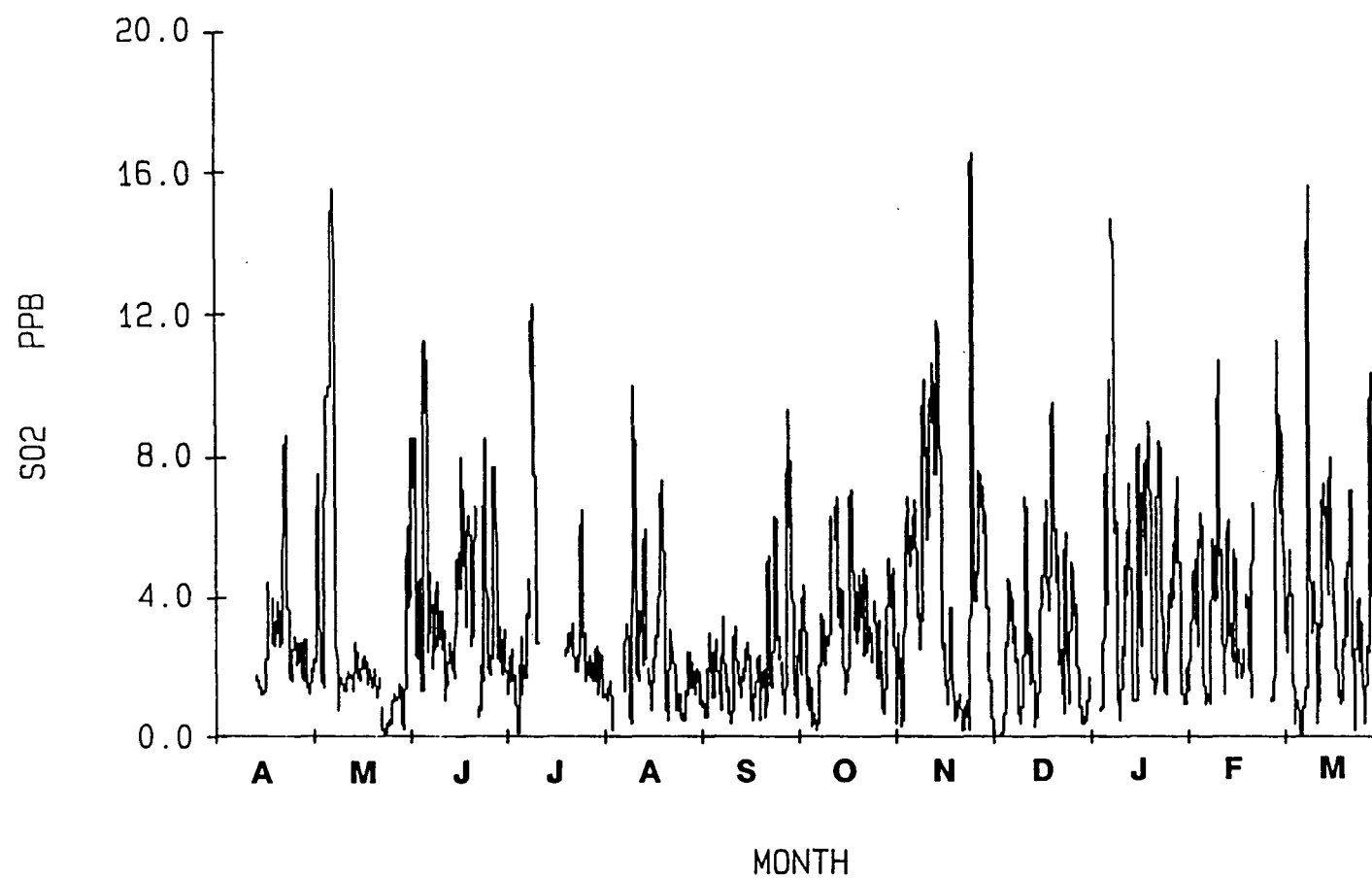


Tampa Electric Station AQ-1

Averaging Time: 3 Hour

11.11-92

TIME PLOT FOR 04/01/91 00:00:00 TO 03/31/92 23:00:00



Tampa Electric Station AQ-1

Averaging Time: 24 Hour

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR SO2 IN PPB

		APRIL, 1991																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1		0	1	0	1	0	0	1	1	3	Cal	3	2	3	4	2	1	1	2	3	4	0	1	5	14	2
2		1	1	1	1	3	4	2	4	4	1	1	0	Cal	Cal	0	0	0	0	0	0	0	0	0	4	1
3		10	3	Cal	1	2	2	4	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1
4		2	2	Cal	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	2	1	1
5		1	2	Cal	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6		0	1	Cal	0	0	0	0	2	0	0	0	0	0	0	0	1	0	1	3	0	0	0	0	0	0
7		0	1	Cal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8		0	0	Cal	1	1	1	1	1	1	2	2	Cal	1	1	1	1	1	1	7	1	1	1	1	1	1
9		2	2	Cal	1	1	2	2	2	2	2	2	2	2	2	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Bad<
10		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
11		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Bad<
12		2	2	Cal	1	0	4	2	3	2	2	1	1	1	2	2	2	2	2	3	3	3	3	2	3	Bad<
13		1	1	Cal	2	1	1	1	2	2	2	2	1	1	1	1	1	2	1	1	1	2	1	1	1	1
14		1	1	Cal	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
15		1	1	Cal	0	1	1	1	1	2	2	2	2	1	1	1	1	1	1	2	3	2	3	5	7	2
16		5	5	Cal	1	1	1	1	2	2	2	1	1	2	1	1	2	15	22	12	PwrF	PwrF	PwrF	PwrF	PwrF	Bad<
17		PwrF	Miss	Cal	5	5	5	5	5	5	5	5	5	5	PwrF	1	Cal	1	2	PwrF	6	Cal	7	3	1	Bad<
18		1	2	3	1	1	1	2	2	2	4	4	7	2	2	3	5	5	6	4	2	3	2	2	3	3
19		2	2	Cal	2	4	4	4	2	1	2	2	4	7	15	7	2	2	2	8	2	2	1	2	2	3
20		2	5	Cal	1	0	2	2	3	5	2	2	2	2	8	2	2	2	5	7	2	2	3	2	1	3
21		2	11	Cal	6	3	4	3	3	5	3	3	4	10	19	17	22	21	20	21	5	5	3	3	2	8
22		2	2	Cal	2	4	6	8	4	7	6	5	6	4	3	3	5	3	2	2	2	2	4	3	1	4
23		1	1	Cal	0	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	1	2
24		2	1	Cal	2	2	2	2	3	3	2	3	7	4	3	3	3	3	3	3	2	3	3	3	3	3
25		3	3	Cal	1	1	1	2	2	4	2	2	3	2	3	4	3	2	2	3	3	1	1	1	1	2
26		2	1	Cal	3	2	4	3	2	1	11	3	2	2	2	1	2	1	2	4	5	3	3	2	1	3
27		1	1	Cal	1	0	1	1	2	1	1	1	1	1	1	1	1	2	1	11	21	6	2	2	1	3
28		1	1	Cal	0	0	1	2	2	2	1	1	1	1	1	1	2	2	1	3	2	2	1	1	1	1
29		1	1	Cal	0	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	3	4	4	3	1
30		2	2	Cal	2	1	1	1	1	4	2	2	2	2	1	1	1	1	2	2	2	2	2	2	4	2

TOTAL HOURS 720 TOTAL GOOD HOURS 631 DATA CAPTURE 87.6%

MAX. 1HR AVG 22 04/21/91 15:00:00 2ND MAX. 1 HR AVG 22 04/16/91 17:00:00

MIN. 1HR AVG 0 04/01/91 00:00:00 ARITHMETIC MEAN 2 STANDARD DEV. 3

NAAQS Comparison: MAX. 3 HR AVG 21 (500) 04/21/91 17:00:00
MAX. 24 HR AVG 9 (140) 04/22/91 11:00:00

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration
BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data
Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

11.11-93

HOURLY AVERAGES FOR SO2 IN PPB

[illegible]

NAAQS Comparison: MAX. 3 HR AVG 43 (500) 05/06/91 17:00:00
MAX. 24 HR AVG 16 (140) 05/07/91 14:00:00

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration
BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data
Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR SO2 IN PPB

JUNE, 1991																								DAILY		
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1	2	2	Cal	1	2	6	4	3	17	60	44	7	4	3	2	5	5	8	6	4	3	0	0	0	8	
2	0	0	Cal	1	4	2	1	1	3	0	1	5	1	1	12	15	26	18	6	1	1	1	2	1	4	
3	2	1	Cal	2	2	2	2	2	1	2	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	
4	2	2	Cal	1	1	1	2	1	1	9	Cal	Cal	9	2	1	18	50	17	91	24	3	2	2	2	11	
5	2	2	Cal	0	1	0	0	0	0	0	0	0	0	31	6	5	3	7	2	0	0	0	0	0	3	
6	0	0	Cal	2	2	2	2	8	12	17	3	2	3	2	1	5	4	1	2	2	3	2	2	7	4	
7	2	2	Cal	3	2	1	2	4	3	4	2	1	1	1	2	2	1	0	0	9	5	11	4	0	3	
8	14	12	Cal	3	4	4	4	5	7	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	
9	2	2	Cal	1	8	20	14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	
10	1	1	Cal	21	8	7	3	18	3	Cal	1	0	0	0	0	0	0	0	0	0	0	0	0	2	3	
11	1	3	Cal	4	3	2	3	2	Cal	2	1	Cal	1	1	1	1	1	1	1	1	4	1	1	4	2	
12	6	4	Cal	2	2	2	3	4	2	1	2	3	3	2	3	3	3	2	3	4	3	1	1	1	2	
13	4	5	Cal	1	1	1	1	1	1	2	3	3	2	2	2	2	2	2	2	3	3	1	1	1	2	
14	1	1	Cal	2	3	3	5	2	4	3	3	1	1	1	1	1	1	11	20	11	11	5	8	5		
15	5	5	Cal	1	1	1	1	1	2	6	3	2	1	4	3	2	8	12	13	13	9	8	3	2	5	
16	1	1	Cal	1	1	1	1	2	4	13	16	19	16	14	21	3	10	7	1	1	1	1	1	2	6	
17	1	1	Cal	1	1	2	1	2	2	2	6	67	6	2	2	4	2	PwrF	PwrF	3	3	2	4	2	5	
18	2	2	Cal	2	3	2	2	1	1	1	1	20	56	9	6	5	7	6	3	1	1	1	3	2	6	
19	2	1	Cal	1	1	2	2	1	1	1	1	2	4	8	6	3	13	4	3	2	2	1	3	1	3	
20	2	1	Cal	2	3	3	1	1	1	5	12	10	9	8	7	5	20	14	12	7	PwrF	PwrF	PwrF	PwrF	6	
21	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	3	1	1	1	Cal	0	0	0	0	0	0	0	0	0	Bad<	
22	0	0	Cal	1	2	2	2	3	3	1	1	1	1	1	1	2	2	5	2	2	6	4	1	2	2	
23	2	2	Cal	1	0	0	0	0	0	2	1	3	6	16	39	39	11	15	2	1	0	0	0	0	6	
24	0	0	Cal	0	0	1	1	4	45	11	3	1	2	5	0	0	0	1	2	1	2	2	2	3	4	
25	1	1	Cal	2	2	2	1	1	7	5	2	2	2	2	2	3	3	7	1	2	1	2	2	2	2	
26	2	2	Cal	1	1	2	2	4	10	10	1	1	1	1	1	3	20	25	38	14	20	3	15	3	8	
27	2	1	Cal	1	1	1	1	1	1	1	1	2	2	5	3	4	4	2	4	3	3	3	3	3	2	
28	11	5	Cal	1	1	1	1	2	4	4	2	2	2	6	3	3	2	6	4	1	1	3	0	0	3	
29	1	1	Cal	1	1	2	2	1	1	1	1	1	1	2	3	5	6	21	3	1	2	1	1	1	3	
30	1	1	Cal	1	1	2	2	9	4	2	1	1	1	2	4	2	1	1	1	1	1	1	1	1	2	

TOTAL HOURS 720 TOTAL GOOD HOURS 669 DATA CAPTURE 92.9%

MAX. 1HR AVG 91 06/04/91 18:00:00 2ND MAX. 1 HR AVG 67 06/17/91 11:00:00

MIN. 1HR AVG 0 06/01/91 22:00:00 ARITHMETIC MEAN 4 STANDARD DEV. 8

NAAQS Comparison: MAX. 3 HR AVG 53 (500) 06/04/91 18:00:00
MAX. 24 HR AVG 11 (140) 06/04/91 21:00:00

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

11.11-95

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR SO2 IN PPB

		JULY, 1991																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1	0	0	Cal	1	1	1	1	1	1	1	1	3	5	4	4	9	6	3	2	1	2	1	1	1	1	2
2	1	1	Cal	1	1	2	1	2	1	3	4	2	1	2	4	1	2	2	1	1	1	1	2	1	1	2
3	1	1	Cal	4	1	0	0	0	0	Cal	6	1	0	0	0	0	0	0	2	0	0	0	0	0	0	1
4	0	0	Cal	0	0	0	0	0	0	0	0	0	0	0	0	8	18	6	5	1	2	0	0	0	0	2
5	0	0	Cal	5	2	1	0	0	0	Cal	Cal	7	2	2	2	1	0	1	1	6	7	5	2	0	2	2
6	0	0	Cal	3	1	1	1	1	1	1	2	1	1	1	2	3	2	1	2	4	6	3	1	2	2	2
7	3	2	Cal	2	2	2	2	3	19	3	4	6	5	3	3	3	3	3	7	9	6	3	Qai	Qai	4	4
8	Qai	Qai	Qai	Qai	Qai	Qai	22	3	10	10	14	12	8	3	3	3	17	43	31	14	9	6	4	3	Bad<	
9	2	2	Cal	1	2	2	2	1	6	85	26	10	2	3	5	6	3	3	1	2	2	2	2	1	7	
10	2	1	Cal	1	1	1	1	1	1	2	12	12	PwrF	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Bad<
11	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	PwrF	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Miss
12	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Miss
13	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Miss
14	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Miss
15	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Miss
16	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Miss
17	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Miss
18	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Miss
19	4	1	3	3	3	3	3	3	3	3	3	3	3	1	3	3	3	3	3	Cal	Cal	Cal	Cal	3	3	3
20	1	1	Cal	0	2	3	3	4	1	3	2	5	2	10	2	2	3	5	2	2	0	5	2	2	2	3
21	3	5	Cal	2	3	2	2	2	5	2	5	5	5	5	2	2	0	0	0	0	5	2	2	2	2	3
22	0	0	Cal	0	0	2	2	2	0	2	5	5	5	5	2	2	2	0	2	0	2	0	2	2	2	2
23	3	Cal	2	2	2	3	2	0	2	2	2	2	2	3	3	15	31	37	11	2	2	2	1	1	6	
24	2	2	Cal	2	1	2	3	2	6	5	4	3	2	1	15	3	2	2	2	3	2	1	1	2	3	3
25	1	1	Cal	1	3	3	2	1	1	2	2	2	1	2	1	1	1	1	1	3	3	9	2	1	2	2
26	1	2	Cal	1	1	1	1	1	3	2	2	1	3	5	2	2	2	2	5	3	2	1	1	1	1	2
27	1	1	Cal	1	2	1	0	0	1	3	2	5	5	4	3	2	4	2	3	1	0	0	0	0	2	2
28	1	0	Cal	0	0	0	0	0	3	6	6	9	6	3	2	2	6	9	0	1	1	0	0	0	2	2
29	0	0	Cal	1	1	1	1	1	2	1	2	2	1	2	2	1	2	6	11	7	5	2	1	1	2	2
30	1	1	Cal	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1
31	1	1	Cal	1	2	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1

TOTAL HOURS 744 TOTAL GOOD HOURS 509 DATA CAPTURE 68.4%

MAX. 1HR AVG 85 07/09/91 09:00:00 2ND MAX. 1 HR AVG 43 07/08/91 17:00:00

MIN. 1HR AVG 0 07/01/91 00:00:00 ARITHMETIC MEAN 3 STANDARD DEV. 6

NAAQS Comparison: MAX. 3 HR AVG 40 (500) 07/09/91 11:00:00
MAX. 24 HR AVG 12 (140) 07/09/91 10:00:00

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

10-29-91

11.11-96

HOURLY AVERAGES FOR SO2 IN PPB

AUGUST, 1991

TOTAL HOURS	744	TOTAL GOOD HOURS	646	DATA CAPTURE	86.8%
MAX. 1HR AVG	45	08/18/91 10:00:00	2ND MAX. 1 HR AVG	38	08/12/91 16:00:00
MIN. 1HR AVG	0	08/02/91 07:00:00	ARITHMETIC MEAN	2	STANDARD DEV. 5
NAAQS Comparison:	MAX. 3 HR AVG	31 (500)	08/09/91 13:00:00		
	MAX. 24 HR AVG	10 (140)	08/09/91 17:00:00		

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration
BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data
Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

11-15-91

11.11-97

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR SO2 IN PPB

		SEPTEMBER, 1991																							DAILY		
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG	
DAY																											
1	1	1	Cal	1	1	1	1	1	1	3	3	8	4	3	2	2	1	1	1	1	1	3	1	1	2		
2	1	1	Cal	0	2	0	0	17	0	13	2	2	1	0	1	1	0	0	0	0	2	1	1	1	2		
3	0	5	Cal	1	2	3	4	3	1	2	0	0	1	0	1	2	2	0	0	1	0	2	6	8	2		
4	7	5	Cal	4	3	3	3	6	3	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	2		
5	3	2	Cal	2	5	1	0	1	4	1	0	0	0	0	0	0	0	1	2	2	2	0	0	0	1		
6	0	0	Cal	1	2	4	8	5	14	2	1	3	3	Qai	Qai	Qai	Qai	2	2	2	1	1	2	6	4	3	
7	2	2	Cal	2	1	1	1	1	1	1	1	1	1	1	2	2	2	1	2	1	1	1	1	1	2	1	
8	2	1	Cal	0	1	0	0	6	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
9	0	0	Cal	1	0	0	3	5	1	1	1	0	1	1	0	0	0	1	0	4	5	0	0	0	4	1	
10	8	11	Cal	4	1	2	5	12	4	2	2	2	2	1	1	1	1	2	1	1	1	4	2	1	2	3	
11	1	1	Cal	0	1	1	2	2	1	2	1	2	2	3	2	3	2	2	2	2	2	1	0	0	0	1	
12	0	0	Cal	0	1	2	1	0	0	1	3	5	5	4	4	4	3	2	1	1	0	0	0	0	0	1	
13	0	0	Cal	1	2	2	2	3	2	2	2	5	3	7	7	4	3	3	2	1	1	1	2	2	2	2	
14	1	1	Cal	1	1	1	1	1	1	2	5	9	7	5	3	3	3	2	2	2	2	2	1	1	1	2	
15	1	1	Cal	0	0	0	0	0	0	0	4	3	1	0	0	0	0	0	0	1	0	0	0	0	0	0	
16	0	0	Cal	2	1	2	3	4	2	6	3	2	1	1	1	1	2	3	0	2	1	0	0	0	0	1	
17	0	0	Cal	1	1	4	2	3	5	7	6	4	3	2	2	2	1	1	1	1	1	1	1	1	2		
18	1	1	Cal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	8	2	1	0	0	0	1	
19	0	0	Cal	1	1	1	3	2	2	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1	
20	1	1	Cal	1	2	2	2	3	9	9	27	2	6	8	7	7	7	4	5	2	4	5	2	1	5	5	
21	2	2	Cal	2	3	1	1	1	1	4	1	1	2	2	2	1	2	1	0	0	0	3	5	1	2	2	
22	1	1	Cal	6	3	3	3	4	7	4	2	2	2	3	3	3	2	3	4	10	12	13	18	19	5		
23	8	5	Cal	6	2	10	2	7	8	2	1	3	2	2	3	2	1	1	1	1	1	1	2	1	3	3	
24	1	9	Cal	2	Qai	Qai	Qai	Qai	9	2	2	1	Qai	Qai	Qai	Qai	1	2	5	5	1	2	2	2	Bad<	1	
25	2	2	Cal	4	1	0	0	0	0	0	0	0	0	0	0	0	2	0	1	1	1	2	1	1	1	1	
26	1	1	Cal	3	1	1	1	2	3	3	5	5	4	26	22	29	16	9	7	2	2	3	2	2	6	6	
27	3	2	Cal	13	13	11	9	4	4	11	8	10	9	9	6	4	2	5	5	3	6	9	25	6	8	8	
28	5	4	Cal	1	1	2	2	2	5	4	3	2	1	2	1	1	3	0	0	2	1	2	3	0	2	2	
29	0	2	Cal	0	0	1	0	2	4	0	0	0	0	0	0	0	0	2	0	0	0	0	1	15	1	1	
30	16	3	Cal	0	11	1	0	4	1	6	0	0	0	1	2	0	2	0	0	5	0	5	0	0	0	2	2

TOTAL HOURS 720 TOTAL GOOD HOURS 678 DATA CAPTURE 94.2%

MAX. 1HR AVG 29 09/26/91 15:00:00 2ND MAX. 1 HR AVG 27 09/20/91 10:00:00

MIN. 1HR AVG 0 09/02/91 03:00:00 ARITHMETIC MEAN 2 STANDARD DEV. 3

NAAQS Comparison: MAX. 3 HR AVG 26 (500) 09/26/91 15:00:00
MAX. 24 HR AVG 9 (140) 09/27/91 12:00:00

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

10-21-91

11.11-98

HOURLY AVERAGES FOR SO2 IN PPB

DAY	OCTOBER, 1991				OCTOBER, 1991																			DAILY AVG					
	HOUR (EST)				00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18		19	20	21	22	23
1	1	4	Cal	4	4	10	4	7	5	3	1	1	2	4	2	2	17	12	1	6	2	3	2	1	4				
2	5	2	Cal	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	2	1	Cal	0	0	0	0	0	0	0	0	0	9	9	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	Cal	1	1	1	1	1	1	1	0	0	0	0	0	0	2	5	1	1	0	0	0	0	0	0	0	0	0
5	0	0	Cal	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	2	1	0	0	0	0	0
6	0	0	Cal	0	0	1	1	1	0	0	1	0	0	0	5	12	5	2	2	2	2	2	2	2	2	2	2	2	2
7	1	1	Cal	1	2	3	3	4	5	5	10	5	3	3	3	3	3	1	1	2	2	2	2	2	2	2	2	2	2
8	6	1	Cal	8	5	1	1	2	2	2	2	2	2	1	0	0	1	1	2	20	2	1	0	1	1	1	1	1	1
9	3	1	Cal	3	4	4	2	3	4	2	2	2	1	0	0	1	1	3	6	17	1	4	1	1	1	1	1	1	1
10	5	2	Cal	4	5	5	5	4	9	15	14	12	10	8	5	Cal	Cal	3	3	4	Cal	Cal	Cal	Cal	Cal	Cal	Cal	Cal	Cal
11	Cal	2	Cal	2	2	2	2	3	5	6	5	1	2	3	3	9	38	24	8	5	4	Cal	Cal	Cal	Cal	Cal	Cal	Cal	Cal
12	2	1	Cal	2	4	5	5	2	8	6	9	7	6	4	1	1	1	2	2	2	3	3	2	3	3	3	3	3	3
13	2	2	Cal	3	2	2	3	4	5	4	8	10	6	5	4	4	4	3	5	6	6	4	3	1	1	1	1	1	1
14	1	1	Cal	1	1	1	2	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
15	1	2	Cal	2	1	1	3	2	6	4	2	1	1	1	1	2	2	1	4	1	1	1	1	1	1	1	1	1	1
16	1	1	Cal	2	2	2	7	19	16	15	12	6	5	5	7	6	6	6	6	6	5	5	4	4	4	4	4	4	4
17	11	4	Cal	2	3	4	7	5	15	6	6	4	5	2	2	2	2	2	3	3	2	2	2	1	1	1	1	1	1
18	2	3	Cal	2	1	1	2	16	15	2	2	2	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
19	2	2	Cal	4	8	7	7	4	3	3	4	3	2	2	2	2	2	2	2	2	2	2	7	25	4	2	2	2	2
20	3	2	Cal	1	1	1	2	5	11	7	1	2	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
21	17	17	Cal	18	13	1	1	2	7	4	2	1	1	1	1	1													

NAAQS Comparison: MAX. 3 HR AVG 23 (500) 10/11/91 17:00:00
MAX. 24 HR AVG 7 (140) 10/17/91 05:00:00

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration
BadS - Bad Analyzer Status, Pwrf - Power Failure, Down - Operator downed channel, Miss - Missing Data
Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg

02/17/9

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR SO2 IN PPB

NOVEMBER, 1991																								DAILY	
DAY	HOUR (EST)			03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
	00	01	02																						
1	0	0	Cal	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	2	1	2	1	0
2	0	0	Cal	1	1	1	1	1	1	1	1	1	1	1	2	7	20	10	8	12	9	6	2	4	4
3	6	5	Cal	3	3	3	3	5	10	11	2	4	4	12	10	4	3	6	6	4	8	6	6	5	6
4	2	4	Cal	7	7	3	1	2	3	6	6	9	11	7	5	7	5	6	4	3	3	5	15	10	6
5	5	4	Cal	1	3	6	4	2	3	6	13	12	17	7	3	7	6	4	4	4	4	10	11	11	7
6	4	4	Cal	5	2	2	3	3	5	PwrF	9	12	4	3	1	3	3	2	1	0	0	1	5	6	3
7	4	7	Cal	10	2	1	1	1	2	3	2	4	1	1	3	2	3	2	2	2	2	3	20	4	3
8	3	6	Cal	10	4	4	4	15	17	21	8	9	7	12	13	Cal	Cal	7	6	12	11	9	15	13	10
9	9	12	Cal	8	3	6	2	2	4	11	10	13	16	5	4	3	5	9	11	2	1	1	10	6	7
10	3	3	Cal	3	3	6	6	8	16	18	6	8	10	14	17	19	9	7	6	8	7	5	5	10	8
11	14	10	Cal	14	7	2	4	3	8	22	7	6	21	24	15	18	16	13	9	5	4	4	3	3	10
12	2	1	Cal	8	6	8	7	11	7	9	14	14	11	10	5	5	14	14	13	13	9	7	6	6	9
13	16	13	Cal	6	9	10	11	17	23	27	13	9	8	6	6	6	5	7	6	11	6	5	5	11	10
14	5	3	Cal	2	3	2	1	1	10	14	2	1	1	1	1	0	1	6	2	3	1	1	0	0	3
15	2	2	Cal	1	1	4	2	6	4	3	1	0	0	1	0	0	0	1	0	1	1	2	2	1	1
16	1	1	Cal	0	0	2	2	1	16	3	1	3	2	1	0	0	1	0	2	1	4	1	0	6	2
17	14	16	Cal	4	1	1	7	1	1	1	1	2	1	1	0	0	0	0	0	0	1	0	1	1	2
18	1	1	Cal	1	1	0	1	0	4	0	0	0	0	0	0	0	2	1	1	1	0	0	0	0	1
19	2	2	Cal	2	2	2	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
20	1	1	Cal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
21	0	0	Cal	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
22	1	1	Cal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0
23	0	0	Cal	0	0	7	38	23	6	3	12	2	2	3	23	44	107	83	6	5	3	2	1	4	16
24	3	2	Cal	3	3	5	5	5	3	8	24	4	2	3	3	1	2	2	2	2	2	4	10	5	4
25	7	5	Cal	1	2	2	3	3	6	9	11	6	5	5	7	6	6	9	8	8	16	8	8	5	6
26	4	6	Cal	4	7	7	11	12	10	7	8	6	6	6	6	6	7	7	6	4	5	5	8	9	7
27	7	9	Cal	9	5	6	8	9	8	9	9	7	3	5	2	1	1	1	11	23	3	3	4	4	6
28	3	2	Cal	3	3	4	5	6	5	5	2	0	0	0	0	0	0	0	0	0	2	5	2	4	2
29	0	5	Cal	8	1	1	1	2	4	1	0	0	0	0	0	0	1	0	0	0	2	0	0	0	1
30	0	0	Cal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TOTAL HOURS 720 TOTAL GOOD HOURS 687 DATA CAPTURE 95.4%

MAX. 1HR AVG 107 11/23/91 16:00:00 2ND MAX. 1 HR AVG 83 11/23/91 17:00:00

MIN. 1HR AVG 0 11/01/91 00:00:00 ARITHMETIC MEAN 5 STANDARD DEV. 7

NAAQS Comparison: MAX. 3 HR AVG 78 (500) 11/23/91 17:00:00
MAX. 24 HR AVG 17 (140) 11/24/91 04:00:00

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

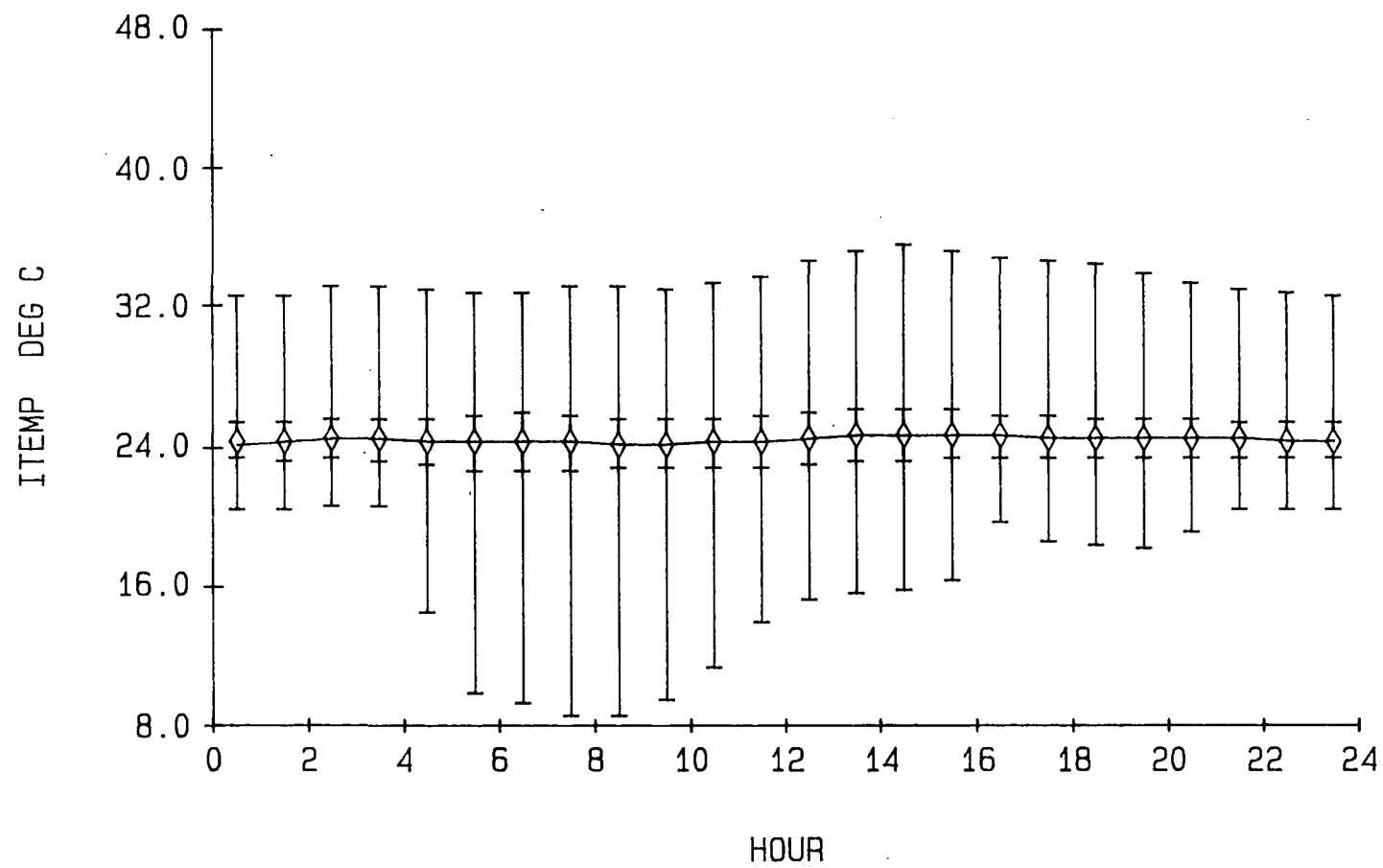
BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

02/17/92

11.11-100

DIURNAL PLOT 04/01/91 TO 03/31/92



Tampa Electric Station AQ-1

Averaging Time: 3600 sec

11.11-102

		DECEMBER, 1991																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1	0	0	Cal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	Cal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
3	0	0	Cal	0	0	0	0	0	0	0	0	0	0	Down	Cal	Cal	1	1	1	1	1	1	8	1	0	0
4	0	0	Cal	0	0	4	3	5	5	2	2	2	2	2	2	5	9	5	2	3	2	2	3	2	2	3
5	2	12	Cal	1	1	2	3	5	6	13	13	5	6	2	1	1	1	1	2	4	4	3	2	1	0	4
6	0	4	Cal	7	9	7	3	2	2	5	11	1	0	1	2	0	0	3	2	1	0	0	3	6	3	3
7	7	0	Cal	0	1	4	3	1	3	9	3	1	0	0	1	2	1	3	2	1	1	1	1	1	0	2
8	0	0	Cal	0	0	0	0	1	2	0	1	0	0	0	0	0	0	1	1	1	1	4	1	1	0	0
9	0	0	Cal	1	2	2	4	1	1	1	0	0	0	0	0	0	2	4	4	4	4	6	5	5	3	2
10	3	3	Cal	3	2	4	3	3	8	4	2	2	16	24	16	28	7	4	1	3	2	6	4	2	7	7
11	2	2	Cal	1	1	2	2	2	1	1	1	4	3	1	1	1	4	5	2	1	1	0	1	1	1	2
12	0	4	Cal	6	0	0	1	11	13	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
13	0	0	Cal	0	0	0	0	0	0	2	4	1	0	0	0	0	0	0	2	2	0	0	2	1	0	1
14	0	0	Cal	0	0	1	0	1	0	8	3	1	1	0	4	2	0	4	11	3	1	1	4	2	2	2
15	1	3	Cal	5	5	3	3	3	6	9	6	7	5	5	4	4	4	5	4	7	8	3	3	3	5	5
16	3	3	Cal	2	3	7	4	8	7	11	11	9	8	9	11	9	6	3	5	7	4	6	2	3	6	6
17	7	12	Cal	2	5	7	4	8	8	12	7	3	1	1	1	0	0	2	3	1	1	1	1	7	4	4
18	13	5	Cal	3	4	6	4	3	11	21	10	3	5	3	4	4	12	18	9	4	15	21	14	9	9	
19	9	10	Cal	6	9	9	7	10	5	6	7	3	2	1	1	3	5	4	7	7	9	4	9	10	6	6
20	6	6	Cal	1	0	21	9	2	13	10	0	0	0	0	0	0	0	0	0	2	27	0	1	1	4	4
21	1	1	Cal	0	1	1	1	0	2	12	1	0	0	0	0	0	0	2	3	2	3	3	1	1	0	1
22	0	0	Cal	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	2	36	30	22	13	7	4	5
23																										

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge 02/17/92

02/17/92

TEC AQ - 1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR SO2 IN PPB

		JANUARY 1992																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1		Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Miss
2		Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	1	1	0	0	2	1	1	0	1	1	Bad<
3		1	0	Cal	1	0	0	3	1	0	0	0	1	3	1	7	6	4	5	1	3	1	2	3	4	2
4		7	3	Cal	2	1	4	4	5	9	26	18	14	14	10	4	7	8	8	14	5	3	2	3	3	7
5		3	2	Cal	1	1	2	3	2	1	2	3	3	2	6	24	48	59	8	10	4	3	3	4	2	8
6		1	0	Cal	3	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	67	34	43	53	26	9	2	2	3	4	3	Bad<
7		2	3	Cal	4	4	3	3	4	6	8	16	11	6	13	15	10	3	6	6	7	6	4	3	2	6
8		2	2	Cal	1	0	0	1	1	0	1	3	0	0	0	0	0	0	0	0	2	0	0	0	0	1
9		0	0	Cal	2	2	3	5	3	2	2	3	2	2	2	2	2	Cal	Cal	4	4	4	4	2	2	2
10		3	2	Cal	1	2	2	2	2	2	3	2	2	6	46	Cal	Cal	Cal	2	1	1	1	1	1	1	4
11		2	12	Cal	4	3	2	3	3	3	9	10	6	10	9	7	6	4	3	5	7	4	6	6	3	5
12		4	26	Cal	31	2	1	1	5	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4
13		1	1	Cal	1	1	1	1	1	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1
14		1	1	Cal	1	1	1	1	1	4	3	8	44	25	26	22	13	10	5	5	8	3	3	2	2	8
15		1	2	Cal	2	2	1	1	2	2	2	6	6	2	3	5	5	5	3	2	1	1	2	3	2	3
16		2	9	Cal	6	18	27	12	20	5	3	15	11	2	2	2	2	1	Cal	Cal	4	3	3	5	11	8
17		6	4	Cal	5	5	3	5	4	12	18	16	10	7	3	5	4	5	8	8	8	8	7	21	8	
18		9	7	Cal	8	8	6	6	6	12	29	6	3	2	2	2	1	1	3	4	4	3	2	2	1	5
19		2	1	Cal	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	1	1
20		1	2	Cal	1	1	1	1	1	7	10	10	13	11	14	11	7	4	3	2	2	3	3	4	16	5
21		16	18	Cal	12	6	4	4	4	5	18	16	7	10	4	3	10	6	7	7	6	4	4	2	2	8
22		5	4	Cal	2	1	2	4	3	5	3	1	1	1	1	1	1	1	1	2	1	2	1	1	1	2
23		1	1	Cal	1	1	1	1	1	2	1	1	1	2	1	2	2	1	1	2	1	1	1	3	11	2
24		10	5	Cal	12	8	2	2	2	1	2	6	9	3	5	1	1	1	1	3	1	3	3	3	17	4
25		12	6	Cal	3	4	5	3	3	3	4	3	2	3	2	3	3	3	3	4	3	6	26	10	8	5
26		4	2	Cal	3	3	7	7	5	5	10	9	9	5	5	4	3	4	3	4	5	5	6	4	5	5
27		29	3	Cal	11	14	16	8	5	6	4	1	1	1	1	1	1	1	1	1	1	1	1	2	4	5
28		1	1	Cal	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
29		1	1	Cal	1	1	1	1	1	1	1	1	1	1	1	1	2	14	3	1	1	3	2	2	2	2
30		1	1	Cal	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	10	5	5	6	2
31		4	3	Cal	1	2	3	2	2	1	2	7	4	3	3	2	1	3	6	4	13	11	9	9	5	4

TOTAL HOURS 744 TOTAL GOOD HOURS 661 DATA CAPTURE 88.8%

MAX. 1HR AVG 67 01/06/92 13:00:00 2ND MAX. 1 HR AVG 59 01/05/92 16:00:00

MIN. 1HR AVG 0 01/02/92 16:00:00 ARITHMETIC MEAN 4 STANDARD DEV. 7

NAAQS Comparison: MAX. 3 HR AVG 48 (500) 01/06/92 15:00:00
MAX. 24 HR AVG 15 (140) 01/07/92 07:00:00

KEY FOR MISSING CODES

Bad< - To few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

HOURLY AVERAGES FOR SO2 IN PPB

DAY	HOUR (EST)																							DAILY AVG	
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22		23
1	2	4	Cal	4	4	3	2	3	4	4	5	6	6	4	4	3	2	2	5	2	2	3	3	3	3
2	6	4	Cal	2	3	1	2	2	2	2	4	7	5	4	2	1	2	1	1	3	25	22	9	23	6
3	1	6	Cal	9	2	2	3	3	6	8	1	2	0	1	3	3	2	1	6	4	2	0	0	0	3
4	0	0	Cal	2	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5	1	1	Cal	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6	1	1	Cal	1	1	1	1	1	1	2	14	11	5	4	10	3	2	11	16	2	3	8	2	1	4
7	5	10	Cal	1	3	8	3	2	3	6	6	10	3	14	5	6	3	2	2	2	6	2	2	2	4
8	6	4	Cal	2	1	1	3	4	4	6	8	12	21	26	12	10	10	15	41	23	6	4	3	2	10
9	1	7	Cal	8	5	6	4	4	9	11	9	7	6	4	5	4	4	5	4	4	5	5	3	3	5
10	4	4	Cal	2	2	1	1	0	1	8	7	0	0	0	0	0	0	0	0	2	2	3	0	0	2
11	0	0	Cal	1	1	1	2	10	10	17	12	16	16	5	3	4	3	4	4	8	2	4	1	1	5
12	1	1	Cal	4	6	9	1	1	1	1	2	1	1	3	3	3	4	6	8	6	4	5	2	2	3
13	2	2	Cal	1	0	0	0	0	0	1	6	2	1	1	1	Cal	Cal	4	38	28	10	6	3	3	5
14	2	2	Cal	1	1	1	0	1	1	2	1	1	1	0	0	Cal	Cal	1	2	2	3	4	4	3	4
15	5	7	Cal	3	4	3	1	1	1	1	1	1	1	1	1	1	1	1	2	4	2	2	3	2	2
16	2	2	Cal	3	2	1	1	1	1	1	1	1	2	2	1	1	1	2	4	4	4	4	4	5	2
17	3	4	Cal	1	1	1	Miss	Miss	Miss	Miss	Miss	Miss	2	2	3	3	3	3	4	5	18	4	4	3	Bad<
18	3	3	3	4	3	3	3	4	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2
19	2	1	1	1	1	1	1	1	1	Cal	Cal	Cal	Cal	Cal	3	4	46	16	8	5	4	4	4	3	6
20	2	1	4	3	5	6	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Bad<
21	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
22	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
23	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
24	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	1	1	1	1	1	2	

NAAQS Comparison: MAX. 3 HR AVG 26 (500) 02/28/92 19:00:00
MAX. 24 HR AVG 11 (140) 02/27/92 17:00:00

Bad< - To few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration
 BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data
 Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

11.11-104

TEC AQ - 1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR SO2 IN PPB

MARCH 1992																								DAILY	
DAY	HOUR (EST)			03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
	00	01	02																						
1	3	2	Cal	1	0	0	0	7	4	2	1	8	7	2	2	1	1	2	3	12	16	9	4	4	4
2	3	2	Cal	3	2	2	3	3	9	9	17	4	4	2	2	2	2	3	4	7	6	4	1	4	
3	1	1	Cal	1	1	0	0	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	
4	0	0	Cal	1	1	1	2	4	4	4	2	0	0	0	0	0	0	0	0	0	0	0	5	1	
5	0	0	Cal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6	0	0	Cal	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	2	2	3	
7	2	1	Cal	1	1	1	1	1	1	1	2	4	1	1	1	1	1	1	1	1	1	42	14	172	
8	32	19	Cal	7	4	2	7	11	2	2	5	15	3	4	2	1	1	3	7	6	4	4	4	5	
9	4	4	Cal	3	2	2	2	1	7	3	2	2	2	1	1	1	1	4	12	12	9	11	10	10	
10	3	2	Cal	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	
11	5	3	Cal	1	1	3	3	1	1	1	1	2	3	3	2	2	5	13	16	4	1	2	2	2	
12	1	1	Cal	3	3	7	8	6	12	17	7	3	3	11	13	9	15	11	10	3	4	5	4	2	
13	1	1	Cal	2	8	8	8	10	13	7	4	4	10	12	8	8	6	7	12	4	4	5	4	3	
14	3	4	Cal	2	1	1	2	3	6	4	2	4	8	8	2	2	23	37	10	7	7	9	7	5	
15	6	7	Cal	6	4	5	3	8	8	6	4	3	2	3	4	3	2	2	29	6	3	2	3	1	
16	1	1	Cal	2	2	2	3	3	4	4	4	4	4	4	4	4	4	4	2	1	1	1	1	3	
17	1	1	Cal	0	0	0	0	4	3	0	1	3	2	2	2	2	1	1	1	0	1	1	0	0	
18	0	0	Cal	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	3	2	1	1	1	
19	1	1	Cal	3	1	0	0	0	1	1	0	0	2	2	0	0	16	25	4	0	0	0	2	16	
20	1	0	Cal	0	0	0	4	6	7	6	8	4	2	2	3	3	1	1	2	3	4	3	3	2	
21	1	4	Cal	4	10	26	11	4	7	9	6	6	6	7	6	6	6	6	5	4	4	5	7	6	
22	8	6	Cal	5	4	2	1	1	1	1	1	0	0	0	0	1	0	1	0	0	0	0	0	0	
23	0	0	Cal	0	0	0	0	0	1	1	6	39	3	1	4	1	1	6	1	1	1	0	1	1	
24	0	1	Cal	2	5	4	5	3	3	3	2	6	3	2	2	1	2	1	4	1	1	11	13	2	
25	1	1	Cal	0	1	2	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
26	0	1	Cal	2	1	1	2	3	4	3	2	2	2	3	2	4	3	2	3	3	2	2	3	4	
27	4	3	Cal	2	1	1	2	3	1	2	2	10	6	1	3	17	64	43	21	6	4	5	12	9	
28	6	2	Cal	3	2	2	4	3	3	11	4	4	4	5	4	4	3	5	4	4	4	4	3	2	
29	2	5	Cal	7	6	3	1	2	4	2	3	2	2	2	2	3	2	2	2	3	8	19	18	6	
30	2	3	Cal	2	1	1	0	0	0	0	0	0	0	0	1	1	2	3	4	1	0	0	0	0	
31	0	0	Cal	0	0	0	0	3	3	6	4	Cal	Cal	Cal	37	30	18	19	13	2	1	2	1	1	

TOTAL HOURS 744 TOTAL GOOD HOURS 710 DATA CAPTURE 95.4%

MAX. 1HR AVG 172 03/07/92 23:00:00 2ND MAX. 1 HR AVG 64 03/27/92 16:00:00

MIN. 1HR AVG 0 03/01/92 05:00:00 ARITHMETIC MEAN 4 STANDARD DEV. 8

NAAQS Comparison: MAX. 3 HR AVG 76 (500) 03/07/92 23:00:00
MAX. 24 HR AVG 16 (140) 03/08/92 20:00:00

KEY FOR MISSING CODES

Bad< - To few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

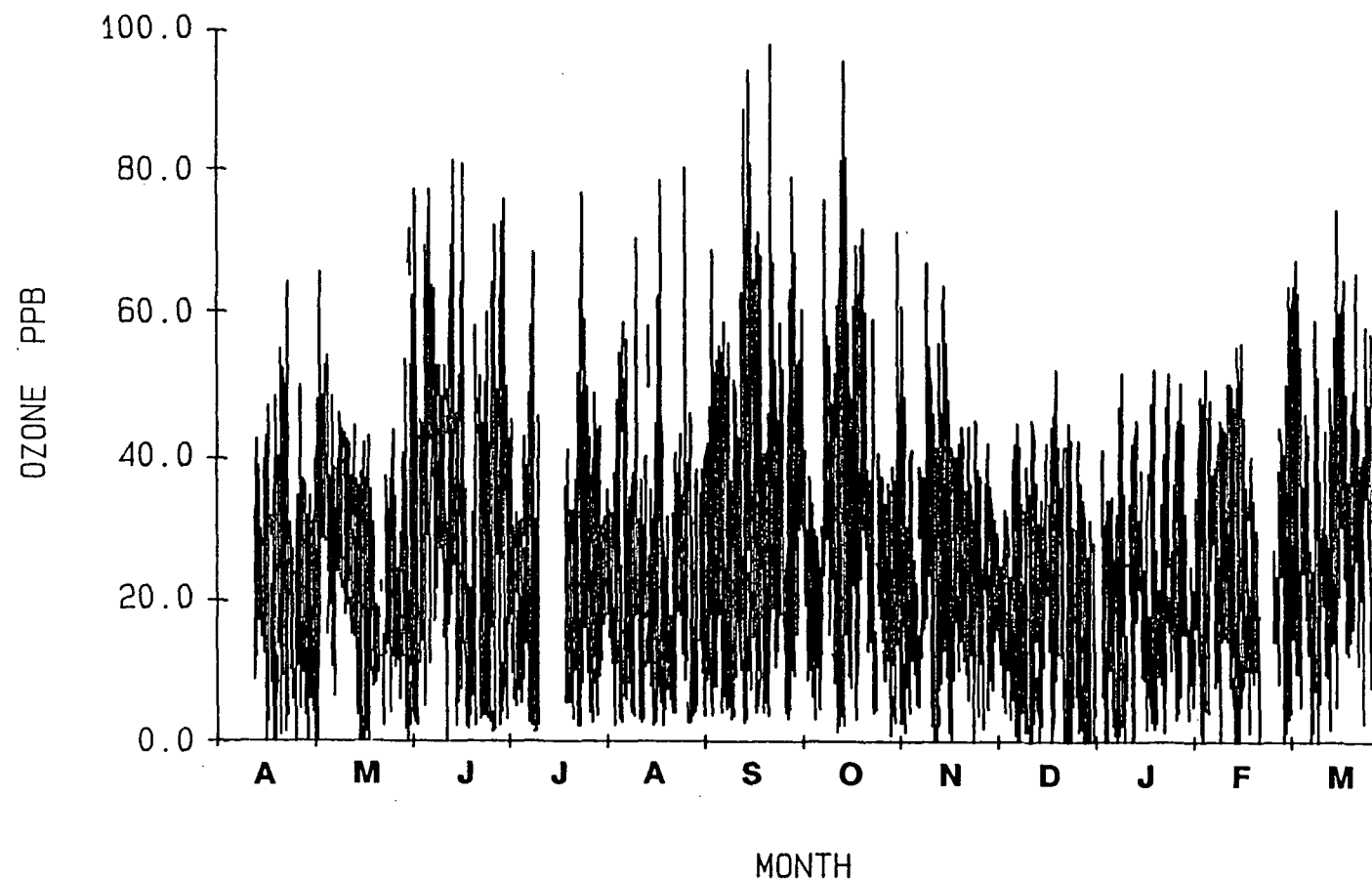
BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

**HOURLY AVERAGES FOR OZONE
[PARTS PER BILLION (ppb)]**

11.11-107

TIME PLOT FOR 04/01/91 00:00:00 TO 03/31/92 23:00:00



Tampa Electric Station AQ-1

Averaging Time: 1 Hour

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR OZONE IN PPB

		APRIL, 1991																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1	14	21	14	14	16	16	12	23	27	Cal	40	47	53	56	58	57	55	58	51	45	42	40	38	36	36	36
2	34	23	27	19	10	6	5	12	34	42	47	32	Cal	Cal	Qaf	Qaf	64	58	55	69	49	51	41	32	35	
3	32	8	Cal	12	8	4	3	32	40	49	51	51	54	56	58	51	51	51	49	47	47	45	45	39	39	
4	19	14	Cal	0	0	34	6	30	36	45	51	41	43	42	43	42	0	29	27	27	29	27	25	28	28	
5	23	4	Cal	0	0	0	0	20	32	37	0	0	37	0	33	0	0	0	0	33	0	0	0	0	9	
6	0	0	Cal	11	0	11	9	13	22	31	0	0	0	0	37	37	41	31	31	0	0	0	0	0	12	
7	20	4	Cal	20	0	0	0	0	0	28	31	32	34	35	35	34	31	32	30	31	17	11	16	17	20	
8	13	18	3	17	18	17	19	17	21	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Bad<
9	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
10	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
11	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
12	19	17	Cal	12	12	9	12	18	25	23	32	34	39	42	43	39	39	35	32	28	25	22	19	17	26	
13	15	12	Cal	15	18	19	17	21	25	28	30	32	33	34	34	37	39	38	37	35	30	25	24	23	27	
14	22	19	Cal	18	17	15	15	18	23	28	29	30	30	30	29	28	29	28	26	26	25	24	22	24	24	
15	20	16	Cal	17	16	16	13	19	27	33	37	38	42	40	41	43	43	40	29	32	34	22	9	4	27	
16	0	3	Cal	12	10	9	8	3	20	27	30	32	33	34	34	30	40	47	37	PwrF	PwrF	PwrF	PwrF	PwrF	Bad<	
17	PwrF	Miss	Cal	9	19	22	22	17	17	17	8	17	PwrF	28	Cal	32	29	PwrF	18	Cal	3	19	21	Bad<	Bad<	
18	22	12	0	1	10	10	13	13	16	20	23	26	34	40	45	49	46	40	32	25	11	13	10	1	21	
19	4	6	Cal	4	0	0	0	4	8	10	12	PwrF	26	25	37	40	36	31	19	20	20	21	14	17	16	
20	19	15	Cal	19	19	7	1	11	19	25	33	40	47	53	51	52	55	52	45	41	35	25	16	9	30	
21	21	21	Cal	25	34	28	21	26	36	47	50	52	53	49	53	49	48	46	43	46	41	38	32	19	38	
22	7	5	Cal	3	1	1	1	19	46	52	54	59	58	59	55	63	57	65	53	43	31	5	4	21	33	
23	26	26	Cal	27	29	29	23	23	30	31	30	24	24	22	21	21	18	17	15	10	14	14	17	17	22	
24	10	10	Cal	10	8	6	6	6	13	18	23	27	27	24	24	24	24	22	18	15	12	10	4	0	15	
25	0	0	Cal	0	0	0	2	13	21	26	32	35	35	25	11	19	29	31	33	35	33	30	29	29	20	
26	19	17	Cal	16	15	14	10	15	20	29	39	44	47	47	48	48	50	29	13	5	15	17	10	17	25	
27	16	16	Cal	13	12	15	11	10	11	16	22	25	28	28	31	31	37	36	28	8	10	7	4	7	18	
28	9	7	Cal	8	9	7	7	11	15	18	21	24	27	29	29	31	32	31	25	21	17	7	0	0	16	
29	13	12	Cal	7	8	9	6	16	14	18	22	25	27	35	31	31	33	31	25	28	14	7	6	19	19	
30	13	6	Cal	4	6	7	8	11	13	18	24	27	28	30	29	29	29	31	33	23	16	13	8	7	18	

TOTAL HOURS 720 TOTAL GOOD HOURS 602 DATA CAPTURE 83.6%

MAX. 1HR AVG 69 04/02/91 19:00:00 2ND MAX. 1 HR AVG 65 04/22/91 17:00:00

MIN. 1HR AVG 0 04/04/91 03:00:00 ARITHMETIC MEAN 24 STANDARD DEV. 15

NAAQS Comparison: MAX. 1 HR AVG 69 (120) 04/02/91 19:00:00

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration
 BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data
 Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

11.11-108

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR OZONE IN PPB

MAY, 1991																								DAILY	
HOUR (EST)																								AVG	
DAY	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1	3	0	Cal	0	0	3	6	10	18	25	34	39	39	43	47	48	45	33	36	34	27	13	4	14	22
2	8	8	Cal	11	1	0	3	15	25	33	45	51	52	58	65	66	64	57	47	23	26	41	38	38	34
3	38	35	Cal	34	33	29	30	36	41	44	47	49	45	47	47	47	49	49	47	45	45	47	46	44	42
4	43	41	Cal	33	34	32	28	34	39	40	46	50	51	53	53	54	54	53	34	39	38	40	30	28	41
5	29	24	Cal	18	16	15	16	19	23	28	30	33	36	38	38	37	37	36	33	35	32	34	29	25	29
6	23	20	Cal	13	14	11	12	13	21	25	29	34	36	36	36	29	21	49	35	31	30	39	26	22	26
7	15	7	Cal	11	12	9	11	16	22	27	30	32	33	Cal	Cal	39	39	36	33	29	28	30	30	30	24
8	30	27	Cal	28	28	24	26	30	36	42	44	45	46	47	46	45	45	46	40	33	29	28	26	28	35
9	29	24	Cal	24	22	22	22	27	33	35	38	40	43	44	42	42	44	43	37	33	29	26	26	25	32
10	22	19	Cal	20	20	19	18	22	29	34	38	40	41	43	44	42	43	43	42	39	35	30	30	29	32
11	26	23	Cal	25	22	20	20	30	38	40	42	41	40	40	42	42	41	39	38	35	33	32	31	30	33
12	27	23	Cal	20	18	17	15	24	29	32	34	37	38	37	38	37	36	34	33	32	35	32	30	28	30
13	23	19	Cal	21	17	17	15	17	24	34	45	33	32	34	32	PwrF	29	28	24	28	37	24	17	14	25
14	14	13	Cal	14	11	4	10	15	22	26	23	35	34	28	35	32	35	36	31	22	9	2	0	0	19
15	0	1	Cal	0	0	0	4	12	19	22	24	27	31	34	38	38	34	33	26	18	17	5	1	0	17
16	0	0	Cal	2	3	0	0	9	19	29	34	35	41	42	35	31	33	32	18	15	17	21	9	4	19
17	3	8	Cal	1	6	15	16	23	22	22	30	37	36	38	40	42	43	39	31	30	25	17	14	12	24
18	7	0	Cal	0	5	8	4	22	27	29	34	36	32	34	34	30	23	25	26	23	21	19	16	15	20
19	11	8	Cal	9	9	8	8	13	18	24	26	27	30	31	30	31	30	27	26	19	15	9	11	10	18
20	10	9	Cal	10	9	9	8	8	12	16	19	20	17	17	18	18	19	17	14	11	11	11	10	11	13
21	12	10	Cal	10	10	10	10	12	12	Down	Down	Down	21	22	23	22	Cal	Cal	Cal	Cal	Cal	0	0	0	Bad<
22	0	0	Cal	14	14	13	11	10	12	13	8	2	3	5	10	15	11	8	12	13	13	13	13	13	9
23	15	13	Cal	14	17	16	14	15	21	26	30	36	38	36	36	33	33	32	28	23	21	18	16	15	24
24	15	14	Cal	14	15	15	14	16	19	24	31	33	34	34	37	32	21	16	12	4	14	18	18	16	20
25	15	12	Cal	12	13	12	15	18	21	24	26	29	31	32	38	41	44	42	35	29	26	21	17	14	24
26	12	11	Cal	12	13	14	13	15	19	22	23	23	22	35	27	24	25	25	21	21	20	19	18	14	19
27	17	17	Cal	15	14	12	13	17	20	23	24	26	27	28	30	27	23	19	15	7	6	12	15	18	18
28	16	12	Cal	13	13	12	15	18	21	25	27	29	31	31	32	34	39	41	39	39	27	30	24	21	25
29	21	16	Cal	2	2	2	11	21	29	34	39	41	43	47	52	54	50	47	28	5	19	28	21	19	27
30	12	4	Cal	0	0	5	12	19	27	Cal	Cal	67	70	72	72	66	PwrF	53	44	35	31	15	21	15	32
31	11	12	Cal	4	2	8	8	22	42	54	58	62	51	51	58	59	59	63	42	24	25	30	10	5	33

TOTAL HOURS 744 TOTAL GOOD HOURS 699 DATA CAPTURE 94.0%

MAX. 1HR AVG 72 05/30/91 14:00:00 2ND MAX. 1 HR AVG 72 05/30/91 13:00:00

MIN. 1HR AVG 0 05/01/91 01:00:00 ARITHMETIC MEAN 25 STANDARD DEV. 14

NAAQS Comparison: MAX. 1 HR AVG 72 (120) 05/30/91 14:00:00

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

Bads - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR OZONE IN PPB

		JUNE, 1991																							DAILY AVG	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22		23
DAY																										
1	4	3	Cal	3	4	11	15	29	38	38	59	78	77	71	66	72	75	76	71	42	16	28	28	19	40	
2	11	4	Cal	6	2	2	10	19	28	34	38	43	43	43	46	42	39	39	41	34	28	18	11	12	26	
3	13	14	Cal	14	14	15	18	26	34	39	42	43	44	45	42	43	40	40	34	31	26	22	17	14	29	
4	17	15	Cal	12	5	16	10	26	43	46	Cal	Cal	60	57	53	52	53	70	34	50	46	48	53	47	38	
5	34	34	Cal	37	49	49	29	35	46	51	54	60	63	65	77	78	72	69	62	61	64	62	59	53	55	
6	53	43	Cal	29	27	11	16	23	30	42	58	63	64	64	61	56	55	51	48	40	38	40	42	43	43	
7	45	38	Cal	38	29	18	17	27	37	43	51	55	58	64	58	58	53	48	45	43	42	39	40	35	42	
8	37	35	Cal	36	33	22	26	37	44	47	49	53	50	52	52	53	53	50	47	44	40	39	40	35	42	
9	39	34	Cal	31	30	27	29	37	42	45	47	47	48	48	49	47	47	46	43	43	40	38	36	34	40	
10	31	28	Cal	28	24	15	17	30	34	Cal	49	48	50	52	53	50	48	48	47	46	44	42	39	36	33	
11	19	8	Cal	5	3	0	9	30	Cal	44	46	Cal	49	50	50	48	48	47	46	44	42	39	36	33	33	
12	28	24	Cal	17	22	18	25	31	43	44	54	66	61	66	69	70	68	65	58	21	45	43	36	33	44	
13	29	23	Cal	29	29	25	26	28	33	55	64	72	78	78	76	82	82	79	62	51	49	42	38	37	51	
14	33	25	Cal	20	5	2	3	24	29	36	44	44	45	44	45	45	45	47	41	30	14	6	7	19	28	
15	15	11	Cal	24	25	26	21	23	27	35	47	52	52	49	46	50	59	61	65	53	37	32	36	17	37	
16	14	12	Cal	7	9	12	16	27	47	59	67	74	81	78	78	58	45	53	45	41	35	29	22	14	40	
17	15	11	Cal	8	3	2	5	9	19	23	23	19	30	26	36	PwrF	35	PwrF	PwrF	18	6	3	5	4	15	
18	3	2	Cal	2	2	2	5	11	16	21	22	16	14	21	18	22	14	15	16	13	13	12	5	4	11	
19	6	8	Cal	12	11	5	8	14	17	18	21	27	29	30	30	28	25	25	12	33	31	25	12	14	19	
20	7	9	Cal	8	2	3	14	22	29	36	40	52	55	57	59	56	PwrF	36	38	25	PwrF	PwrF	PwrF	PwrF	Bad<	
21	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	48	47	Cal	45	40	44	52	44	46	36	30	25	20	Bad<
22	12	7	Cal	13	3	3	12	20	28	29	27	34	39	39	33	39	45	41	37	33	21	19	25	7	24	
23	8	4	Cal	14	11	4	10	20	32	37	35	40	47	51	30	35	41	42	PwrF	44	35	36	32	25	29	
24	15	10	Cal	10	9	3	8	26	24	31	40	49	59	60	47	42	38	40	28	25	17	21	11	7	27	
25	5	9	Cal	3	3	3	10	27	36	41	51	61	65	63	62	63	60	56	50	44	43	28	20	16	35	
26	19	17	Cal	4	1	2	2	11	28	39	49	60	67	69	73	64	PwrF	54	50	30	47	45	30	32	36	
27	33	36	Cal	33	35	28	30	37	44	50	47	48	48	39	36	27	29	31	12	6	4	5	4	3	29	
28	6	5	Cal	3	5	2	5	20	32	47	60	68	66	68	72	61	59	73	59	39	30	47	43	29	39	
29	26	26	Cal	11	6	4	8	40	50	56	60	59	62	65	73	76	72	64	52	57	51	50	36	38	45	
30	35	34	Cal	17	8	3	12	37	47	44	44	44	42	45	48	49	50	35	29	24	17	20	18	21	31	

TOTAL HOURS 720 TOTAL GOOD HOURS 664 DATA CAPTURE 92.2%

MAX. 1HR AVG 82 06/13/91 16:00:00 2ND MAX. 1 HR AVG 82 06/13/91 15:00:00

MIN. 1HR AVG 0 06/11/91 05:00:00 ARITHMETIC MEAN 35 STANDARD DEV. 19

NAAQS Comparison: MAX. 1 HR AVG 82 (120) 06/13/91 15:00:00

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qel - Data questionable external influence, Purg - Analyzer in Purge

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR OZONE IN PPB

		JULY, 1991																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1	25	23	Cal	24	26	25	24	23	25	27	36	38	43	43	41	46	35	35	34	30	33	26	27	25	31	
2	24	18	Cal	17	13	10	14	18	24	31	30	30	29	27	20	25	24	23	26	14	7	6	9	6	19	
3	7	6	Cal	6	6	5	7	12	19	Cal	21	24	26	29	33	30	28	28	PwrF	30	18	7	9	10	17	
4	9	7	Cal	10	11	16	19	20	24	27	28	29	28	31	32	25	19	20	16	15	15	14	15	10	19	
5	7	6	Cal	8	7	8	10	16	22	Cal	Cal	29	34	43	35	PwrF	27	21	13	18	10	9	19	21	18	
6	22	20	Cal	23	25	14	28	26	28	32	33	31	29	31	34	32	39	34	20	15	14	17	21	11	25	
7	3	7	Cal	9	5	3	5	18	31	37	39	45	49	45	43	45	47	44	59	51	47	PwrF	48	35	32	
8	32	24	Cal	22	10	2	3	15	24	28	39	51	60	66	69	67	54	15	30	45	35	20	10	2	31	
9	2	2	Cal	1	2	1	4	8	15	13	19	32	26	14	13	19	21	21	21	15	6	4	3	4	11	
10	2	7	Cal	5	6	4	4	15	35	46	46	46	PwrF	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Bad<
11	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Miss
12	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Miss
13	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Miss
14	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Miss
15	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Miss
16	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Miss
17	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Miss
18	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Miss
19	9	6	10	9	6	8	6	13	22	28	33	37	41	Cal	Cal	Cal	Cal	31	26	26	Cal	Cal	16	16	Bad<	
20	17	13	Cal	16	14	10	6	18	22	28	33	33	33	28	28	28	33	33	23	13	13	8	8	13	20	
21	8	3	Cal	12	12	7	7	17	17	22	22	32	32	32	32	32	37	32	27	22	22	22	22	22	21	
22	19	10	Cal	19	9	2	7	17	22	32	32	42	42	52	52	52	52	42	27	22	17	12	7	26		
23	2	Cal	7	7	7	7	7	22	32	37	42	42	47	52	57	72	77	53	PwrF	46	32	17	29	26	33	
24	20	17	Cal	12	10	8	9	26	40	48	52	56	54	60	58	45	48	36	27	30	35	29	26	16	33	
25	18	22	Cal	26	19	10	10	24	30	37	42	46	41	47	40	45	48	50	44	28	22	21	29	22	31	
26	10	4	Cal	16	13	11	10	27	28	33	36	37	40	43	39	33	29	30	PwrF	23	19	19	22	22	25	
27	24	18	Cal	8	4	3	11	17	18	28	36	44	46	49	45	46	44	38	41	36	24	23	28	26	28	
28	12	13	Cal	10	8	13	14	17	25	26	34	40	43	43	42	44	39	28	25	12	4	7	19	20	23	
29	14	9	Cal	22	20	10	15	21	26	29	38	38	36	40	45	38	28	23	16	18	12	21	22	22	24	
30	23	18	Cal	19	17	17	18	18	22	24	27	31	32	29	29	30	30	27	27	26	22	23	22	23	24	
31	22	20	Cal	21	17	18	18	19	21	28	28	36	36	34	31	30	31	28	33	35	32	33	31	26	27	

TOTAL HOURS 744 TOTAL GOOD HOURS 509 DATA CAPTURE 68.4%

MAX. 1HR AVG 77 07/23/91 16:00:00 2ND MAX. 1 HR AVG 72 07/23/91 15:00:00

MIN. 1HR AVG 1 07/09/91 03:00:00 ARITHMETIC MEAN 24 STANDARD DEV. 14

NAAQS Comparison: MAX. 1 HR AVG 77 (125) 07/23/91 16:00:00

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

10-29-91

11.1-111

HOURLY AVERAGES FOR OZONE IN PPB

**DAILY
AVG**

DAY	HOUR (EST)																							DAILY AVG	
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22		23
1	22	19	Cal	17	16	16	15	16	18	23	27	30	31	33	33	24	25	25	21	19	15	16	15	17	21
2	16	14	Cal	11	13	14	15	15	22	28	28	29	33	31	38	29	18	19	11	11	10	7	5	6	18
3	11	12	Cal	8	9	4	2	14	25	28	34	33	35	37	41	48	46	31	30	38	26	16	11	23	24
4	21	17	Cal	14	6	3	4	12	17	19	24	37	24	32	31	48	55	53	42	26	17	12	5	5	23
5	3	3	Cal	3	3	3	3	5	25	Cal	Cal	44	53	51	59	Cal	Cal	51	41	27	32	33	21	18	25
6	16	7	Cal	8	8	18	24	34	44	51	54	57	51	45	44	44	39	33	28	17	33	16	18	15	30
7	10	6	Cal	8	13	15	12	15	19	24	28	28	29	29	35	28	26	27	29	25	19	18	16	15	20
8	14	12	Cal	9	4	6	8	13	18	23	28	29	30	31	32	36	38	36	31	31	33	PwrF	27	22	23
9	20	11	Cal	4	6	4	5	14	34	38	37	34	47	57	PwrF	PwrF	71	41	49	45	46	41	25	18	31
10	20	21	Cal	19	19	18	17	22	27	27	30	32	31	32	17	26	29	27	24	19	13	10	3	4	21
11	3	4	Cal	3	3	4	4	9	20	26	30	33	37	26	36	37	33	30	24	20	18	14	5	3	18
12	3	3	Cal	3	6	4	5	11	19	25	28	31	30	40	40	35	30	33	32	27	32	26	26	24	22
13	22	18	Cal	11	14	16	11	19	24	Down	Down	Down	Qai	54	59	56	50	Qai	Qai	Qai	Qai	20	25	27	Bad<
14	15	13	8	14	14	17	17	28	31	27	27	27	29	34	36	36	31	27	15	10	4	3	2	3	19
15	7	20	15	16	16	13	11	13	21	24	24	31	35	31	25	37	45	41	31	17	38	38	25	18	24
16	11	10	5	5	7	3	3	9	24	Cal	37	51	48	49	54	63	60	47	49	37	26	40	49	27	31
17	12	7	Cal	13	6	10	7	14	22	34	47	63	61	55	67	79	69	57	47	41	31	25	16	20	35
18	16	15	Cal	10	4	2	6	16	23	25	20	24	27	30	26	25	22	26	21	17	14	10	9	6	17
19	7	7	Cal	7	5	5	6	12	18	23	26	29	26	24	32	28	25	23	21	15	13	9	7	7	16
20	8	7	Cal	10	9	14	18	10	6	13	12	10	12	10	15	16	16	15	16	9	10	6	9	7	11
21	6	4	Cal	10	11	11	12	15	21	23	28	25	32	33	31	29	28	32	29	17	22	24	41	37	22
22	32	26	Cal	24	17	5	4	15	19	24	32	37	38	33	30	32	32	33	31	27	25	22	19	20	25
23	20	19	Cal	18	20	20	18	22	28	33	38	40	44	43	36	37	38	32	32	33	30	27	20	24	29
24	23	17	Cal	19	16	15	13	21	27	33	33	34	34	32	33	35	37	81	27	24	21	20	20	20	27
25	20	17	Cal	19	17	13	9	18	23	28	32	32	35	36	35	35	40	35	27	25	28	25	24	22	26
26	19	12	Cal	6	3	3	3	8	17	30	38	43	45	47	45	42	40	42	39	29	25	25	23	20	26
27	16	11	Cal	9	7	4	4	10	16	21	27	32	15	18	27	25	16	15	8	5	7	13	11	14	14
28	11	4	Cal	10	12	5	7	15	23	31	36	39	38	35	27	27	30	33	22	15	5	12	21	20	21
29	21	18	Cal	12	14	14	14	17	22	29	31	31	31	32	33	35	33	27	29	33	29	25	22	19	25
30	16	14	Cal	12	11	10	11	14	22	28	32	33	33	34	33	34	39	34	20	15	8	7	8	12	21
31	18	14	Cal	7	10	6	4	16	30	32	35	38	40	42	41	39	41	39	34	33	13	14	23	25	26

NAAQS Comparison: MAX. 1 HR AVG 81 (125) 08/24/91 17:00:00

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

10-21-91

11.11-112

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR OZONE IN PPB

		SEPTEMBER, 1991																							DAILY AVG
DAY	HOUR (EST)	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	24	21	Cal	10	10	9	12	26	31	38	47	47	45	46	47	44	39	37	41	31	19	26	22	13	29
2	11	6	Cal	10	69	4	4	20	32	38	47	49	47	46	51	55	57	61	56	45	52	35	27	16	36
3	18	24	Cal	21	14	9	8	14	29	44	48	52	50	50	43	54	52	46	43	37	35	25	27	18	33
4	18	16	Cal	17	14	9	8	15	28	43	46	47	47	47	50	51	56	48	42	39	36	33	24	30	33
5	18	19	Cal	20	11	4	6	12	29	40	44	45	45	45	49	53	55	44	41	52	34	24	22	25	32
6	19	11	Cal	10	9	7	7	13	24	39	45	51	59	Qai	Qai	Qai	Qai	44	52	43	42	30	13	15	28
7	13	10	Cal	9	6	5	5	9	22	36	47	50	53	56	54	50	51	46	38	27	28	31	22	11	29
8	5	7	Cal	10	6	3	6	12	17	26	33	27	28	28	29	37	35	29	17	14	12	8	7	8	17
9	7	4	Cal	9	11	21	29	32	35	39	48	51	51	51	51	50	51	49	46	44	39	35	29	29	34
10	24	21	Cal	22	22	19	9	21	31	36	42	43	43	43	40	38	41	43	38	32	28	27	26	23	31
11	22	18	Cal	23	19	10	15	18	26	32	40	50	57	62	63	60	59	63	49	37	31	10	27	26	35
12	23	19	Cal	10	4	3	10	18	31	42	60	66	65	70	86	89	77	54	26	11	33	39	33	31	39
13	29	22	Cal	6	6	4	3	11	37	47	59	71	75	88	95	89	85	71	49	41	40	41	37	36	45
14	34	27	Cal	24	14	10	19	20	32	45	59	70	75	80	81	77	65	53	23	7	26	37	35	35	41
15	34	28	Cal	20	18	15	20	28	35	45	57	65	63	58	54	53	51	50	48	48	46	40	39	40	41
16	38	28	Cal	8	8	6	4	28	54	70	69	69	68	67	70	72	69	60	53	50	48	43	39	28	45
17	15	10	Cal	9	7	7	5	9	33	56	61	65	68	68	68	63	55	52	48	43	35	30	26	25	37
18	28	26	Cal	18	16	20	17	20	26	32	37	38	40	41	37	35	23	4	7	22	6	8	24	20	23
19	18	17	Cal	11	7	11	13	17	20	27	33	35	38	41	42	45	47	40	33	28	22	19	11	10	25
20	5	5	Cal	5	5	4	4	7	17	26	42	62	72	85	99	90	82	66	57	61	38	37	20	27	40
21	26	20	Cal	19	20	25	27	26	32	41	48	54	62	65	67	67	56	56	52	43	37	33	17	25	40
22	26	19	Cal	16	14	11	11	15	26	37	43	47	51	54	49	45	44	43	35	31	27	24	26	25	31
23	24	19	Cal	20	19	19	13	19	34	40	46	49	53	53	56	59	56	46	37	29	27	23	24	22	34
24	25	18	Cal	21	Qai	Qai	Qai	Qai	30	32	42	47	Qai	Qai	Qai	Qai	48	53	40	35	32	18	16	7	Bad<
25	4	4	Cal	15	15	15	13	13	16	20	24	23	21	23	21	24	27	24	14	5	6	9	14	8	15
26	4	5	Cal	8	5	3	14	8	23	36	44	50	58	54	64	61	61	55	47	46	36	22	18	5	31
27	9	24	Cal	29	24	10	14	22	38	43	60	72	76	79	80	76	75	55	43	38	26	20	15	9	41
28	31	33	Cal	37	36	27	30	35	45	58	64	69	68	68	65	61	PwrF	55	51	46	46	41	41	39	47
29	35	26	Cal	25	19	15	16	20	34	46	52	53	54	52	51	49	45	34	31	33	31	32	35	39	36
30	38	33	Cal	30	35	37	40	38	40	38	44	46	46	61	40	45	45	43	42	42	37	35	36	32	40

TOTAL HOURS 720 TOTAL GOOD HOURS 677 DATA CAPTURE 94.0%

MAX. 1HR AVG 99 09/20/91 14:00:00 2ND MAX. 1 HR AVG 95 09/13/91 14:00:00

MIN. 1HR AVG 3 09/12/91 05:00:00 ARITHMETIC MEAN 34 STANDARD DEV. 19

NAAQS Comparison: MAX. 1 HR AVG 99 (125) 09/20/91 14:00:00

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

10-21-91

11.11-113

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR OZONE IN PPB

		OCTOBER, 1991																							DAILY AVG
DAY	HOUR (EST)	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	29	26	Cal	23	25	20	20	20	29	41	41	41	40	38	33	33	32	30	31	29	20	21	23	17	29
2	16	15	Cal	13	9	11	14	13	14	18	25	27	26	32	35	38	33	31	28	17	20	18	15	15	21
3	11	13	Cal	13	10	12	14	13	21	26	32	25	29	34	31	31	26	25	21	18	16	14	13	12	20
4	11	7	Cal	3	3	4	4	8	10	15	27	29	30	30	27	26	22	21	13	12	11	20	19	15	16
5	17	16	Cal	15	11	14	11	12	15	23	26	27	29	29	25	21	21	18	10	7	7	7	6	8	16
6	7	9	Cal	7	11	6	5	6	18	24	29	29	25	19	17	24	28	22	20	13	17	21	29	25	18
7	31	27	Cal	35	32	25	27	24	24	27	35	46	57	61	71	76	62	46	41	37	38	39	40	41	41
8	42	39	Cal	37	36	30	29	31	36	46	51	55	57	57	55	56	55	51	47	43	41	36	35	32	43
9	29	29	Cal	28	26	15	21	24	30	33	43	48	48	46	45	44	43	40	36	31	36	38	33	33	34
10	33	23	Cal	13	12	10	8	11	14	17	24	32	40	52	52	47	43	Down	Down	34	20	18	Cal	Cal	26
11	Cal	4	Cal	1	1	1	2	3	16	21	35	49	57	61	61	61	45	54	47	31	23	15	12	14	28
12	16	9	Cal	2	2	3	4	13	34	52	61	71	75	82	75	76	76	71	54	26	13	8	4	7	36
13	9	8	Cal	7	6	5	2	10	46	72	89	93	96	96	95	92	86	41	31	51	55	50	45	38	49
14	45	47	Cal	55	46	35	15	33	43	63	73	77	82	80	77	74	67	51	42	59	53	51	48	44	55
15	43	38	Cal	42	41	25	9	18	29	35	48	50	48	42	40	44	37	37	36	39	37	30	20	17	35
16	16	16	Cal	8	16	30	28	27	31	35	44	51	55	59	58	61	61	54	36	36	29	26	22	30	36
17	27	34	Cal	20	8	7	3	5	28	42	52	60	67	68	70	69	69	33	7	12	12	30	40	40	35
18	31	21	Cal	16	17	15	18	31	42	51	60	63	63	64	70	66	64	60	54	52	52	50	36	38	45
19	38	31	Cal	27	25	23	27	33	46	52	58	63	63	66	68	72	72	47	34	41	41	41	39	36	45
20	35	30	Cal	27	32	30	30	36	45	52	56	58	60	58	51	44	42	44	43	39	38	36	39	39	42
21	39	34	Cal	35	29	23	22	13	26	31	34	34	33	34	34	35	37	36	33	32	32	31	30	25	31
22	25	25	Cal	24	22	18	14	18	25	37	44	48	52	58	60	59	55	52	46	36	31	25	12	7	34
23	7	4	Cal	8	8	5	9	16	Cal	Cal	Cal	Cal	Cal	Cal	Cal	34	Cal	Cal	Cal	Down	26	25	22	22	Bad<
24	23	23	Cal	21	20	23	22	23	27	34	39	40	41	41	41	40	37	33	31	29	29	30	27	26	30
25	23	18	Cal	20	24	22	22	25	28	33	36	38	37	36	34	32	30	23	25	21	23	23	20	20	26
26	16	14	Cal	13	9	11	11	16	23	29	32	33	33	34	33	33	32	28	23	29	27	24	19	18	23
27	20	19	Cal	12	12	13	16	18	24	30	33	35	34	35	36	37	36	32	30	27	23	22	18	17	25
28	15	9	Cal	8	4	2	1	4	17	29	36	PwrF	PwrF	39	39	39	39	37	37	31	29	25	24	25	23
29	19	11	Cal	7	4	3	3	4	18	28	34	34	35	33	34	37	37	37	36	34	27	27	31	24	24
30	25	24	Cal	72	26	22	14	24	34	38	40	42	43	41	41	44	44	40	37	34	35	33	28	22	35
31	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	3	10	30	37	43	46	51	52	54	59	61	35	19	7	3	14	22	29	Bad<

TOTAL HOURS 744 TOTAL GOOD HOURS 690 DATA CAPTURE 92.7%

MAX. 1HR AVG 96 10/13/91 13:00:00 2ND MAX. 1 HR AVG 96 10/13/91 12:00:00

MIN. 1HR AVG 1 10/28/91 06:00:00 ARITHMETIC MEAN 31 STANDARD DEV. 18

NAAQS Comparison: MAX. 1 HR AVG 96 (125) 10/13/91 13:00:00

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qel - Data questionable external influence, Purg - Analyzer in Purge

02/17/9

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR OZONE IN PPB

		NOVEMBER, 1991																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1	27	23	Cal	15	20	17	17	17	26	41	48	49	47	47	48	45	42	31	30	5	11	8	1	8	27	
2	11	13	Cal	9	17	16	12	15	20	25	29	31	31	29	28	27	22	16	8	8	7	4	11	11	17	
3	13	12	Cal	20	19	15	9	12	20	24	29	37	40	41	38	30	27	16	12	19	17	16	15	19	21	
4	20	20	Cal	21	19	22	18	16	14	15	22	25	26	26	24	23	22	17	17	15	16	14	10	14	19	
5	14	17	Cal	19	18	14	9	11	12	16	19	20	16	21	21	23	23	12	9	6	5	6	6	12	14	
6	15	14	Cal	15	13	14	11	11	12	PwrF	29	32	37	37	39	37	34	24	21	19	16	14	12	16	21	
7	17	20	Cal	22	22	20	16	15	15	18	21	24	32	36	38	36	29	30	17	16	21	27	33	29	24	
8	23	17	Cal	27	34	25	18	19	21	31	43	46	61	67	61	Cal	Cal	49	32	35	37	36	34	43	36	
9	47	46	Cal	46	41	33	26	28	24	25	27	37	46	56	53	52	50	38	32	29	28	20	18	18	35	
10	15	11	Cal	2	6	12	14	7	18	24	25	26	29	27	33	35	47	42	17	1	0	2	1	0	17	
11	1	0	Cal	0	0	1	0	0	13	30	39	40	28	34	42	39	39	34	28	24	23	9	9	2	19	
12	4	5	Cal	17	16	15	7	8	15	21	36	47	49	50	56	55	47	46	38	30	33	31	32	34	30	
13	30	28	Cal	30	22	16	9	8	17	29	38	46	52	57	58	61	64	25	13	37	35	25	19	15	32	
14	22	23	Cal	22	16	15	15	17	21	32	45	53	56	55	55	54	50	9	19	32	38	37	35	31	32	
15	19	3	Cal	10	9	3	1	10	21	32	41	46	46	47	48	48	47	35	30	28	27	16	3	6	25	
16	6	6	Cal	8	6	4	0	2	10	26	36	42	40	40	39	38	38	32	22	20	9	11	15	22	20	
17	20	18	Cal	18	18	14	11	20	25	29	33	33	35	35	35	38	40	39	36	32	27	23	21	18	27	
18	22	15	Cal	11	11	10	15	13	18	25	34	39	41	40	41	42	40	35	31	27	22	20	19	16	25	
19	14	16	Cal	18	18	18	24	26	25	32	36	39	41	45	42	41	40	36	32	23	20	19	19	16	28	
20	15	12	Cal	18	20	22	23	21	23	24	26	30	33	36	36	36	32	26	22	26	23	20	20	17	24	
21	14	10	Cal	9	6	6	8	10	16	23	30	33	34	36	37	45	45	42	31	32	31	22	20	18	24	
22	18	15	Cal	13	16	15	13	13	18	25	30	31	32	37	36	32	27	22	21	13	13	15	9	9	20	
23	12	11	Cal	7	2	0	0	0	6	13	18	31	40	46	30	30	23	22	33	28	28	24	23	22	19	
24	20	20	Cal	19	10	12	4	8	22	31	30	33	29	31	39	35	35	32	26	23	20	21	20	21	23	
25	21	24	Cal	24	20	17	12	11	13	20	25	30	36	38	37	23	13	15	21	19	14	6	9	2	19	
26	2	4	Cal	2	5	16	16	18	19	23	29	34	37	35	36	36	33	24	22	30	27	33	32	33	23	
27	30	27	Cal	27	25	15	7	5	8	18	26	29	32	37	42	41	39	36	33	23	21	22	23	24	25	
28	23	19	Cal	17	17	13	9	10	17	23	30	35	36	36	36	36	35	33	31	27	25	21	20	20	24	
29	19	14	Cal	14	9	7	8	10	12	23	28	30	31	32	31	31	30	27	25	20	17	19	18	16	20	
30	15	14	Cal	17	15	18	18	19	19	22	25	27	28	29	30	30	29	26	25	20	18	18	17	16	21	

TOTAL HOURS 720 TOTAL GOOD HOURS 687 DATA CAPTURE 95.4%

MAX. 1HR AVG 67 11/08/91 13:00:00 2ND MAX. 1 HR AVG 64 11/13/91 16:00:00

MIN. 1HR AVG 0 11/10/91 20:00:00 ARITHMETIC MEAN 24 STANDARD DEV. 13

NAAQS Comparison: MAX. 1 HR AVG 67 (125) 11/08/91 13:00:00

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration
BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

11.11-115

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR OZONE IN PPB

DAY	DECEMBER, 1991																								DAILY AVG
	HOUR (EST)	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	14	11	Cal	15	14	14	15	15	16	19	23	24	24	24	25	25	25	23	21	19	16	16	12	9	18
2	9	7	Cal	7	8	9	10	10	9	14	19	22	26	30	31	33	33	28	19	12	13	4	10	13	16
3	11	11	Cal	13	12	12	12	13	13	15	Cal	Cal	Cal	23	22	21	19	17	16	16	14	10	22	29	16
4	32	27	Cal	16	18	14	13	11	10	11	12	16	21	22	23	24	24	14	3	7	6	13	12	14	16
5	15	10	Cal	16	17	14	7	7	10	14	23	29	33	35	42	42	42	20	14	11	6	1	1	3	18
6	2	1	Cal	9	8	8	4	4	7	16	24	33	38	41	44	45	42	2	0	11	27	24	13	16	18
7	19	17	Cal	14	14	5	0	3	5	14	27	35	37	39	41	42	37	10	5	10	12	21	18	15	19
8	21	17	Cal	14	4	10	5	5	18	27	31	33	33	34	33	33	33	13	8	22	23	22	16	16	20
9	6	1	Cal	2	1	1	1	1	7	27	35	37	39	38	38	35	17	4	2	20	16	9	2	1	15
10	2	2	Cal	0	0	0	1	0	2	18	31	33	27	30	35	32	34	26	23	15	7	5	0	3	14
11	1	6	Cal	1	1	0	0	1	8	14	24	30	38	39	41	46	43	8	5	3	5	10	6	10	15
12	12	6	Cal	17	19	19	16	12	12	17	22	29	34	35	37	35	33	29	27	20	22	23	20	17	22
13	17	14	Cal	9	5	3	5	8	17	23	28	29	30	31	31	29	5	0	4	10	7	9	14	15	15
14	16	13	Cal	12	10	6	5	2	8	15	23	25	26	27	34	34	28	23	20	12	11	11	13	11	16
15	14	17	Cal	16	14	17	15	14	18	22	26	30	35	40	42	40	30	27	24	22	24	25	26	22	24
16	23	22	Cal	26	26	21	21	24	24	26	26	28	29	28	29	34	25	18	21	19	14	13	16	13	23
17	15	20	Cal	20	24	24	10	6	10	22	29	35	41	44	44	44	45	27	0	3	5	4	5	6	21
18	4	7	Cal	15	10	7	4	7	15	23	34	46	46	47	51	53	40	9	23	33	25	19	19	19	24
19	13	13	Cal	25	24	21	15	13	19	24	28	35	42	41	40	40	37	36	36	36	36	34	34	35	29
20	34	31	Cal	33	34	33	22	12	22	28	33	36	36	35	36	36	36	36	34	30	27	26	21	11	29
21	7	5	Cal	10	8	1	0	0	6	21	35	39	41	42	42	41	31	9	5	4	0	9	20	19	17
22	10	7	Cal	2	2	4	0	0	4	25	34	41	42	44	44	44	45	20	16	5	6	4	1	2	17
23	0	0	Cal	1	0	0	1	1	3	20	34	37	38	39	43	41	37	24	13	7	6	17	22	21	17
24	21	20	Cal	18	18	15	11	5	10	20	21	23	25	28	31	30	29	27	20	18	20	18	20	26	20
25	23	23	Cal	20	17	15	11	7	12	17	26	32	37	42	42	43	36	10	6	1	4	14	14	11	20
26	9	3	Cal	3	8	2	4	10	12	12	18	24	31	35	37	34	33	24	12	25	20	9	3	0	16
27	0	0	Cal	1	5	4	4	5	7	14	23	27	28	31	33	34	32	21	15	16	16	14	9	7	15
28	0	0	Cal	8	9	10	7	7	8	9	14	19	21	24	26	27	27	13	18	19	12	1	0	5	12
29	0	2	Cal	5	11	5	5	4	11	19	24	26	28	30	32	31	30	25	13	16	17	12	0	0	15
30	0	0	Cal	0	1	0	0	2	4	18	24	26	31	33	31	32	28	21	13	12	12	13	13	11	14
31	7	4	Cal	Qal	Qal	Qal	Qal	Qal	Qal	Qal	Qal	Qal	Qal	Qal	Qal	Qal	Qal	Qal	Qal	Qal	Qal	Qal	Qal	Qal	Bad<

TOTAL HOURS 744 TOTAL GOOD HOURS 689 DATA CAPTURE 92.6%

MAX. 1HR AVG 53 12/18/91 15:00:00 2ND MAX. 1 HR AVG 51 12/18/91 14:00:00

MIN. 1HR AVG 0 12/06/91 18:00:00 ARITHMETIC MEAN 18 STANDARD DEV. 12

NAAQS Comparison: MAX. 1 HR AVG 53 (125) 12/18/91 15:00:00

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration
BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data
Qad - Data questionable insufficient documentation, Qal - Data questionable external influence, Purg - Analyzer in Purge

02/17/92

HOURLY AVERAGES FOR OZONE IN PPB

		HOUR (EST)																				DAILY AVG				
		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19		20	21	22	23
DAY		Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Miss
1		Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Back
2		Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	37	41	34	30	7	12	6	12	7	2	Back
3		1	1	Cal	1	0	5	9	11	11	18	21	27	31	32	30	33	34	29	27	13	6	0	3	10	15
4		9	13	Cal	29	32	28	23	20	22	16	19	22	22	28	34	34	28	24	16	23	25	25	25	13	23
5		10	13	Cal	9	6	4	2	3	7	12	16	22	28	29	20	15	14	35	31	28	22	13	3	1	15
6		2	4	Cal	1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	Qa1	22	33	25	18	27	25	23	18	9	1	5	Back
7		5	2	Cal	0	1	3	1	1	7	13	22	33	41	43	47	47	47	15	2	1	2	1	20	22	16
8		17	19	Cal	2	9	19	23	23	28	34	37	45	48	50	50	52	52	49	35	15	25	35	32	27	31
9		21	23	Cal	11	1	0	0	0	4	19	28	30	32	34	34	Cal	Cal	26	25	Cal	Cal	Cal	10	14	Back
10		6	8	Cal	15	10	11	10	7	7	Cal	Cal	Cal	Cal	Cal	Cal	Cal	Cal	29	34	30	24	24	22	22	Back
11		23	25	Cal	22	19	16	8	9	16	18	26	33	38	39	42	40	38	33	10	0	0	0	1	9	20
12		11	22	Cal	25	23	21	22	21	23	30	35	39	40	39	40	42	43	46	42	40	39	37	33	29	32
13		27	24	Cal	23	23	20	17	18	19	24	27	32	31	29	30	31	31	29	28	27	24	23	23	22	25
14		24	22	Cal	24	22	21	18	15	22	33	39	26	31	31	32	33	31	29	24	19	20	9	10	9	23
15		11	9	Cal	10	11	12	9	9	11	15	19	20	23	24	25	24	23	22	20	24	21	11	2	8	16
16		13	12	Cal	19	18	19	18	12	22	27	26	29	37	38	38	38	37	Cal	Cal	11	16	17	18	14	23
17		15	10	Cal	14	10	8	3	3	11	21	27	33	39	46	46	48	46	28	13	25	12	4	8	12	21
18		13	12	Cal	8	8	11	2	2	9	23	38	46	51	51	53	51	47	28	8	3	7	7	7	9	21
19		11	16	Cal	3	6	15	23	27	26	27	25	19	21	22	21	21	16	9	16	16	15	16	17	19	17
20		21	19	Cal	18	16	15	12	11	13	14	16	18	20	27	33	34	33	28	2						

NAAQS Comparison: MAX. 1 HR AVG 53 (120) 01/18/92 14:00:00

Bad< - To few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration
 BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data
 Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

11.11-117

TEC AQ - 1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR OZONE IN PPB

		FEBRUARY 1992																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1	13	14	Cal	16	20	25	22	17	21	29	35	41	44	47	48	49	46	40	30	31	35	33	32	29	31	
2	24	10	Cal	9	16	15	1	0	10	29	37	41	42	45	47	48	46	39	33	34	36	36	33	30	29	
3	29	27	Cal	27	22	12	14	16	16	29	34	41	46	50	50	53	51	50	5	4	33	33	27	26	30	
4	26	23	Cal	15	21	12	17	19	12	26	37	42	45	46	45	48	46	44	38	35	37	33	33	30	32	
5	28	25	Cal	28	23	30	24	24	30	33	36	37	36	36	37	37	37	36	38	31	34	29	30	31	31	
6	31	28	Cal	26	26	21	13	25	25	33	31	34	39	39	34	30	31	18	8	24	21	14	22	23	26	
7	17	9	Cal	22	19	15	20	21	20	16	18	17	29	29	42	43	42	46	34	34	23	27	20	17	25	
8	18	18	Cal	7	11	10	4	0	14	24	26	28	27	30	39	43	45	42	22	22	21	16	14	17	22	
9	22	21	Cal	26	19	16	15	16	23	31	34	37	38	41	44	44	40	33	31	25	24	28	27	25	28	
10	29	32	Cal	29	27	24	14	19	22	26	40	47	48	49	50	51	51	47	34	35	28	25	19	23	33	
11	24	18	Cal	23	23	22	18	8	9	9	13	15	19	33	45	48	50	44	19	13	21	15	27	22	23	
12	19	15	Cal	9	8	4	1	3	6	7	11	19	24	33	42	47	44	24	1	0	8	0	5	0	14	
13	1	2	Cal	2	17	14	17	10	17	18	21	34	50	Cal	56	53	55	49	25	17	26	11	14	14	24	
14	0	0	Cal	0	0	0	1	2	16	36	46	50	50	51	53	Cal	56	56	50	26	20	20	10	7	25	
15	10	11	Cal	10	5	7	8	10	26	30	36	36	38	46	44	40	36	34	30	24	18	18	18	16	24	
16	12	10	Cal	16	17	18	12	18	24	28	30	36	36	34	32	33	30	26	20	16	16	10	5	1	21	
17	1	1	Cal	10	12	13	Miss	Miss	Miss	Miss	Miss	Miss	Miss	32	38	32	38	40	32	25	12	32	28	20	16	Bad<
18	24	24	24	16	12	10	16	8	14	14	18	18	20	28	30	32	32	34	28	20	18	16	14	10	20	
19	12	12	10	14	18	20	14	14	12	Cal	Cal	Cal	Cal	Cal	28	30	24	16	12	10	6	8	8	6	14	
20	1	0	0	1	8	18	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Bad<	
21	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	
22	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	
23	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	
24	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	18	20	18	16	14	26	Bad<	
25	27	23	Cal	21	20	18	16	14	PwrF	19	19	20	18	20	22	24	24	23	18	20	22	19	19	15	20	
26	14	18	Cal	18	18	15	8	20	21	23	33	39	PwrF	PwrF	43	45	42	42	34	35	30	28	34	26	28	
27	30	31	Cal	27	28	32	31	31	24	24	30	38	38	38	41	35	35	30	25	22	17	11	5	0	27	
28	6	5	Cal	18	29	19	1	9	28	37	35	46	50	49	48	50	51	42	31	33	32	35	33	9	30	
29	26	14	Cal	36	24	6	3	4	24	39	46	48	48	55	63	64	64	58	53	47	45	33	10	5	35	

TOTAL HOURS 696 TOTAL GOOD HOURS 550 DATA CAPTURE 79.0%

MAX. 1HR AVG 64 02/29/92 15:00:00 2ND MAX. 1 HR AVG 64 02/29/92 16:00:00

MIN. 1HR AVG 0 02/02/92 07:00:00 ARITHMETIC MEAN 25 STANDARD DEV. 14

NAAQS Comparison: MAX. 1 HR AVG 64 (120) 02/29/92 15:00:00

KEY FOR MISSING CODES

Bad< - To few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

11.11-118

TEC AQ - 1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR OZONE IN PPB

		MARCH 1992																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1	7	4	Cal	21	12	6	10	17	26	32	49	59	63	64	64	64	63	53	44	39	35	17	15	20	34	
2	28	20	Cal	15	23	25	18	24	29	45	56	64	65	66	65	66	68	54	42	10	39	37	31	37	40	
3	31	25	Cal	20	25	13	13	10	23	44	51	59	61	63	62	60	60	56	52	56	54	51	49	46	43	
4	38	33	Cal	28	19	12	18	5	15	28	35	36	37	36	33	35	34	32	33	31	27	28	29	29	28	
5	29	25	Cal	27	27	24	24	27	28	33	37	39	42	43	44	46	47	45	43	35	31	29	25	25	33	
6	22	18	Cal	15	13	13	14	13	18	25	30	31	35	39	44	33	29	23	21	19	16	8	2	0	21	
7	4	3	Cal	9	11	10	9	7	12	13	15	20	27	25	24	23	25	23	19	13	10	2	7	1	13	
8	4	2	Cal	2	8	13	12	10	19	26	31	38	45	49	50	52	55	50	60	38	26	15	13	9	27	
9	7	8	Cal	8	3	0	3	12	24	32	36	42	45	46	47	51	52	48	51	34	40	34	22	37	29	
10	34	31	Cal	25	23	22	20	22	24	26	6	26	29	27	26	25	25	25	25	25	28	27	28	31	25	
11	20	20	Cal	27	25	25	20	21	26	29	30	31	31	37	44	44	40	27	21	25	30	27	15	15	27	
12	13	10	Cal	20	17	16	13	14	9	16	30	28	27	24	19	20	28	21	20	25	23	22	21	18	19	
13	28	27	Cal	25	10	6	2	5	15	30	37	42	40	38	48	50	50	44	33	36	29	17	25	28	29	
14	30	31	Cal	30	29	19	14	24	28	32	35	40	43	50	57	57	51	49	49	46	37	21	15	16	35	
15	20	14	Cal	23	21	17	5	19	30	43	55	61	66	69	74	75	72	69	54	55	48	39	34	34	43	
16	36	32	Cal	28	25	29	21	33	37	39	43	45	52	56	59	59	60	53	61	47	43	43	44	41	43	
17	39	35	Cal	34	34	35	31	31	37	45	52	60	62	65	65	65	65	64	43	54	43	37	40	33	46	
18	29	26	Cal	26	24	24	23	25	32	37	40	40	42	42	44	49	46	35	26	13	17	20	20	20	30	
19	17	15	Cal	14	15	13	19	19	21	28	33	33	35	34	33	37	31	23	29	26	22	18	22	14	24	
20	27	28	Cal	28	28	29	31	37	40	44	44	44	47	47	47	48	50	48	44	39	38	36	32	29	38	
21	22	28	Cal	30	23	16	17	23	27	35	45	49	54	61	66	66	66	57	45	43	45	39	31	26	40	
22	29	28	Cal	24	21	14	11	24	32	37	40	44	45	44	41	31	36	28	21	24	30	32	34	34	30	
23	31	28	Cal	40	34	31	27	20	25	35	38	25	37	36	35	41	40	36	40	34	28	30	25	20	32	
24	6	3	Cal	18	28	24	15	24	31	38	44	50	55	59	54	54	52	49	47	46	44	41	40	39	37	
25	38	35	Cal	33	28	27	27	29	37	42	44	46	47	48	48	47	47	45	41	38	33	23	22	16	36	
26	21	17	Cal	13	11	12	13	8	16	32	41	50	57	57	58	57	57	54	49	37	34	22	10	9	32	
27	3	7	Cal	6	17	16	11	3	35	49	52	55	60	64	69	65	51	57	56	54	48	34	6	6	36	
28	4	9	Cal	13	23	23	27	27	34	37	43	51	57	62	69	74	75	69	47	45	41	30	32	40	40	
29	38	30	Cal	37	35	34	34	35	40	47	62	66	67	66	63	65	66	62	38	38	41	26	9	28	44	
30	35	17	Cal	13	29	32	29	28	39	43	43	45	49	49	46	48	34	26	22	38	36	35	33	31	35	
31	29	26	Cal	28	27	22	19	20	29	34	Cal	Cal	Cal	Cal	44	44	46	40	37	36	31	19	17	12	29	

TOTAL HOURS 744 TOTAL GOOD HOURS 709 DATA CAPTURE 95.3%

MAX. 1HR AVG 75 03/28/92 16:00:00 2ND MAX. 1 HR AVG 75 03/15/92 15:00:00

MIN. 1HR AVG 0 03/06/92 23:00:00 ARITHMETIC MEAN 33 STANDARD DEV. 16

NAAQS Comparison: MAX. 1 HR AVG 75 (120) 03/28/92 16:00:00

KEY FOR MISSING CODES

Bad< - To few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

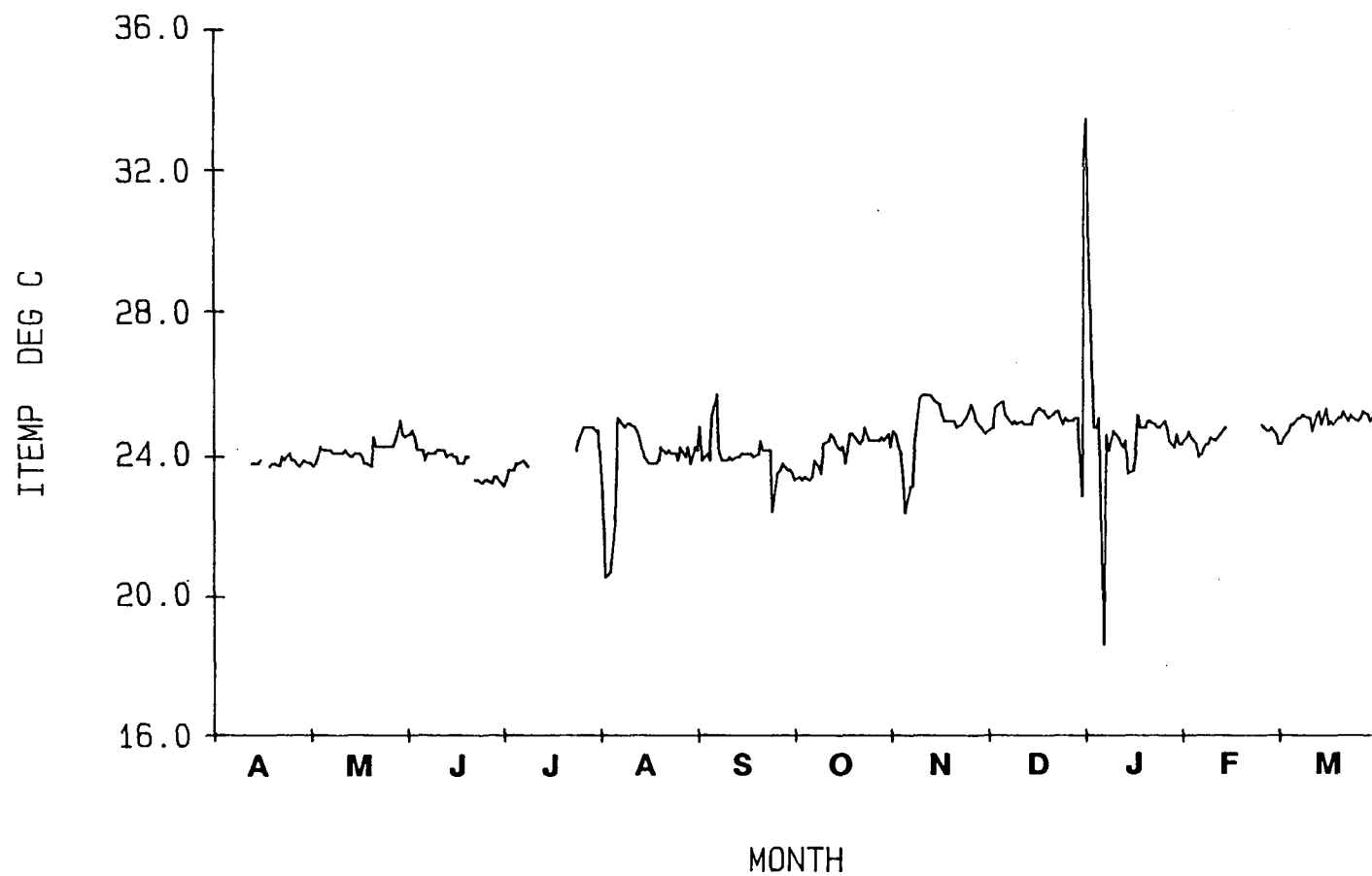
BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

**HOURLY AVERAGES FOR SHELTER TEMPERATURE
(DEGREES CELSIUS)**

11.11-121

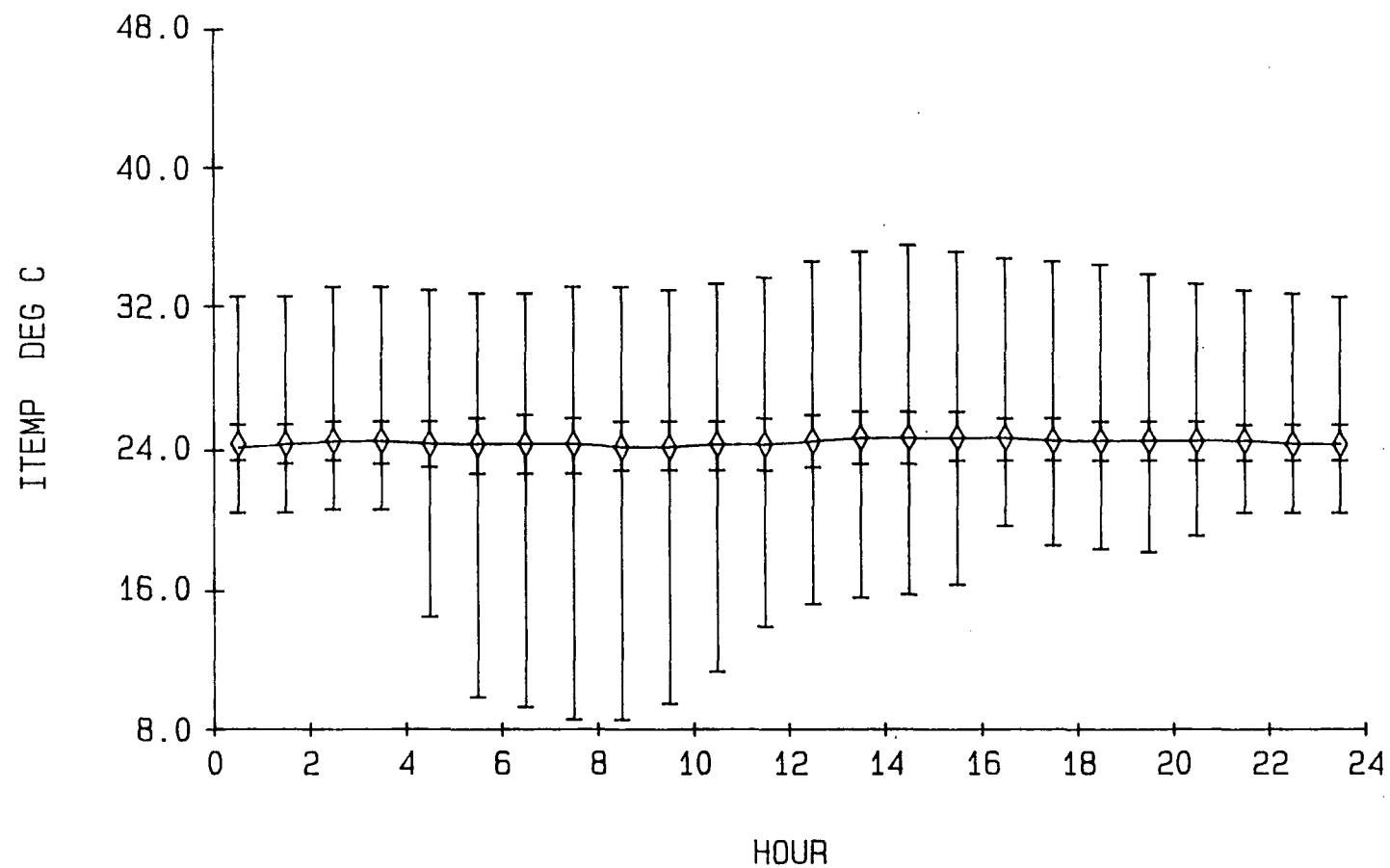
TIME PLOT FOR 04/01/91 00:00:00 TO 03/31/92 00:00:00



Tampa Electric Station AQ-1

Averaging Time: 24 Hour

DIURNAL PLOT 04/01/91 TO 03/31/92



Tampa Electric Station AQ-1

Averaging Time: 3600 sec

11.11-122

11.11-123

		APRIL, 1991																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1		23.6	23.7	23.4	23.1	22.5	22.4	22.3	23.1	23.1	22.9	22.9	23.1	23.1	23.2	23.4	23.3	23.3	23.3	23.3	23.0	23.1	23.2	23.4	23.7	23.1
2		23.7	23.4	23.0	22.6	22.1	21.7	21.4	22.0	23.0	22.9	23.1	23.5	24.8	24.7	24.5	24.5	24.5	24.4	24.3	24.2	24.2	24.3	24.6	24.6	23.6
3		24.8	24.7	24.8	24.6	24.3	24.0	23.8	24.2	24.0	24.1	24.2	24.2	24.3	24.4	24.5	24.5	24.5	24.5	24.4	24.3	24.2	24.2	24.1	24.1	24.3
4		24.2	24.3	24.3	24.2	24.2	24.2	24.1	24.1	24.1	24.1	24.2	24.3	24.4	24.4	24.6	24.5	24.4	24.3	24.2	24.1	24.1	24.1	24.1	24.1	24.2
5		24.2	24.1	24.2	24.1	24.0	24.2	24.0	24.1	23.4	24.1	24.3	24.4	24.5	24.6	24.6	24.6	24.6	24.6	24.4	24.3	24.3	24.1	24.1	24.1	24.2
6		24.1	24.1	24.2	24.1	24.1	24.1	24.1	24.0	24.1	24.3	24.4	24.6	24.8	25.0	25.1	25.1	25.1	24.9	24.9	24.7	24.4	24.3	24.2	24.2	24.4
7		24.2	24.1	24.2	24.1	24.1	24.2	24.0	24.1	24.1	24.2	24.3	24.5	24.6	24.8	25.0	25.1	25.0	24.8	24.7	24.4	Qai	Qai	Qai	Qai	24.4
8		Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Qai	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
9		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
10		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
11		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
12		23.6	23.6	23.7	23.7	23.4	23.6	23.5	23.5	23.6	23.6	23.7	23.8	24.0	24.1	24.2	24.3	24.2	24.2	24.1	23.9	23.7	23.7	23.6	23.6	23.8
13		23.6	23.6	23.7	23.5	23.6	23.5	23.6	23.5	23.6	23.6	23.7	23.8	23.9	24.0	24.1	24.2	24.3	24.3	24.2	24.0	23.8	23.8	23.6	23.6	23.8
14		23.6	23.6	23.6	23.5	23.6	23.6	23.6	23.4	23.6	23.7	23.8	24.0	24.1	24.1	24.2	24.2	24.2	24.1	24.1	23.8	23.8	23.7	23.6	23.6	23.8
15		23.6	23.6	23.6	23.6	23.6	23.5	23.5	23.5	23.6	23.8	23.9	24.1	24.6	24.6	24.4	24.5	24.5	24.3	24.2	24.0	23.7	23.7	23.6	23.6	23.9
16		23.6	23.6	23.7	23.6	23.5	23.5	23.6	23.5	23.6	23.8	23.9	24.0	24.2	24.4	24.4	24.3	24.3	Miss	Miss	PwrF	PwrF	PwrF	PwrF	PwrF	Bad<
17		PwrF	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	PwrF	PwrF	23.9	24.2	24.0	24.0	PwrF	23.9	23.8	23.7	23.6	23.6	Bad<

MAX. 1HR AVG 26.1 04/29/91 13:00:00 2ND MAX. 1 HR AVG 25.1 04/07/91 15:00:00

KEY FOR MISSING CODES

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR INDOOR TEMPERATURE IN DEGREES CELSIUS

MAY, 1991																									
DAY	HOUR (EST)																							DAILY AVG	
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22		23
1	23.5	23.5	23.5	23.5	23.4	23.3	23.3	23.3	23.5	23.7	23.9	24.1	24.2	24.3	24.4	24.4	24.4	24.3	24.2	23.9	23.7	23.5	23.5	23.3	23.8
2	23.3	23.4	23.4	23.4	23.3	23.3	23.3	23.3	23.4	23.7	23.8	23.9	24.0	24.1	24.2	24.2	24.3	24.3	24.0	23.8	23.7	23.6	23.4	23.5	23.7
3	23.3	23.4	23.5	23.4	23.3	23.4	23.2	23.2	23.4	23.5	23.7	22.1	Qaf	23.9	24.5	24.7	24.7	24.8	24.5	24.4	24.1	24.2	24.0	23.9	23.8
4	23.9	23.9	23.9	23.9	23.8	23.9	23.8	23.8	24.0	24.0	24.2	24.4	24.5	24.7	24.8	24.8	24.9	24.8	24.7	24.4	24.2	24.1	23.9	24.0	24.2
5	23.9	23.8	23.9	23.8	23.9	23.8	23.9	23.8	23.9	23.9	24.1	24.3	24.4	24.5	24.7	24.8	24.7	24.7	24.5	24.4	24.2	24.1	24.0	24.0	24.1
6	24.0	23.9	23.9	23.9	23.9	23.9	23.8	23.9	24.0	24.1	24.2	24.3	24.4	25.0	25.4	24.8	24.6	24.5	24.5	24.2	24.2	24.0	23.9	23.8	23.8
7	23.9	23.8	23.8	23.9	23.9	23.7	23.8	23.7	24.0	24.1	24.2	24.3	24.4	25.0	25.4	24.8	24.6	24.5	24.2	24.2	24.0	24.0	24.0	23.9	24.1
8	23.9	23.8	24.0	23.9	23.9	23.8	23.8	23.9	23.9	24.0	24.0	24.1	24.1	24.3	24.3	24.3	24.4	24.3	24.2	24.1	24.1	24.0	23.9	23.9	24.0
9	23.8	23.8	24.0	23.9	23.9	23.7	23.8	23.8	24.0	24.0	24.1	24.2	24.2	24.4	24.5	24.5	24.4	24.5	24.4	24.3	24.1	24.1	24.0	24.0	24.1
10	23.9	23.9	24.1	24.0	23.9	23.9	23.8	23.9	23.9	24.0	24.1	24.2	24.5	24.4	24.5	24.5	24.5	24.4	24.3	24.2	24.0	24.1	23.9	23.8	24.1
11	23.9	23.8	23.9	23.8	23.9	23.8	23.7	23.8	24.0	24.0	24.2	24.2	24.4	24.4	24.5	24.4	24.5	24.4	24.2	24.1	24.0	24.0	23.8	23.9	24.0
12	23.8	23.9	23.9	23.8	23.9	23.8	23.8	23.7	23.9	24.0	24.1	24.4	24.4	24.7	24.7	24.8	24.8	24.5	24.4	24.2	24.0	24.1	23.9	23.9	24.1
13	23.8	23.8	23.9	23.8	23.8	23.9	23.7	23.7	23.9	24.1	24.2	24.2	24.2	24.1	24.1	24.2	24.1	24.1	24.0	24.0	23.9	23.8	23.8	23.9	23.9
14	23.7	23.8	23.9	23.8	23.8	23.8	23.6	23.7	23.9	24.0	24.2	24.1	24.2	24.2	24.3	24.4	24.3	24.3	24.3	24.3	24.1	24.0	23.9	23.8	24.0
15	23.7	23.8	23.9	23.8	23.7	23.7	23.7	23.7	23.9	24.1	24.2	24.3	24.2	24.5	24.7	24.7	24.6	24.7	24.5	24.3	24.1	24.0	23.9	23.9	24.1
16	23.9	23.8	23.9	23.8	23.8	23.7	23.7	23.7	23.9	24.1	24.3	24.4	24.6	24.7	24.8	24.5	24.3	24.1	23.9	23.9	23.9	23.8	23.7	23.8	24.0
17	23.8	23.7	23.9	23.9	23.7	23.8	23.7	23.7	23.9	24.0	24.2	23.8	24.0	24.5	24.5	24.6	24.5	24.4	24.1	23.8	23.8	23.7	23.6	23.6	23.9
18	23.6	23.7	23.6	23.7	23.6	23.6	23.5	23.5	23.6	23.7	23.9	24.0	24.1	24.3	24.4	24.4	24.1	24.0	23.8	23.8	23.6	23.7	23.6	23.7	23.8
19	23.5	23.6	23.7	23.6	23.6	23.6	23.6	23.6	23.6	23.7	23.8	23.8	24.0	24.1	24.2	24.0	24.1	23.9	23.9	23.7	23.6	23.6	23.6	23.6	23.7
20	23.6	23.6	23.8	23.6	23.6	23.6	23.6	23.6	23.5	23.6	23.6	23.7	23.9	23.9	23.8	23.8	23.7	23.8	23.7	23.6	23.7	23.7	23.7	23.7	23.7
21	23.6	23.6	23.7	23.7	23.7	23.7	23.8	24.4	24.6	25.0	25.6	26.2	25.3	25.3	Down	Down	25.2	25.6	25.2	25.0	25.0	24.4	24.4	24.2	24.6
22	24.3	24.2	24.4	24.2	24.3	24.1	24.2	24.1	24.1	24.1	24.1	24.3	24.3	24.4	24.3	24.4	24.3	24.3	24.4	24.4	24.3	24.3	24.3	24.3	24.2
23	24.3	24.2	24.4	24.2	24.2	24.3	24.2	24.3	24.2	24.2	24.4	24.4	24.4	24.5	24.5	24.4	24.3	24.3	24.3	24.4	24.2	24.2	24.3	24.2	24.3
24	24.2	24.2	24.3	24.2	24.2	24.2	24.2	24.2	24.3	24.2	24.2	24.3	24.4	24.5	24.5	24.6	24.4	24.3	24.3	24.3	24.4	24.3	24.2	24.3	24.3
25	24.1	24.2	24.3	24.3	24.1	24.2	24.2	24.1	24.1	24.2	24.1	24.2	24.3	24.4	24.5	24.6	24.5	24.5	24.4	24.4	24.3	24.3	24.2	24.2	24.3
26	24.2	24.2	24.2	24.3	24.1	24.2	24.2	24.2	24.1	24.3	24.4	24.5	24.5	24.6	24.4	24.4	24.4	24.2	24.2	24.3	24.3	24.2	24.2	24.2	24.3
27	24.2	24.2	24.3	24.3	24.3	24.1	24.2	24.1	24.1	24.2	24.2	24.3	24.4	24.5	24.7	24.6	24.4	24.3	24.3	24.2	24.3	24.1	24.2	24.2	24.3
28	24.1	24.1	24.3	24.3	24.2	24.1	24.1	24.1	24.1	24.2	24.2	24.9	24.7	25.0	25.2	25.1	25.1	25.0	24.8	24.6	24.5	24.2	24.2	24.2	24.4
29	24.2	24.2	24.3	24.1	24.1	24.4	25.0	25.3	25.1	25.3	25.4	25.6	25.5	25.4	25.5	25.6	25.5	25.5	25.3	25.1	24.9	24.6	24.5	24.5	24.9
30	24.4	24.4	24.6	24.4	24.3	24.5	24.3	24.3	24.5	24.8	25.2	25.1	25.2	25.3	25.4	25.4	25.0	24.6	24.4	24.3	24.3	24.4	24.2	24.3	24.6
31	24.2	24.3	24.5	24.3	24.3	24.3	24.2	24.2	24.4	24.6	24.9	25.0	25.0	24.9	24.9	25.1	24.9	24.9	24.9	24.6	24.5	24.4	24.2	24.3	24.5

TOTAL HOURS 744 TOTAL GOOD HOURS 741 DATA CAPTURE 99.6%

MAX. 1HR AVG 26.2 05/21/91 11:00:00 2ND MAX. 1 HR AVG 25.6 05/29/91 15:00:00

MIN. 1HR AVG 22.1 05/03/91 11:00:00 ARITHMETIC MEAN 24.1 STANDARD DEV. 0.4

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration
BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data
Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purge - Analyzer in Purge

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR INDOOR TEMPERATURE IN DEGREES CELSIUS

JUNE, 1991																									
HOUR (EST)																								DAILY	
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																									
1	24.2	24.3	24.4	24.3	24.2	24.2	24.2	24.1	24.3	24.4	24.7	24.9	25.1	25.0	25.0	25.3	25.3	25.2	25.0	24.8	24.6	24.5	24.4	24.3	24.6
2	24.3	24.3	24.4	24.3	24.3	24.2	24.2	24.3	24.5	24.7	24.8	25.0	25.0	25.1	25.1	25.1	25.3	25.3	25.1	24.9	24.8	24.5	24.5	24.4	24.7
3	24.4	24.3	24.5	24.4	24.3	24.2	24.3	24.3	24.5	24.6	24.8	24.9	25.0	25.4	25.4	25.3	25.1	24.9	24.7	24.3	24.1	24.0	23.9	23.8	24.5
4	23.7	23.8	23.9	23.9	23.7	23.8	23.7	23.8	23.9	24.1	24.3	24.6	24.6	24.6	24.5	24.6	24.5	24.6	24.4	24.3	24.1	24.0	24.0	24.0	24.1
5	23.8	23.9	24.0	24.0	23.9	23.8	23.7	23.8	23.9	24.1	24.2	24.4	24.3	24.5	24.5	24.8	24.6	24.6	24.4	24.2	24.1	24.1	24.0	23.9	24.1
6	23.9	23.8	23.9	23.9	23.7	23.7	23.7	23.8	23.8	24.0	24.1	24.2	24.2	24.2	24.1	24.1	24.0	24.0	23.9	23.8	23.8	23.7	23.7	23.7	23.9
7	23.7	23.8	23.7	23.6	23.7	23.6	23.7	23.6	23.8	24.0	24.1	24.2	24.4	24.5	24.6	24.7	24.8	24.6	24.4	24.1	24.1	23.9	23.9	23.8	24.0
8	23.8	23.8	23.9	23.8	23.8	23.7	23.7	23.8	23.9	24.0	24.0	24.8	24.6	24.5	24.5	24.6	24.5	24.4	24.3	24.2	24.1	23.8	23.9	23.7	24.1
9	23.8	23.8	23.8	23.8	23.7	23.7	23.7	23.8	24.0	24.2	24.1	24.3	24.4	24.5	24.6	24.5	24.4	24.3	24.2	24.1	24.0	23.9	23.8	23.8	24.0
10	23.7	23.7	23.9	23.9	23.8	23.7	23.7	23.9	24.1	24.3	24.4	24.4	24.5	24.6	24.6	24.8	24.7	24.7	24.4	24.3	24.1	24.0	23.8	23.8	24.1
11	23.8	23.7	23.9	23.8	23.8	23.9	23.6	23.7	23.9	24.1	24.2	24.6	24.6	24.7	24.7	24.9	24.8	24.8	24.5	24.4	24.2	24.0	24.0	23.9	24.2
12	23.9	23.8	24.0	23.8	23.7	23.6	23.6	23.8	24.5	24.9	24.4	24.5	24.4	24.6	24.6	24.8	24.7	24.7	24.5	24.2	23.9	23.8	23.7	23.7	24.1
13	23.5	23.6	23.7	23.6	23.5	23.5	23.5	23.6	23.8	24.0	24.2	24.2	24.4	24.4	24.6	24.8	24.7	24.7	24.4	24.1	23.9	23.8	23.8	23.7	24.0
14	23.7	23.6	23.9	23.7	23.6	23.6	23.5	23.6	23.8	24.0	24.2	24.3	24.4	24.6	24.5	24.9	24.7	24.6	24.3	24.1	24.0	23.9	23.7	23.7	24.0
15	23.7	23.6	23.9	23.7	23.6	23.5	23.5	23.7	23.9	24.1	24.2	24.4	24.4	24.7	24.3	24.1	24.2	24.3	24.3	24.1	24.0	23.8	23.8	23.7	24.0
16	23.7	23.6	24.0	23.6	23.6	23.6	23.6	23.6	23.7	24.1	24.2	24.4	24.5	24.7	24.7	24.5	24.3	24.2	24.2	24.0	23.8	23.9	23.7	23.7	24.0
17	23.5	23.6	23.8	23.7	23.6	23.5	23.5	23.5	23.7	24.0	24.1	24.0	24.2	24.2	24.2	23.9	24.0	PwrF	PwrF	23.8	23.7	23.6	23.6	23.5	23.8
18	23.5	23.5	23.8	23.6	23.5	23.5	23.5	23.6	23.9	24.0	24.2	24.1	24.1	24.2	24.1	24.0	23.8	23.9	23.8	23.8	23.7	23.7	23.6	23.6	23.8
19	23.6	23.6	23.8	23.7	23.6	23.6	23.4	23.6	23.8	23.9	24.2	24.2	24.4	24.4	24.4	24.8	24.3	24.1	24.0	24.0	23.9	23.7	23.7	23.7	23.9
20	23.6	23.6	23.8	23.7	23.6	23.6	23.5	23.6	23.8	24.0	24.2	24.3	24.4	24.5	24.5	24.5	24.3	24.2	23.9	23.8	PwrF	PwrF	PwrF	PwrF	24.0
21	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	24.6	24.2	24.4	23.6	24.7	24.3	24.1	23.9	23.6	23.4	23.3	23.1	23.1	23.1	Bad<
22	23.1	23.0	23.1	23.0	23.0	23.0	22.9	23.1	23.2	23.4	23.4	23.6	23.8	23.7	23.6	23.6	23.5	23.5	23.5	23.4	23.2	23.2	23.1	23.1	23.3
23	23.1	23.0	23.2	23.1	23.0	23.0	23.0	23.1	23.1	23.2	23.3	23.6	23.7	23.6	23.7	23.7	23.7	23.8	23.6	23.3	23.2	23.2	23.0	23.1	23.3
24	23.1	23.0	23.1	23.0	23.1	23.0	23.0	23.0	23.0	23.2	23.3	23.5	23.8	23.9	23.7	23.3	23.3	23.1	23.1	23.0	23.0	23.0	23.1	23.0	23.2
25	23.1	22.9	23.1	23.1	22.9	23.0	22.9	23.0	23.1	23.2	23.3	23.5	23.7	23.8	23.9	23.8	24.0	23.8	23.5	23.5	23.3	23.1	23.0	23.0	23.3
26	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.1	23.3	23.4	23.5	23.6	23.8	24.0	24.2	23.9	23.7	23.6	23.5	23.3	23.2	23.1	23.1	23.1	23.3
27	23.1	23.0	23.1	23.1	23.1	22.9	23.0	23.0	23.1	23.3	23.5	23.6	23.7	24.0	23.6	23.4	23.4	23.4	23.3	23.2	23.3	23.1	23.1	23.1	23.2
28	23.1	23.0	23.2	23.1	23.0	23.1	23.0	22.9	23.1	23.2	23.4	23.5	23.7	23.9	24.0	24.0	24.2	24.0	24.3	23.7	23.4	23.4	23.2	23.2	23.4
29	23.2	23.1	23.3	23.2	23.2	23.1	23.1	23.0	23.2	23.3	23.5	23.8	23.8	24.0	24.0	24.3	24.3	23.8	23.5	23.3	23.2	23.1	23.1	23.0	23.4
30	23.0	23.0	23.0	23.0	23.1	23.0	23.0	23.0	23.1	23.3	23.4	23.5	23.8	23.8	24.0	23.9	23.7	23.4	23.2	23.1	23.1	23.1	23.0	23.1	23.2

TOTAL HOURS 720 TOTAL GOOD HOURS 704 DATA CAPTURE 97.8%

MAX. 1HR AVG 25.4 06/03/91 14:00:00 2ND MAX. 1 HR AVG 25.4 06/03/91 13:00:00

MIN. 1HR AVG 22.9 06/25/91 01:00:00 ARITHMETIC MEAN 23.8 STANDARD DEV. 0.5

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

11.11-125

11.11-126

AUGUST, 1991

TOTAL HOURS 744		TOTAL GOOD HOURS 744		DATA CAPTURE 100.0%	
MAX. 1HR AVG 30.9		08/13/91 12:00:00		2ND MAX. 1 HR AVG 30.2 08/13/91 11:00:00	
MIN. 1HR AVG 18.1		08/13/91 19:00:00		ARITHMETIC MEAN 23.8 STANDARD DEV. 1.5	

10-21-91

11.11-127

HOURLY AVERAGES FOR SHELTER TEMPERATURE IN DEGREES CELSIUS

DAY	HOUR (EST)																							DAILY AVG	
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1	24.1	24.1	24.1	24.2	24.2	24.2	24.1	24.0	23.9	23.7	23.6	24.5	26.6	27.3	28.9	28.4	26.3	24.8	24.4	24.2	24.1	24.1	24.1	24.1	24.8
2	24.2	24.1	24.2	24.2	24.1	24.2	24.1	23.9	23.5	23.3	23.3	23.6	23.7	23.8	24.0	24.0	24.0	24.0	23.9	24.0	24.1	24.1	24.1	24.1	23.9
3	24.1	24.1	24.2	24.2	24.1	24.1	24.1	23.9	23.7	23.6	23.6	23.5	23.9	24.0	24.3	24.3	24.3	24.3	24.0	24.1	24.0	24.0	24.1	24.1	24.0
4	24.1	24.1	24.2	24.1	24.1	24.1	24.0	23.9	23.7	23.7	23.6	23.7	23.8	24.1	24.1	24.0	24.0	23.8	23.8	23.8	23.9	23.9	23.9	24.0	23.9
5	24.1	24.0	24.1	24.0	24.1	24.0	24.1	23.8	23.5	23.2	23.1	23.5	26.0	27.9	28.6	30.1	30.4	29.7	27.2	24.2	24.1	24.1	24.1	24.1	25.2
6	24.1	24.1	24.2	24.1	24.1	24.1	24.0	23.9	23.5	23.1	25.5	27.4	29.8	31.9	32.7	32.8	31.4	25.6	24.8	24.5	24.3	24.2	24.1	23.9	25.9
7	23.9	23.9	23.9	23.9	23.9	23.8	23.8	23.7	23.9	23.9	24.0	24.2	24.2	24.4	24.6	24.7	24.6	24.7	24.3	24.0	24.1	23.9	23.9	23.8	24.1
8	23.8	23.9	23.9	23.9	23.9	23.8	23.8	23.8	23.8	23.9	23.9	23.9	24.0	24.0	24.2	24.4	24.2	24.0	23.9	23.9	23.7	23.8	23.8	23.8	23.9
9	23.7	23.7	23.9	23.8	23.8	23.7	23.7	23.7	23.8	23.9	23.8	23.9	23.9	24.2	24.3	24.3	24.2	24.1	24.0	23.9	23.8	23.8	23.8	23.8	23.9
10	23.8	23.7	23.9	23.8	23.8	23.8	23.7	23.7	23.7	23.9	24.0	24.0	24.2	24.4	24.4	24.4	24.2	24.2	24.1	23.9	23.8	23.8	23.8	23.8	23.9
11	23.7	23.7	23.8	23.8	23.7	23.7	23.8	23.6	23.6	23.7	23.8	23.9	24.1	24.3	24.4	24.4	24.4	24.3	24.2	24.1	24.1	23.9	23.8	23.7	23.9
12	23.8	23.7	23.8	23.7	23.8	23.6	23.7	23.5	23.6	23.6	23.8	24.7	24.4	24.4	24.4	24.5	24.4	24.3	24.2	24.0	24.0	23.8	23.9	23.8	24.0
13	23.8	23.8	23.9	23.9	23.9	23.8	23.8	23.6	23.6	23.5	23.7	23.9	24.2	24.3	25.3	24.7	24.4	24.3	24.3	24.1	24.0	23.9	23.9	23.9	24.0
14	23.9	23.8	23.9	23.9	23.8	24.0	23.8	23.6	23.7	23.8	23.9	24.0	24.2	24.3	24.4	24.6	24.5	24.4	24.4	24.3	24.1	23.9	24.0	23.9	24.0
15	24.0	23.9	24.0	24.0	23.9	23.9	23.9	23.9	23.8	23.8	23.8	23.9	24.1	24.2	24.4	24.5	24.6	24.6	24.4	24.3	24.2	24.1	24.0	24.1	24.0
16	23.9	23.9	24.1	24.0	23.9	23.9	23.9	23.8	23.8	23.8	24.0	24.1	24.2	24.3	2										

KEY FOR MISSING CODES

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

10-21-91

11.11-128

OCTOBER, 1991

DAY	HOUR (EST)																							DAILY AVG	
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22		23
1	23.5	23.3	23.5	23.4	23.4	23.4	23.3	23.3	23.3	23.0	23.2	23.3	23.2	23.5	23.5	23.3	23.3	23.3	23.4	23.4	23.4	23.4	23.5	23.3	23.3
2	23.5	23.3	23.5	23.6	23.4	23.4	23.4	23.3	23.3	23.2	23.0	23.2	23.5	23.3	23.5	23.6	23.6	23.5	23.5	23.4	23.4	23.4	23.4	23.3	23.4
3	23.3	23.4	23.4	23.5	23.3	23.5	23.3	23.2	22.9	22.9	23.0	23.2	23.2	23.3	23.3	23.4	23.4	23.3	23.5	23.4	23.4	23.4	23.4	23.4	23.3
4	23.5	23.5	23.5	23.6	23.4	23.6	23.4	23.2	23.3	23.4	23.1	23.1	23.2	23.3	23.4	23.4	23.4	23.4	23.5	23.3	23.4	23.4	23.4	23.5	23.4
5	23.5	23.3	23.5	23.4	23.4	23.4	23.4	23.3	23.1	23.0	23.0	23.1	23.1	23.4	23.7	23.5	23.4	23.6	23.5	23.4	23.4	23.4	23.5	23.4	23.3
6	23.4	23.4	23.6	23.5	23.4	23.4	23.4	23.5	23.1	22.9	22.9	23.1	23.4	23.5	23.5	23.4	23.3	23.4	23.3	23.4	23.4	23.4	23.6	23.6	23.7
7	23.5	23.8	23.6	24.0	24.1	24.1	24.6	24.1	23.7	23.7	23.3	23.3	23.8	24.1	23.9	23.8	23.8	23.8	23.7	23.8	23.8	23.9	23.9	23.9	23.8
8	24.2	23.9	24.0	23.9	23.9	24.0	24.2	23.6	23.5	23.4	23.4	23.3	23.4	23.6	23.5	23.7	23.8	23.6	23.7	23.5	23.6	23.6	23.8	23.5	23.7
9	23.8	23.7	23.6	23.8	23.5	23.7	23.7	23.5	23.3	23.4	23.3	23.4	23.4	23.4	23.5	23.5	23.5	23.6	23.5	23.4	23.5	23.6	23.6	23.5	23.5
10	23.6	23.6	23.6	23.7	23.7	23.8	23.6	23.5	23.5	23.5	23.2	23.3	24.3	24.8	25.0	25.1	25.2	25.1	25.2	25.4	25.4	25.5	25.1	25.4	24.3
11	24.9	24.6	24.5	24.6	24.3	24.2	24.3	24.4	24.0	24.1	24.0	24.2	24.4	24.5	24.7	24.7	24.5	24.6	24.3	24.3	24.4	24.3	24.7	24.9	24.4
12	24.9	25.2	25.0	24.9	25.1	25.1	25.0	24.4	24.0	23.9	23.9	24.0	24.2	24.4	24.5	24.5	24.6	24.5	24.3	24.5	24.6	24.7	25.1	25.4	24.6
13	24.9	25.1	25.1	25.4	25.3	25.2	25.2	24.4	23.8	23.7	23.8	24.1	24.3	24.5	24.7	24.7	24.7	24.7	24.5	24.2	24.2	24.2	24.2	24.1	24.5
14	24.2	24.2	24.3	24.2	24.3	24.4	24.3	24.3	23.9	23.9	23.8	24.0	24.0	24.2	24.4	24.5	24.6	24.5	24.4	24.2	24.1	24.2	24.0	24.1	24.2
15	24.1	24.1	24.3	24.2	24.1	24.1	24.1	24.1	23.9	24.0	24.1	24.1	24.4	24.3	24.4	24.3	24.3	24.3	24.2	24.1	24.2	24.2	24.1	24.3	24.2
16	24.0	24.2	24.3	24.5	24.4	24.4	24.6	24.4	24.0	23.7	23.6	23.7	23.9	24.1	24.2	24.3	24.3	24.4	24.9	25.4	25.1	24.7	24.2	23.8	24.3
17	23.4	23.1	23.4	23.1	22.4	21.8	21.2	21.5	23.1	23.9	24.0	24.0	24.2	24.3	24.5	24.7	24.5	24.6	24.8	25.2	25.5	25.3	24.8	25.1	23.8
18	25.1	25.0	25.0	25.0	24.6	24.5	25.0	24.6	24.2	24.1	24.2	24.3	24.4	24.6	24.6	24.8	24.7	24.7	24.5	24.5	24.5	24.5	24.6	24.6	24.6
19	24.9	24.9	24.7	25.0	25.2	25.0	25.2	24.5	24.2	24.0	24.1	24.4	24.5	24.7	24.8	24.9	25.0	24.8	24.7	24.5	24.4	24.5	24.4	24.5	24.6
20	24.4	24.5	24.6	24.6	24.6	24.7	24.7	24.3	24.1	24.1	24.0	24.3	24.4	24.7	24.9	24.9	24.8	24.7	24.6	24.4	24.4	24.4	24.3	24.5	24.5
21	24.3	24.4	24.5	24.4	24.4	24.4	24.3	24.3	24.1	24.1	24.2	24.4	24.4	24.6	24.5	24.5	24.5	24.6	24.4	24.4	24.4	24.4	24.3	24.3	24.4
22	24.4	24.3	24.5	24.5	24.3	24.4	24.4	24.2	24.3	24.3	24.2	24.3	24.4	24.7	24.8	24.9	24.7	24.8	24.5	24.4	24.7	24.5	24.4	24.3	24.4
23	24.4	24.4	24.4	24.4	24.3	24.3	24.2	24.4	24.7	25.1	25.2	24.9	25.2	25.8	25.8	25.0	25.3	25.7	Bad<	24.9	24.8	24.7	24.4	24.6	24.8
24	24.4	24.5	24.6	24.5	24.5	24.5	24.3	24.4	24.3	24.1	24.3	24.1	24.3	24.4	24.4	24.6	24.6	24.6	24.6	24.6	24.5	24.4	24.6	24.4	24.4
25	24.5	24.5	24.5	24.5	24.4	24.5	24.4	24.4	24.3	24.3	24.3	24.1	24.2	24.4	24.6	24.6	24.6	24.6	24.6	24.4	24.5	24.3	24.5	24.5	24.4
26	24.4	24.5	24.6	24.5	24.5	24.5	24.5	24.2	24.2	24.0	24.2	24.1	24.2	24.4	24.6	24.9	24.9	24.8	24.7	24.5	24.5	24.5	24.5	24.5	24.4
27	24.3	24.4	24.7	24.5	24.4	24.4	24.4	24.4	24.1	24.1	24.2	24.2	24.3	24.5	24.7	24.7	24.9	24.7	24.6	24.6	24.4	24.6	24.4	24.4	24.4
28	24.4	24.5	24.7	24.6	24.5	24.7	24.8	24.3	24.0	24.0	24.1	PwrF	PwrF	25.0	24.8	24.7	24.7	24.7	24.5	24.4	24.4	24.3	24.4	24.4	24.5
29	24.5	24.4	24.7	24.6	24.6	24.7	24.6	24.4	24.0	24.1	24.2	24.5	24.5	24.7	24.5	24.5	24.5	24.4	24.5	24.3	24.4	24.5	24.5	24.4	24.4
30	24.4	24.4	24.7	24.6	24.5	24.5	24.6	24.4	24.1	23.8	24.0	24.3	25.0	25.2	25.0	25.2	25.2	25.3	25.2	24.7	24.6	24.5	24.6	24.9	24.6
31	PwrF	PwrF	PwrF	PwrF	PwrF	20.1	21.5	22.8	24.3	24.0	24.1	24.3	24.9	25.1	25.1	25.0	25.1	25.0	25.1	25.0	25.1	25.3	25.2	25.3	24.3

TOTAL HOURS 744 TOTAL GOOD HOURS 736 DATA CAPTURE 98.9%

MAX. 1HR AVG 25.8 10/23/91 14:00:00 2ND MAX. 1 HR AVG 25.8 10/23/91 13:00:00

MIN. 1HR AVG 20.1 10/31/91 05:00:00 ARITHMETIC MEAN 24.1 STANDARD DEV. 0.6

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

02/17/92

HOURLY AVERAGES FOR SHELTER TEMPERATURE IN DEGREES CELSIUS

		JANUARY 1994																							DAILY AVG	
		HOUR (EST)																								
		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
DAY																										
1		24.9	24.9	24.9	25.3	24.9	25.2	24.9	24.7	24.4	24.2	24.1	24.4	24.6	24.7	24.7	24.8	24.8	24.7	24.7	24.6	24.6	24.8	24.7	24.7	24.7
2		24.9	24.7	24.9	24.8	24.9	24.7	24.7	24.7	24.4	24.4	24.4	24.7	24.6	24.7	24.7	24.6	24.6	24.6	24.7	24.6	24.6	24.6	24.6	24.6	24.6
3		24.5	24.7	24.9	24.7	24.7	24.7	24.7	24.7	24.5	24.5	24.4	24.8	24.5	24.3	23.9	23.3	23.2	23.0	23.1	23.4	23.3	23.6	23.6	23.6	24.1
4		23.6	24.1	23.3	23.7	24.0	24.1	23.8	23.5	23.3	23.4	23.7	23.6	23.4	23.3	23.3	23.4	23.6	24.0	23.9	23.5	23.1	22.7	22.4	22.2	23.4
5		21.9	21.6	21.6	21.3	21.1	20.9	20.7	20.5	20.4	20.6	21.5	22.7	23.4	23.8	23.5	23.3	23.6	23.7	24.1	24.0	23.9	23.7	23.6	23.5	22.4
6		23.3	23.2	23.4	23.3	23.2	23.1	23.1	23.3	23.8	23.4	22.7	22.8	22.8	22.9	23.0	23.1	23.1	23.2	23.0	22.9	23.0	23.2	23.3	23.2	23.1
7		23.5	23.4	23.3	23.3	23.5	23.3	23.4	23.4	23.3	23.0	22.7	22.5	22.9	22.8	23.1	23.0	23.1	23.2	23.0	22.9	22.9	23.1	23.1	23.5	23.1
8		23.7	23.8	24.2	23.7	24.0	24.0	23.7	23.6	23.8	22.8	22.7	22.5	24.2	25.0	25.4	25.4	25.4	25.1	25.8	25.6	25.5	25.5	25.6	25.5	24.4
9		25.4	25.4	25.7	25.6	25.6	25.5	25.6	25.5	25.7	25.7	25.5	25.4	25.4	25.6	25.8	25.8	25.8	25.6	25.6	25.8	25.8	25.9	25.9	25.7	25.6
10		25.9	25.8	26.1	26.0	26.0	25.9	25.9	25.8	25.6	25.3	25.3	25.5	25.6	25.7	25.8	25.7	25.7	25.7	25.9	25.9	26.0	25.9	25.9	26.0	25.8
11		25.9	26.0	26.1	26.1	26.0	26.1	26.0	25.8	25.3	25.1	25.2	25.1	25.4	25.5	25.8	25.9	25.9	25.8	25.8	25.7	25.8	25.9	25.8	26.0	25.7
12		26.0	26.1	26.2	26.0	25.9	25.9	25.9	25.7	25.3	25.1	25.2	25.4	25.6	25.7	25.9	26.1	26.0	26.0	25.8	25.8	25.8	25.8	25.8	25.7	25.7
13		25.8	25.7	25.8	25.9	25.8	26.0	25.9	25.7	25.2	25.1	25.1	25.4	25.5	25.7	25.9	26.0	26.0	25.9	25.9	25.6	25.6	25.6	25.6	25.6	25.6
14		25.7	25.6	25.8	25.6	25.7	25.6	25.6	25.6	25.2	25.1	25.2	25.3	25.5	25.7	25.9	26.1	25.9	25.9	25.7	25.6	25.6	25.4	25.5	25.5	25.6
15		25.5	25.6	25.8	25.6	25.5	25.6	25.6	25.4	25.2	25.2	25.3	25.2	25.4	25.6	25.7	25.8	26.0	25.7	25.4	25.3	25.2	25.3	25.3	25.2	25.5
16		25.2	25.3	25.3	25.4	25.2	25.2	25.2	25.1	25.0	24.9															

KEY FOR MISSING CODES

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

02/17/92

11.11-130

11.11-131

DECEMBER, 1991

TOTAL HOURS 744		TOTAL GOOD HOURS 744		DATA CAPTURE 100.0%	
MAX. 1HR AVG 34.7		12/31/91 15:00:00		2ND MAX. 1 HR AVG 34.7 12/31/91 16:00:00	
MIN. 1HR AVG 15.2		12/30/91 12:00:00		ARITHMETIC MEAN 25.3 STANDARD DEV. 1.7	

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration
BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data
Qed - Data questionable insufficient documentation, Qei - Data questionable external influence, Purg - Analyzer in Purge

02/17/92

TEC AQ - 1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR SHELTER TEMPERATURE IN DEGREES CELSIUS

JANUARY 1992																									
DAY	HOUR (EST)																							DAILY AVG	
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22		23
1	32.5	32.5	32.8	33.0	32.9	32.9	32.9	32.9	32.8	33.0	33.5	33.9	34.8	35.3	35.6	35.3	34.9	34.8	34.6	34.0	33.3	33.0	32.7	32.6	33.6
2	32.6	32.7	33.2	33.2	33.0	32.9	32.8	33.3	33.3	33.1	33.2	33.7	34.0	32.1	29.6	25.6	25.5	25.3	25.1	25.1	25.1	25.1	25.1	24.9	30.0
3	24.9	24.9	24.9	25.0	25.0	24.9	24.9	24.9	24.7	24.5	24.5	24.4	24.5	24.4	24.8	24.6	24.7	24.8	24.8	25.1	25.1	25.3	25.2	25.1	24.8
4	24.9	25.2	24.8	25.0	24.7	25.0	24.9	25.1	24.7	24.5	24.6	24.7	24.6	24.4	24.8	24.7	24.7	24.9	25.0	25.0	25.1	25.0	25.0	25.2	24.8
5	25.2	25.3	25.3	25.4	25.4	25.4	25.4	25.3	25.1	24.9	24.9	24.7	24.7	24.7	24.9	25.0	25.0	25.0	24.9	24.9	25.1	25.1	25.2	25.1	25.1
6	25.2	25.1	25.0	24.1	15.1	11.1	9.2	8.4	8.5	9.4	11.3	14.0	18.3	24.9	25.0	25.1	25.3	25.2	25.2	25.1	25.2	25.4	25.4	25.4	20.1
7	25.5	25.6	25.7	25.8	25.7	25.7	25.7	25.9	24.1	24.1	24.4	24.1	24.0	24.2	24.2	24.2	24.2	24.2	24.1	24.2	24.2	24.1	24.1	24.1	24.6
8	24.2	24.1	23.9	24.2	24.2	24.3	24.2	24.2	24.3	24.2	24.0	24.1	24.0	24.1	24.2	24.0	24.1	24.1	24.1	24.3	24.1	24.1	24.2	24.5	24.1
9	24.9	24.8	24.7	24.7	24.9	24.8	24.8	24.6	25.0	25.1	25.2	24.8	24.9	24.7	24.7	24.7	24.6	24.8	24.6	24.2	24.7	24.7	24.6	24.5	24.7
10	24.4	24.6	24.5	24.7	24.6	24.6	24.5	24.7	24.5	24.6	24.9	24.6	25.0	24.8	24.6	24.6	25.6	25.0	24.2	24.3	24.3	24.3	24.4	24.3	24.6
11	24.4	24.6	24.5	24.6	24.6	24.6	24.7	24.6	24.6	24.7	24.7	24.6	24.5	24.4	24.4	24.5	24.4	24.4	24.5	24.5	24.6	24.6	24.6	24.6	24.5
12	24.6	24.6	24.5	24.6	24.6	24.6	24.6	24.7	24.4	24.4	24.0	23.7	24.1	23.9	24.2	24.2	24.0	23.9	24.1	24.0	24.2	24.1	24.1	24.1	24.2
13	24.1	24.3	24.1	24.2	24.2	24.2	24.4	24.2	24.2	24.0	23.9	24.3	25.2	25.6	25.8	25.9	25.6	25.1	24.0	24.0	24.0	24.0	24.1	23.9	24.4
14	24.0	23.9	23.8	23.8	23.7	24.0	23.9	24.0	24.0	24.0	24.2	23.5	22.8	23.1	23.0	23.2	23.1	23.2	23.3	23.2	23.3	23.5	23.4	23.5	23.5
15	23.4	23.5	23.5	23.5	23.6	23.6	23.7	23.6	23.7	23.7	23.6	23.6	23.6	23.5	23.6	23.5	23.6	23.7	23.7	23.6	23.7	23.7	23.7	23.7	23.6
16	23.7	23.7	23.7	23.7	23.7	23.7	23.8	23.8	23.8	23.8	23.8	23.8	23.8	23.8	23.6	23.7	23.6	24.2	24.2	23.9	25.2	25.1	25.1	25.0	25.1
17	25.1	25.2	25.3	25.2	25.3	25.2	25.2	25.2	25.2	25.3	25.3	25.1	25.3	25.2	25.0	24.9	25.1	25.1	25.0	25.1	25.1	25.1	25.1	25.1	25.1
18	25.1	25.2	25.2	25.1	25.1	25.0	25.1	25.1	25.1	25.0	24.9	24.6	24.5	24.6	24.3	24.5	24.6	24.6	24.7	24.8	24.9	24.8	24.9	24.9	24.8
19	24.8	25.0	25.0	25.0	24.9	24.9	24.9	24.7	24.8	24.6	24.8	24.6	24.5	24.3	24.5	24.5	24.6	24.8	24.8	25.1	25.0	25.1	25.1	25.0	24.8
20	25.0	25.0	25.2	25.2	25.1	25.1	25.1	25.2	25.2	25.1	25.1	25.1	25.0	24.9	24.9	24.8	24.9	25.0	25.0	25.0	25.0	25.0	25.2	25.1	25.0
21	25.1	25.1	25.3	25.1	25.2	25.2	25.2	25.3	25.1	25.2	25.1	24.9	24.9	24.7	24.7	24.7	24.7	24.8	24.9	25.0	25.1	25.0	25.2	25.2	25.0
22	25.2	25.2	25.2	25.1	25.2	25.3	25.0	25.1	25.2	25.1	25.3	25.1	25.2	25.1	25.2	24.7	24.2	24.5	24.5	24.5	24.6	24.5	24.5	24.5	24.9
23	24.5	24.5	25.0	24.8	24.9	24.9	24.8	24.9	24.5	24.4	25.1	25.1	25.1	25.2	24.8	25.2	24.5	24.9	25.0	25.1	25.0	24.4	24.6	24.5	24.8
24	24.6	24.6	24.7	24.6	24.7	24.8	24.7	24.8	24.9	25.0	25.0	25.0	24.9	25.0	24.8	24.6	24.7	24.6	24.8	24.9	24.9	25.0	25.0	25.1	24.8
25	24.9	25.0	25.2	25.1	25.0	25.0	25.1	25.2	25.2	25.1	25.1	25.1	25.1	25.2	25.0	25.0	24.5	24.6	24.8	24.8	24.8	24.8	25.0	25.0	25.0
26	24.9	24.9	25.1	25.1	25.0	25.0	25.0	25.0	25.0	25.0	24.8	24.7	24.6	24.5	24.5	24.4	24.5	24.5	24.7	24.7	24.9	24.8	24.9	24.7	24.8
27	24.9	24.8	24.9	24.8	24.8	24.8	24.8	24.8	24.8	24.5	24.4	24.0	24.2	24.1	23.9	23.9	24.1	24.1	24.2	24.4	24.3	24.2	24.3	24.4	24.4
28	24.3	24.4	24.5	24.4	24.3	24.4	24.3	24.4	24.4	24.4	24.0	24.2	24.0	24.2	24.2	24.6	24.7	24.0	24.2	24.3	24.1	24.2	24.3	24.3	24.3
29	24.3	24.3	24.0	24.2	24.3	24.2	24.3	24.3	24.2	24.3	24.1	23.9	24.5	25.6	26.6	26.9	26.6	25.7	24.5	23.8	24.1	24.2	24.2	24.2	24.6
30	24.2	24.1	24.1	24.1	24.2	24.2	24.3	24.3	24.2	24.3	24.1	24.1	24.4	25.2	25.6	25.7	25.2	24.3	24.0	24.0	24.0	24.1	24.1	24.2	24.3
31	24.3	24.3	24.2	24.4	24.4	24.4	24.5	24.4	24.3	24.2	24.3	24.3	24.2	24.2	24.1	24.0	24.1	24.2	24.4	24.5	24.7	24.8	24.8	24.8	24.3

TOTAL HOURS 744 TOTAL GOOD HOURS 744 DATA CAPTURE 100.0%

MAX. 1HR AVG 35.6 01/01/92 14:00:00 2ND MAX. 1 HR AVG 35.3 01/01/92 15:00:00

MIN. 1HR AVG 8.4 01/06/92 07:00:00 ARITHMETIC MEAN 24.9 STANDARD DEV. 2.5

KEY FOR MISSING CODES

Bad< - To few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, Pwrf - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

TEC AQ - 1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR SHELTER TEMPERATURE IN DEGREES CELSIUS

		FEBRUARY 1992																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1		24.8	24.8	24.7	24.7	24.8	24.8	24.7	24.7	24.6	24.3	24.2	24.2	24.1	24.0	23.9	24.0	24.1	24.3	24.4	24.6	24.7	24.8	24.9	24.8	24.5
2		24.9	24.9	25.0	25.1	25.0	25.1	25.1	25.1	25.1	24.9	24.7	24.5	24.4	24.3	24.2	24.1	24.2	24.4	24.4	24.5	24.6	24.7	24.8	24.8	24.7
3		24.8	24.8	24.8	24.9	24.9	24.9	24.9	25.0	24.8	24.6	24.4	24.3	24.1	24.2	24.4	24.5	24.1	24.1	24.3	24.5	24.6	24.7	24.6	24.6	24.5
4		24.7	24.7	24.5	24.6	24.8	24.8	24.9	24.9	24.5	24.2	24.2	24.0	24.0	24.0	24.2	24.1	23.8	24.0	24.2	24.2	24.1	24.2	24.1	24.1	24.2
5		24.0	24.0	24.0	24.1	24.0	24.1	24.2	24.1	24.0	24.2	24.0	23.9	24.0	23.8	23.9	24.4	24.2	23.7	24.0	24.0	24.0	23.9	24.0	23.9	24.0
6		24.0	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.0	24.0	23.9	23.9	24.1	24.0	24.0	24.1	24.0	24.1	24.2	24.2	24.1	24.2	24.3	24.3	24.1
7		24.3	24.4	24.6	24.6	24.4	24.5	24.7	24.7	24.6	24.5	24.4	24.2	24.2	24.1	24.2	24.1	24.2	24.2	24.2	24.3	24.3	24.4	24.4	24.4	24.3
8		24.4	24.4	24.3	24.4	24.4	24.5	24.5	24.5	24.4	24.3	24.3	24.1	24.1	24.2	24.1	24.1	24.2	24.3	24.4	24.4	24.6	24.6	24.6	24.5	24.3
9		24.5	24.6	24.4	24.5	24.5	24.5	24.6	24.5	24.5	24.7	24.6	24.6	24.6	24.4	24.4	24.5	24.5	24.5	24.6	24.5	24.5	24.6	24.6	24.6	24.5
10		24.6	24.6	24.5	24.5	24.5	24.6	24.6	24.6	24.6	24.5	24.5	24.3	24.3	24.3	24.3	24.2	24.3	24.4	24.3	24.3	24.5	24.5	24.5	24.5	24.4
11		24.5	24.5	24.5	24.5	24.6	24.6	24.5	24.6	24.7	24.6	24.6	24.6	24.4	24.3	24.0	24.4	24.4	24.3	24.5	24.5	24.6	24.5	24.6	24.6	24.5
12		24.7	24.7	24.4	24.6	24.7	24.5	24.7	24.7	24.8	24.7	24.7	24.7	24.6	24.5	24.5	24.6	24.4	24.4	24.5	24.5	24.7	24.6	24.7	24.6	24.6
13		24.7	24.6	24.4	24.6	24.5	24.5	24.6	24.7	24.6	24.6	24.4	24.3	25.4	25.6	24.9	25.0	25.3	25.0	24.9	24.9	24.8	24.9	24.8	24.9	24.8
14		24.9	24.8	24.9	24.8	24.9	24.9	24.8	24.7	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Bad<
15		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
16		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
17		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
18		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
19		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
20		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
21		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
22		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
23		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
24		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
25		25.0	24.8	24.7	25.0	25.0	25.1	25.0	25.1	PwrF	24.9	24.8	24.8	24.7	24.7	24.9	24.9	24.9	24.9	24.9	24.9	24.8	25.0	25.0	24.9	24.9
26		24.9	24.9	24.8	24.8	24.8	24.7	24.7	24.9	24.8	24.8	24.5	24.5	PwrF	PwrF	24.5	24.7	24.7	24.6	24.4	24.5	24.6	24.7	24.7	24.6	24.7
27		24.6	24.5	24.6	24.6	24.6	24.7	24.7	24.6	24.7	24.7	24.6	24.6	24.7	24.8	24.8	24.7	24.6	24.8	24.8	24.8	24.8	24.9	24.8	24.8	24.7
28		24.8	24.8	24.8	24.7	24.8	24.9	25.0	24.8	24.8	24.7	24.7	24.7	24.8	24.9	24.9	25.0	24.9	24.7	24.7	24.8	24.8	24.8	24.8	24.7	24.8
29		24.8	24.9	24.7	24.7	24.7	24.8	24.8	24.6	24.5	24.6	24.7	24.8	24.8	24.7	24.7	24.7	24.7	24.8	24.7	24.5	24.4	24.5	24.6	24.5	24.6

TOTAL HOURS 696 TOTAL GOOD HOURS 437 DATA CAPTURE 62.8%

MAX. 1HR AVG 25.6 02/13/92 13:00:00 2ND MAX. 1 HR AVG 25.4 02/13/92 12:00:00

MIN. 1HR AVG 23.7 02/05/92 17:00:00 ARITHMETIC MEAN 24.5 STANDARD DEV. 0.3

KEY FOR MISSING CODES

Bad< - To few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration
 BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data
 Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

TEC AQ - 1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR SHELTER TEMPERATURE IN DEGREES CELSIUS

DAY	MARCH 1992																								DAILY AVG
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1	24.5	24.5	24.4	24.4	24.4	24.5	24.4	24.5	24.6	24.4	24.0	23.4	24.1	24.4	24.5	25.1	25.2	24.2	24.0	24.0	24.0	24.1	24.0	24.2	24.3
2	24.1	24.0	24.1	24.2	24.1	24.2	24.2	24.1	24.2	24.2	24.1	24.2	24.4	24.5	24.5	24.6	24.5	24.5	24.4	24.8	24.7	24.8	24.6	24.6	24.3
3	24.6	24.5	24.5	24.5	24.4	24.4	24.4	24.4	24.7	24.6	24.3	24.2	24.5	24.6	24.5	24.5	24.6	24.6	24.7	24.8	24.8	24.8	24.7	24.8	24.5
4	24.7	24.6	24.7	24.6	24.5	24.6	24.6	24.7	24.7	24.8	24.7	24.5	24.6	24.4	24.4	24.9	24.8	24.9	25.0	24.9	24.9	24.9	25.0	24.8	24.7
5	24.8	24.9	24.8	24.9	24.9	24.7	24.8	24.8	25.0	25.0	24.9	24.9	25.0	25.0	25.0	24.9	24.9	24.9	24.8	24.7	24.8	24.6	24.9	25.1	24.8
6	24.9	24.9	24.7	25.1	25.1	25.1	25.0	25.2	24.9	24.7	24.8	24.9	24.9	24.9	24.9	25.0	25.0	24.9	25.0	25.0	24.9	24.9	24.8	24.7	24.9
7	25.0	24.9	25.0	24.9	25.0	25.1	25.1	25.2	25.2	25.1	25.0	25.0	25.0	25.1	25.0	25.2	25.1	25.1	25.1	25.0	25.1	25.2	25.1	25.2	25.0
8	25.1	25.1	25.0	25.1	25.1	25.2	25.2	25.3	25.1	25.0	25.0	25.0	25.0	25.1	25.1	25.1	25.1	25.1	25.0	25.0	25.2	25.5	25.1	25.6	25.1
9	25.5	25.4	25.4	25.5	25.3	25.6	25.5	25.8	25.5	25.1	24.9	24.9	24.9	25.0	24.9	24.9	24.9	25.0	24.8	25.0	25.1	25.2	25.2	25.4	25.2
10	25.4	25.4	25.1	25.3	25.5	25.3	25.4	25.4	25.0	24.9	25.0	24.8	24.9	24.9	24.9	24.9	24.9	24.9	24.8	24.9	24.8	25.1	25.2	25.4	25.1
11	25.4	25.5	25.2	25.1	25.2	25.2	24.8	25.3	25.5	25.3	25.5	25.2	25.2	25.2	25.2	25.2	25.2	25.3	25.4	25.4	25.2	24.8	24.2	23.9	25.1
12	23.6	23.2	23.5	23.4	23.4	23.7	24.0	24.2	24.7	25.3	25.5	25.6	25.5	25.3	25.1	25.4	25.4	25.2	25.2	25.4	25.5	25.4	25.6	25.6	24.8
13	25.6	25.6	25.2	25.5	25.3	25.6	25.6	25.3	25.2	25.0	24.8	24.9	24.9	24.9	25.0	24.9	25.0	24.8	25.1	25.3	24.9	25.3	25.3	25.4	25.2
14	25.3	25.3	25.1	25.3	25.4	25.2	25.2	25.5	25.5	25.4	25.3	25.2	25.3	25.3	25.1	25.1	25.1	25.1	25.0	25.3	25.7	25.7	25.4	24.9	25.3
15	24.5	24.3	24.6	24.7	24.3	24.0	23.8	24.0	25.5	25.1	25.0	24.9	25.0	25.0	25.0	25.1	25.0	25.0	25.2	25.1	25.6	25.3	25.4	25.6	24.9
16	25.4	25.4	25.5	25.3	25.2	25.4	25.4	25.6	25.3	25.4	25.5	25.3	25.2	25.2	25.1	25.2	25.2	25.1	25.3	25.3	25.5	25.5	25.5	25.3	25.3
17	25.0	24.7	25.0	24.9	24.6	24.5	24.5	24.9	25.4	25.0	24.7	24.7	24.9	25.0	25.0	25.0	25.1	25.0	24.9	25.1	25.1	25.2	25.3	25.3	24.9
18	25.2	25.5	25.1	25.4	25.3	25.4	25.4	25.3	25.2	24.7	24.9	24.8	24.9	24.8	24.8	24.8	24.9	24.8	24.8	24.7	25.0	25.0	25.0	25.0	25.0
19	25.0	25.2	24.8	25.0	25.1	24.6	24.0	24.9	24.7	24.8	25.0	25.0	25.1	24.9	25.0	25.0	25.0	25.0	24.9	24.8	24.7	24.9	24.8	24.9	24.9
20	25.1	25.0	24.7	25.0	24.9	25.1	25.1	25.2	24.9	24.9	24.8	24.7	24.9	24.9	25.0	25.0	25.1	24.8	25.3	25.3	25.4	25.3	25.3	25.4	25.0
21	25.5	25.6	25.2	25.3	24.8	24.3	23.8	23.9	25.2	25.3	25.3	25.1	25.2	25.1	25.1	25.0	25.0	25.1	25.2	25.3	25.4	25.5	25.6	25.5	25.1
22	25.6	25.6	25.4	25.3	25.6	25.5	25.5	25.2	25.6	25.3	25.1	25.1	24.9	25.0	25.1	25.2	25.2	25.1	25.2	25.5	25.3	25.2	25.3	25.3	25.3
23	25.2	25.1	25.1	25.0	25.0	25.4	25.2	25.2	25.0	24.8	24.8	24.8	24.8	24.9	25.0	24.8	24.9	24.9	24.9	25.0	25.3	25.1	25.1	25.2	25.0
24	25.4	25.3	25.1	25.3	25.4	25.5	25.6	25.6	25.3	25.2	25.1	25.0	25.0	25.0	24.9	24.9	24.9	25.0	25.1	25.1	25.3	25.2	25.4	25.5	25.2
25	25.3	25.6	25.0	25.6	25.2	25.4	25.2	25.3	25.4	25.0	24.9	24.8	24.8	24.8	24.8	24.8	24.8	24.6	24.9	25.0	25.1	25.1	25.1	25.1	25.0
26	25.1	24.9	24.5	25.0	25.1	25.1	25.0	25.0	25.2	25.0	24.9	24.8	24.9	24.9	24.9	25.0	24.8	24.9	24.9	25.0	25.1	25.4	25.7	25.6	25.0
27	25.4	25.2	25.3	25.3	25.0	24.9	24.8	25.2	25.4	25.0	24.9	24.9	24.9	25.0	25.0	25.1	25.0	24.9	25.0	25.2	25.4	25.4	25.4	25.2	25.1
28	25.3	25.4	25.3	25.5	25.3	25.4	25.5	25.6	25.6	25.4	25.2	25.0	25.0	24.9	25.0	25.0	25.0	25.0	25.0	25.3	25.3	25.6	25.5	25.5	25.3
29	25.4	25.8	25.6	25.5	25.6	25.7	25.0	25.6	25.5	25.0	24.9	24.9	24.9	24.9	24.8	24.8	24.9	24.9	25.0	25.1	25.2	25.2	25.4	25.4	25.2
30	25.2	25.4	25.1	25.2	25.3	25.1	25.0	25.2	24.9	24.7	24.8	24.8	24.8	24.9	24.9	24.8	24.8	24.7	24.8	25.1	25.2	25.0	24.9	25.0	25.0
31	25.1	25.0	24.9	25.1	25.0	25.1	25.1	24.7	24.7	24.8	24.8	25.0	24.9	24.9	25.0	25.1	Cal	25.0	25.1	25.3	25.8	25.8	25.8	25.7	25.1

TOTAL HOURS 744 TOTAL GOOD HOURS 743 DATA CAPTURE 99.9%

MAX. 1HR AVG 25.8 03/31/92 22:00:00 2ND MAX. 1 HR AVG 25.8 03/29/92 01:00:00

MIN. 1HR AVG 23.2 03/12/92 01:00:00 ARITHMETIC MEAN 25.0 STANDARD DEV. 0.4

KEY FOR MISSING CODES

Bad< - To few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

HOURLY AVERAGES FOR SIGMA THETA (DEGREES)

11.11-136

		APRIL, 1991																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
2	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
3	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
4	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
5	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
6	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
7	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
8	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
9	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
10	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
11	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
12	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	11.7	11.9	13.2	17.0	14.4	11.5	11.6	10.8	9.4	8.1	7.6	7.3	7.3	7.3	Bad<
13	8.1	8.2	7.6	7.9	7.9	8.3	8.4	9.0	11.0	11.4	12.0	13.9	15.9	17.9	13.6	12.5	13.0	11.1	8.9	8.7	9.0	8.8	7.8	8.8	10.4	
14	8.9	8.2	7.6	8.3	8.6	9.2	7.8	9.9	11.0	12.0	16.8	16.5	16.0	11.7	10.3	12.4	9.5	10.1	9.5	9.8	9.4	8.9	8.8	10.0	10.5	
15	8.6	8.9	9.4	9.3	9.8	9.7	16.3	12.5	15.5	17.4	20.8	25.3	27.4	24.2	41.7	41.9	30.3	27.0	12.1	10.1	9.0	29.2	34.0	35.8	20.3	
16	50.1	38.4	9.5	8.7	11.5	22.6	19.1	16.9	15.9	14.6	19.6	24.5	35.8	26.7	24.5	31.2	19.2	Miss	Miss	PwrF	PwrF	PwrF	PwrF	PwrF	Bad<	
17	PwrF	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	PwrF	24.0	14.3	19.7	23.8	PwrF	30.5	34.8	18.3	11.2	10.6	Bad<	
18	8.6	23.0	45.0	42.0	11.0	11.0	8.0	15.0	18.2	19.0	24.1	18.8	15.3	16.0	17.7	15.8	12.4	10.9	9.2	9.5	22.5	15.9	18.2	24.5	18.0	
19	17.5	11.5	9.4	29.6	23.2	27.9	30.9	28.5	30.1	64.1	23.0	PwrF	53.3	42.1	29.2	11.0	10.6	9.8	8.6	7.7	9.0	16.5	7.7	10.8	22.3	
20	11.4	10.1	16.3	17.9	10.0	31.2	44.4	42.2	19.3	18.8	27.5	66.5	48.5	35.9	31.3	31.8	26.3	14.9	8.8							

ARITHMETIC MEAN 18.0 STANDARD DEV. 10.5

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration
BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data
Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR SIGMA THETA IN DEGREES

MAY, 1991																									
DAY	HOUR (EST)																							DAILY AVG	
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22		23
1	52.0	19.8	22.3	46.5	16.4	44.1	12.6	14.3	16.4	21.6	33.0	24.8	31.8	41.6	23.4	31.2	22.9	18.8	11.6	28.7	30.8	48.2	54.5	19.8	28.6
2	29.6	51.2	23.4	19.8	32.5	14.7	15.5	15.0	28.0	50.7	27.9	17.9	20.3	23.6	21.8	23.0	20.1	14.2	16.1	13.3	14.3	8.3	8.1	7.9	21.6
3	8.2	8.6	7.8	8.7	7.1	9.9	9.9	8.8	14.1	16.1	16.0	17.5	19.6	24.5	23.0	28.7	22.1	14.9	7.6	7.7	8.2	8.1	9.3	10.6	13.2
4	9.5	9.5	9.5	8.2	10.4	8.9	9.4	11.6	12.5	18.3	23.4	40.4	32.0	35.9	43.9	33.7	41.5	26.7	44.5	6.8	9.5	13.7	56.4	12.4	22.0
5	10.5	11.6	12.2	13.5	12.0	10.9	11.2	13.2	13.3	13.5	25.2	30.2	42.1	27.0	25.4	23.2	24.8	15.8	12.7	8.3	21.4	12.6	11.7	14.9	17.4
6	9.8	10.4	18.8	20.4	19.3	15.3	15.4	14.7	13.5	13.9	14.8	16.4	20.1	31.8	52.9	34.6	12.0	24.0	22.6	17.7	12.0	11.7	11.1	11.4	18.5
7	20.4	12.5	12.5	7.2	9.3	10.9	8.1	11.5	16.4	16.3	18.1	21.2	21.3	20.1	21.6	22.0	13.2	13.2	8.6	8.1	7.9	7.7	8.3	8.9	13.5
8	7.2	7.9	7.5	8.4	8.1	8.1	7.8	8.7	11.0	11.5	12.4	13.2	13.9	12.2	12.6	12.1	11.2	9.9	8.1	8.2	7.8	8.3	8.6	9.0	9.7
9	9.3	8.2	7.7	8.7	7.7	7.9	7.7	10.0	12.7	13.2	13.9	18.6	15.5	16.9	16.0	17.1	15.5	13.6	15.9	8.6	8.1	11.0	10.6	9.4	11.8
10	7.9	9.2	10.6	10.0	11.9	7.8	10.5	12.4	12.6	13.9	19.8	21.5	45.2	20.1	18.0	14.4	12.5	10.6	8.4	9.3	8.3	7.3	7.7	7.6	13.2
11	7.5	7.6	9.2	7.9	7.8	11.6	9.3	13.3	13.9	15.4	19.6	26.3	19.0	16.4	19.7	16.4	17.6	11.7	8.9	7.5	7.5	8.2	8.6	8.9	12.5
12	7.0	7.5	6.5	7.0	5.6	5.1	12.1	10.9	13.3	16.0	29.2	35.9	48.5	48.7	33.9	42.1	35.5	18.1	8.2	16.9	17.0	14.1	8.1	8.7	19.0
13	10.3	8.7	10.8	13.7	9.9	9.0	12.8	14.2	14.3	20.5	29.1	48.9	13.9	24.3	17.6	17.2	29.7	19.7	36.3	10.6	12.1	9.9	15.8	10.5	17.5
14	12.5	11.5	11.0	9.7	11.5	14.7	11.5	17.4	26.7	21.2	33.1	19.4	18.7	22.4	19.9	20.5	28.0	23.1	10.8	8.4	16.6	17.1	22.0	37.4	18.5
15	31.9	8.3	24.9	48.4	31.2	19.1	25.4	17.1	20.1	19.6	25.6	20.3	30.7	28.1	24.0	19.1	13.2	13.6	9.7	8.4	7.8	14.4	17.0	18.6	20.7
16	27.0	48.7	59.3	21.9	13.8	34.2	37.7	21.8	20.4	45.1	37.9	58.8	24.9	47.9	46.6	16.3	18.0	12.7	27.4	39.3	27.5	24.9	55.1	53.2	34.2
17	59.8	50.7	20.7	36.1	8.8	7.3	8.3	10.9	13.6	18.3	22.0	27.8	43.0	34.0	27.3	25.8	20.1	19.2	32.5	50.0	51.0	22.1	28.7	22.5	27.5
18	23.0	39.4	12.4	32.2	6.6	11.9	14.1	14.3	19.3	22.0	23.5	27.3	26.0	36.4	41.6	30.9	33.7	12.2	10.8	9.5	8.4	16.8	8.9	10.0	20.5
19	10.8	11.7	8.7	11.9	9.4	8.2	10.3	10.5	12.0	14.1	16.3	18.0	18.1	23.7	17.1	12.6	11.0	10.9	11.4	12.8	11.7	23.7	8.7	7.9	13.0
20	8.1	10.6	9.4	8.8	8.2	8.3	9.2	9.0	12.1	11.4	10.9	14.7	12.8	11.2	13.1	10.3	9.9	8.9	8.6	9.5	10.5	8.1	9.7	7.9	10.1
21	7.8	8.3	9.4	9.3	7.6	7.8	7.8	8.1	7.5	8.4	8.9	Down	Down	Down	8.6	8.3	7.5	8.1	8.6	7.9	8.3	8.3	7.8	7.3	8.2
22	7.1	7.6	7.2	6.8	7.3	7.9	8.3	8.2	8.1	8.7	10.8	9.3	7.9	6.8	8.1	8.1	7.9	7.5	7.6	7.1	7.3	7.2	6.7	7.3	7.8
23	7.7	9.2	10.9	8.9	8.3	13.9	11.0	10.1	12.7	12.8	13.7	15.9	18.5	15.5	10.6	9.2	10.0	11.6	9.3	11.0	7.9	9.0	8.2	7.9	11.0
24	8.1	8.7	8.7	10.1	11.4	10.5	14.1	9.0	13.8	18.2	14.2	15.0	18.6	35.2	16.8	12.7	36.6	18.6	19.1	24.1	8.2	7.6	7.9	7.8	14.8
25	7.9	8.9	7.5	7.6	8.9	9.3	8.4	9.3	10.0	10.8	11.1	11.5	13.1	11.9	13.1	13.2	11.4	10.6	7.9	7.8	16.4	21.5	14.4	9.0	10.9
26	8.4	8.9	11.1	10.8	12.1	11.1	13.0	13.5	15.7	19.3	19.4	16.5	27.4	22.3	17.6	23.2	16.3	8.7	8.7	10.9	11.4	8.7	8.9	8.8	13.9
27	8.2	10.1	11.1	9.9	9.5	10.5	11.4	11.2	12.8	15.3	12.8	12.7	18.7	27.3	31.3	34.2	33.5	47.8	39.9	20.2	12.4	12.0	7.9	7.8	17.9
28	8.9	9.2	8.4	10.0	9.5	7.7	9.4	11.2	12.4	12.7	15.2	17.1	11.6	19.7	18.0	14.1	16.0	13.5	9.4	8.7	29.2	9.4	9.0	9.7	12.5
29	9.5	10.4	32.0	58.4	35.8	29.1	14.7	27.6	23.6	33.1	42.9	48.8	44.4	43.8	28.1	24.3	18.2	19.2	29.0	24.7	32.3	36.4	17.2	25.7	29.6
30	17.6	16.9	23.2	37.4	19.7	37.8	15.8	18.5	28.6	50.7	69.9	49.8	49.5	59.8	43.0	18.1	16.4	34.1	52.1	49.0	19.3	22.9	31.4	72.5	35.6
31	52.3	27.9	32.4	44.8	72.4	18.0	47.4	38.6	66.6	30.9	36.6	51.7	25.4	24.9	52.9	23.2	29.1	22.7	16.1	21.6	14.8	27.9	62.6	21.3	35.9

TOTAL HOURS 744 TOTAL GOOD HOURS 741 DATA CAPTURE 99.6%

ARITHMETIC MEAN 18.1 STANDARD DEV. 12.3

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR SIGMA THETA IN DEGREES

		JUNE, 1991																							DAILY		
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG	
DAY																											
1		49.2	33.0	34.4	20.4	12.7	10.8	15.4	21.4	24.0	27.0	29.6	38.8	25.8	21.3	21.0	21.9	14.7	16.8	15.0	22.0	16.3	13.0	13.0	12.7	22.1	
2		17.6	19.2	19.1	10.4	11.9	18.1	12.0	14.2	14.2	11.4	16.1	15.3	16.9	15.5	14.8	35.8	16.0	11.5	9.8	8.7	9.2	7.3	10.1	7.1	14.3	
3		7.1	8.7	8.9	7.8	7.0	7.5	9.2	10.8	13.5	15.3	13.0	15.2	13.8	14.1	15.4	17.0	12.5	11.9	10.4	7.6	9.8	9.0	9.5	6.8	10.9	
4		7.1	9.4	8.6	11.0	10.6	13.7	16.4	12.0	14.2	15.9	PwrF	15.5	12.7	10.1	10.3	16.6	18.8	13.3	10.3	9.8	9.2	8.1	8.1	9.2	11.8	
5		14.7	8.7	12.0	29.5	63.2	14.6	15.0	12.4	9.5	13.7	11.1	11.1	13.8	19.1	15.9	13.5	12.7	15.8	22.6	19.1	14.1	20.2	45.4	21.4	18.7	
6		12.4	18.2	11.0	42.3	13.7	15.5	16.0	17.2	20.9	17.6	16.9	13.7	14.9	13.7	13.8	13.9	12.2	9.8	12.7	14.8	14.2	14.4	14.2	14.2	15.8	
7		13.3	14.8	13.5	13.5	13.1	15.0	13.8	16.1	15.3	16.0	24.5	38.2	41.2	26.0	35.6	23.5	19.6	14.4	13.5	13.5	12.8	14.1	13.8	14.8	18.7	
8		13.8	13.8	13.8	13.3	12.4	12.1	14.1	14.2	13.7	13.2	13.3	13.7	11.9	12.1	13.1	13.7	13.1	10.3	9.4	9.5	9.8	9.7	12.1	10.3	12.3	
9		10.5	12.6	13.2	12.8	13.6	13.9	12.6	10.5	12.5	13.1	12.7	14.3	14.1	17.5	14.2	10.1	13.1	11.1	9.8	10.0	10.3	10.8	10.6	10.8	12.3	
10		13.0	13.7	12.8	13.8	14.4	12.7	14.6	15.3	15.0	11.1	13.2	15.5	15.8	17.0	12.8	14.4	13.0	12.8	7.9	9.4	9.9	10.0	12.5	12.7	13.1	
11		12.2	14.3	11.5	14.6	16.1	10.4	13.3	13.2	12.4	12.8	13.0	13.8	17.6	17.1	19.4	16.4	14.4	12.8	9.8	9.2	7.3	7.7	8.6	7.1	12.7	
12		7.3	7.8	8.9	8.7	8.7	8.1	11.1	12.5	17.9	32.4	36.2	36.8	33.0	41.7	45.5	47.8	31.4	23.0	12.5	13.5	9.4	7.3	7.9	7.8	19.9	
13		10.3	8.7	9.3	10.9	9.5	7.6	9.9	15.9	28.6	27.5	23.0	26.4	34.8	28.6	30.8	26.3	25.8	18.7	14.1	13.5	12.7	9.5	10.0	9.0	17.6	
14		9.7	9.8	10.0	13.0	36.8	10.4	49.6	23.5	17.4	19.2	25.4	17.6	39.4	33.7	29.5	40.5	41.1	22.5	18.3	18.6	30.3	28.6	19.9	24.2	24.5	
15		20.8	29.5	10.9	13.6	11.1	14.4	18.0	15.2	17.6	36.2	39.7	32.9	28.2	22.5	23.0	28.2	20.1	27.5	25.8	26.4	20.2	16.1	13.7	24.7	22.3	
16		34.8	26.9	21.2	44.3	60.5	42.2	26.7	35.3	33.4	64.8	63.3	53.3	55.9	41.0	25.2	13.3	19.6	34.5	27.6	15.5	18.2	27.6	36.8	17.0	35.0	
17		13.8	15.0	11.1	32.5	24.2	35.7	29.8	20.8	26.2	63.2	23.7	39.3	30.4	17.6	39.3	19.8	35.0	PwrF	PwrF	48.9	45.9	25.7	12.0	18.7	28.6	
18		17.2	28.4	31.3	24.0	26.7	31.5	35.5	30.4	28.5	30.4	19.0	28.4	42.8	19.3	18.7	29.3	45.7	47.4	16.1	20.3	9.0	12.2	15.7	11.6	25.8	
19		14.1	15.7	15.8	15.7	16.4	38.6	28.5	17.0	31.1	26.3	32.0	39.9	26.0	22.4	27.3	16.0	17.9	25.2	36.9	10.9	11.7	16.9	18.1	20.1	22.5	
20		47.4	18.8	43.3	35.2	53.7	28.4	21.8	22.4	19.8	31.5	32.5	24.0	40.1	57.8	38.4	43.9	26.9	17.2	36.9	43.5	PwrF	PwrF	PwrF	PwrF	34.2	
21		PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	PwrF	38.3	30.9	54.4	47.4	35.7	20.2	35.8	15.8	25.6	12.7	17.2	15.7	21.9	37.9	Bad<
22		46.5	41.1	51.6	19.0	38.5	29.6	13.0	15.4	25.8	32.0	39.5	36.1	55.1	24.0	21.4	15.7	18.0	22.5	31.4	24.7	38.2	14.6	9.5	61.3	30.2	
23		49.2	43.5	23.4	20.2	31.9	30.1	26.2	16.1	31.4	36.1	43.5	47.9	35.0	20.9	23.7	14.2	20.1	13.2	43.4	18.3	16.8	18.5	14.4	38.5	28.2	
24		39.7	23.8	47.8	47.9	39.5	58.8	49.0	19.8	52.1	30.0	47.7	27.5	33.1	28.7	34.4	28.1	16.3	16.6	40.8	48.2	33.5	22.1	44.6	27.0	35.7	
25		48.1	27.6	56.6	40.4	63.1	16.9	46.0	13.3	15.4	21.4	23.2	38.9	45.9	41.9	47.3	58.3	42.9	19.7	19.4	41.1	48.4	63.1	56.7	44.0	39.2	
26		30.4	46.3	75.4	49.4	31.1	36.4	37.7	22.1	28.7	52.5	60.3	44.9	33.9	34.7	32.9	18.2	13.0	16.9	19.8	30.6	13.7	11.7	44.0	13.6	33.3	
27		14.3	10.1	12.4	11.6	12.0	19.0	12.2	14.2	21.0	38.0	50.9	69.8	63.2	13.7	23.5	13.2	11.1	15.3	46.2	32.8	39.4	21.2	20.3	40.0	26.1	
28		16.0	10.5	23.4	29.0	24.6	24.2	14.4	14.9	16.9	22.4	33.0	37.1	48.5	46.1	38.5	40.1	35.9	25.4	41.1	53.4	27.0	11.0	23.5	44.9	29.2	
29		29.7	13.1	34.8	44.0	28.6	25.4	59.4	17.7	22.6	33.4	56.9	58.1	53.1	51.6	61.3	60.9	26.8	21.3	24.9	19.6	33.3	14.8	51.2	23.7	36.1	
30		28.5	14.3	33.6	29.3	52.8	59.8	22.9	13.3	14.8	33.7	48.7	60.8	61.6	48.7	33.0	38.3	20.3	17.4	27.5	62.0	42.6	26.8	37.8	23.0	35.5	

TOTAL HOURS 720 TOTAL GOOD HOURS 703 DATA CAPTURE 97.6%

ARITHMETIC MEAN 23.7 STANDARD DEV. 13.9

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration
BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data
Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR SIGMA THETA IN DEGREES

		JULY, 1991																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1		15.4	13.8	11.6	13.2	15.0	15.9	18.0	20.7	26.0	20.7	19.1	13.8	17.6	15.7	16.3	18.0	10.5	11.0	9.7	13.1	12.8	11.4	12.4	13.5	15.2
2		11.7	13.5	13.3	12.8	14.9	13.8	33.4	24.7	22.3	12.5	34.8	22.4	27.5	31.7	14.7	10.9	10.9	10.6	8.9	9.7	9.3	11.4	13.9	20.5	17.1
3		10.8	16.1	10.3	9.0	11.9	13.8	16.0	15.9	18.5	20.7	15.9	18.6	24.0	24.0	20.2	16.3	50.4	29.7	22.3	43.3	28.4	31.1	13.7	8.6	20.4
4		11.4	12.5	10.9	10.8	19.0	15.3	14.7	15.9	19.6	16.3	21.2	15.8	19.1	13.5	13.2	28.7	19.6	21.4	42.2	48.2	33.0	20.1	11.6	17.5	19.6
5		32.5	10.5	11.0	9.9	16.8	18.3	19.0	13.8	20.4	18.3	32.9	33.6	53.7	47.3	13.8	21.0	22.4	27.9	34.6	19.9	52.1	35.0	12.1	11.9	24.5
6		10.4	11.7	11.4	21.5	24.8	49.0	15.2	23.8	27.8	47.6	36.8	51.5	52.3	50.9	60.6	23.1	14.3	27.6	17.9	22.1	23.8	16.0	18.6	47.0	29.4
7		46.5	52.0	60.5	29.6	41.6	38.6	47.8	33.1	21.0	24.0	50.3	42.4	57.6	41.1	69.5	48.1	60.9	24.0	23.0	23.8	27.8	36.3	51.1	56.7	42.0
8		36.3	45.6	16.0	19.4	56.7	47.0	60.5	26.9	25.8	39.4	48.4	66.6	51.6	70.4	65.3	33.0	34.2	16.9	23.4	11.9	12.1	14.4	45.4	58.8	38.6
9		47.7	62.9	41.0	42.2	19.7	24.9	42.1	14.4	35.5	39.3	21.5	18.5	55.9	48.5	45.7	39.4	15.5	13.8	10.1	11.2	12.0	11.5	18.3	29.2	30.0
10		24.6	20.5	21.8	16.3	17.7	15.5	16.8	14.7	14.3	15.9	14.6	14.6	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Bad<
11		19.8	14.9	15.5	26.4	12.8	37.4	29.5	14.3	12.0	16.5	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Bad<
12		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
13		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
14		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
15		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
16		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
17		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
18		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
19		26.9	19.9	10.5	10.3	9.4	8.9	13.8	11.4	14.6	16.3	41.1	32.4	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Bad<
20		23.1	12.1	8.9	6.7	11.2	11.4	12.4	18.5	18.3	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Bad<
21		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
22		15.8	29.3	10.6	27.8	22.3	28.2	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Bad<
23		Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	41.5	14.2	19.2	27.0	19.9	58.9	52.8	25.7	32.0	Bad<
24		21.4	19.1	41.6	41.6	42.9	31.2	22.3	15.2	35.2	51.8	35.1	59.7	44.1	43.9	22.6	43.0	22.0	24.0	40.2	15.4	12.8	37.3	30.2	29.8	32.6
25		27.4	15.0	14.1	12.7	17.4	31.1	27.8	15.5	28.6	23.5	25.6	31.7	58.7	35.7	19.9	18.2	18.0	25.6	16.6	25.3	30.4	25.6	13.7	22.3	24.2
26		40.0	21.9	20.1	21.0	18.8	25.2	20.5	12.7	17.1	28.7	29.7	32.6	30.4	23.1	25.1	28.9	35.9	17.6	19.6	55.5	26.8	14.2	12.5	17.2	24.8
27		13.1	13.9	18.3	25.8	20.1	25.8	18.0	16.5	25.9	63.3	49.9	57.1	48.4	44.9	34.4	47.7	27.3	22.7	13.9	12.1	17.6	16.4	12.5	13.8	27.5
28		66.5	32.0	72.8	15.3	22.7	13.5	13.5	16.0	17.6	17.6	22.9	20.1	20.8	26.7	25.8	27.1	14.6	15.2	37.8	32.5	48.7	40.4	12.0	13.6	26.9
29		13.3	23.1	12.4	10.1	14.8	19.1	18.3	13.7	16.5	15.5	16.9	18.7	22.1	19.0	19.3	34.7	38.9	41.3	29.1	22.7	39.1	10.9	9.4	14.6	20.6
30		10.8	17.5	17.0	10.3	12.5	10.6	13.6	14.4	13.7	15.3	18.8	19.6	15.8	23.7	13.3	14.1	16.4	20.4	11.6	14.6	11.7	11.2	10.8	11.5	14.5
31		11.2	12.7	12.8	22.0	15.0	12.4	11.0	12.1	13.2	13.1	13.6	19.0	13.0	14.8	14.8	13.3	16.9	14.7	16.3	13.5	12.0	15.9	11.4	12.4	14.0

TOTAL HOURS 744 TOTAL GOOD HOURS 466 DATA CAPTURE 62.6%

ARITHMETIC MEAN 24.2 STANDARD DEV. 13.8

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

10-29-91

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR SIGMA THETA IN DEGREES

AUGUST, 1991

DAILY																									
DAY																									
HOUR (EST)																									
00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 AVG																									
1	13.1	12.5	13.6	11.7	12.7	12.2	13.7	12.2	13.2	17.5	17.4	19.0	38.3	32.4	18.1	37.2	12.2	20.3	18.0	11.5	19.3	12.8	10.3	10.5	17.1
2	11.9	9.2	12.2	19.3	10.8	10.6	12.1	17.0	13.5	14.7	16.9	19.7	17.7	18.2	25.2	22.1	28.1	32.9	62.6	61.8	12.8	45.0	52.1	13.1	23.3
3	13.3	18.3	17.0	22.7	14.8	34.4	47.6	22.7	16.8	25.3	62.9	45.7	52.1	36.8	70.3	27.8	30.7	21.9	12.6	25.2	31.3	32.9	33.7	12.1	30.4
4	23.1	35.9	24.5	45.2	53.6	42.3	35.1	49.4	33.9	40.1	43.3	34.4	41.9	25.3	26.3	20.8	22.6	18.0	11.4	8.4	7.0	12.4	18.8	17.2	28.8
5	25.8	15.5	22.9	47.3	28.7	52.9	32.4	45.7	48.9	50.3	72.6	51.4	38.3	26.0	23.4	22.6	17.0	20.7	21.2	49.6	16.3	23.4	24.1	19.4	33.2
6	36.1	71.0	30.3	57.0	35.9	9.5	13.9	25.2	28.2	18.3	22.9	23.5	21.6	25.4	27.3	35.2	23.0	22.6	24.1	35.0	38.8	71.4	30.2	15.3	30.9
7	15.2	14.8	11.5	10.5	11.2	7.9	7.6	10.5	11.9	13.7	15.7	16.0	18.6	19.4	24.7	33.9	18.5	24.3	8.7	13.0	14.7	10.9	10.1	8.9	14.7
8	10.4	8.6	19.4	14.2	26.3	9.3	12.8	13.5	19.0	35.1	35.2	43.8	38.9	49.6	50.9	58.9	53.2	55.3	19.4	42.8	30.9	20.8	24.6	26.8	30.0
9	14.4	28.9	64.1	47.6	27.8	20.1	22.6	26.7	31.5	53.3	57.2	61.4	58.1	54.2	17.0	39.0	35.5	15.3	12.1	12.5	13.7	53.4	24.2	10.6	33.4
10	44.5	17.0	13.3	27.5	15.9	19.0	28.6	13.5	19.7	32.9	37.1	35.8	14.8	14.7	14.7	13.9	15.0	10.9	10.3	8.1	12.1	15.0	16.1	16.5	19.5
11	23.7	13.1	13.8	17.4	22.9	30.0	28.0	48.3	23.6	52.1	47.9	36.3	59.4	16.3	22.9	21.9	10.5	12.6	9.2	8.9	7.2	7.8	19.3	45.9	25.0
12	39.6	19.2	35.1	26.3	14.8	42.1	24.8	17.5	24.6	23.6	29.0	36.4	29.6	23.7	21.8	18.2	16.8	40.0	43.0	36.9	28.1	45.2	19.0	16.1	28.0
13	17.7	31.1	66.6	19.3	17.5	18.1	33.5	19.3	30.6	27.4	26.7	52.0	33.9	36.9	26.0	23.4	13.6	17.4	20.7	38.0	29.0	11.9	33.3	15.7	27.5
14	55.4	37.9	40.0	19.8	18.1	8.4	14.3	15.7	15.7	14.3	24.1	19.7	22.7	20.1	21.4	17.2	17.6	30.6	24.1	24.3	17.0	60.3	36.9	54.9	26.3
15	31.3	16.3	28.7	15.5	17.7	17.5	39.4	29.3	23.1	37.4	40.0	44.1	33.0	14.9	47.8	19.2	12.0	28.9	54.4	18.8	16.3	14.4	26.9	24.0	27.1
16	23.2	29.8	48.1	25.1	30.3	29.8	16.6	42.9	33.1	35.7	52.0	51.7	41.3	46.0	41.5	37.5	23.5	12.6	57.3	28.5	24.2	17.9	18.8	33.3	33.4
17	33.3	35.6	41.8	41.6	28.2	20.1	26.9	36.7	31.2	32.6	38.9	28.9	37.3	26.8	38.5	24.9	33.7	27.8	11.5	8.7	12.5	9.5	16.8	7.5	27.1
18	10.4	7.2	8.4	10.4	16.1	16.9	10.1	12.4	17.9	24.1	20.1	26.5	25.8	27.4	23.7	22.9	19.0	16.1	12.7	11.4	15.5	8.8	13.6	11.2	16.2
19	13.0	9.7	14.1	35.7	38.4	16.0	19.4	13.1	20.1	27.6	24.1	19.6	19.3	23.0	19.1	17.4	45.1	30.4	11.6	12.0	9.7	10.3	9.4	13.5	19.6
20	13.2	14.1	13.8	16.1	16.0	15.8	13.6	26.4	28.1	11.9	26.0	39.3	23.2	19.7	11.5	8.9	9.8	26.7	31.4	51.0	22.0	20.8	17.0	10.9	20.3
21	25.3	27.8	13.3	14.8	22.5	32.2	16.5	27.8	35.2	22.9	26.7	14.8	19.1	22.6	15.2	13.2	14.3	11.6	10.1	7.9	7.7	28.6	30.9	21.3	20.1
22	11.4	13.5	11.6	22.9	45.6	26.5	21.6	9.3	15.8	31.9	43.4	24.7	21.4	30.0	19.7	57.0	16.6	16.3	13.6	10.0	11.5	12.7	13.0	8.4	21.2
23	10.9	11.4	8.7	12.8	8.6	11.0	11.4	11.4	15.5	13.9	14.3	18.1	14.1	16.3	43.2	45.4	10.9	10.5	9.7	10.1	8.9	14.4	19.0	10.4	15.0
24	7.6	8.1	11.9	11.0	16.9	12.1	17.4	12.6	16.8	19.0	22.0	19.0	21.4	18.7	46.0	54.7	42.8	24.0	48.9	33.3	35.3	12.8	12.4	10.3	22.3
25	11.6	12.1	12.4	11.5	11.6	18.3	29.2	12.4	13.0	17.4	19.9	19.8	12.1	15.7	13.0	16.3	14.7	43.7	40.6	9.7	8.6	10.8	14.9	14.8	16.8
26	13.1	27.4	42.2	27.4	57.3	46.2	30.9	18.3	19.8	26.2	24.8	34.0	40.5	37.7	49.4	19.7	16.0	13.9	10.0	10.6	12.0	8.2	10.4	7.9	25.2
27	10.8	14.7	9.2	7.5	12.4	9.7	10.9	15.5	19.1	27.5	20.2	16.3	17.7	19.9	27.4	32.3	24.1	16.3	12.0	17.0	38.9	12.7	10.1	8.2	17.1
28	31.1	19.6	16.6	12.1	14.4	16.0	11.0	11.9	16.1	20.2	33.7	37.2	34.8	13.3	14.3	12.4	13.5	9.3	17.6	21.3	19.1	13.1	9.2	9.3	17.8
29	10.4	14.7	16.0	8.7	8.1	9.5	11.2	12.2	16.1	12.8	18.8	18.6	20.2	13.6	14.2	21.5	15.7	19.7	35.2	10.1	9.0	11.0	9.5	9.7	14.4
30	8.4	8.9	9.0	13.1	14.4	12.7	10.1	14.6	14.1	14.2	19.3	19.6	22.0	23.6	31.2	39.6	55.4	16.0	21.5	15.9	37.9	21.4	41.0	13.8	20.7
31	12.4	27.1	39.5	10.9	12.1	60.5	21.4	16.0	13.6	17.2	22.4	30.7	40.8	60.5	49.4	47.0	23.7	19.7	11.0	22.5	59.4	38.4	15.3	10.8	28.4

TOTAL HOURS 744 TOTAL GOOD HOURS 744 DATA CAPTURE 100.0%

ARITHMETIC MEAN 23.6 STANDARD DEV. 13.4

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

10-21-91

11.11-140

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR SIGMA THETA IN DEGREES

SEPTEMBER, 1991

DAY	HOUR (EST)																							DAILY AVG	
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22		23
1	11.9	9.4	14.4	21.8	17.6	23.0	17.1	23.0	28.2	54.2	52.1	38.4	37.3	35.7	34.7	44.8	14.1	15.4	20.3	39.7	26.4	9.3	21.3	39.0	27.0
2	14.8	19.6	58.2	11.0	28.9	35.2	22.4	17.0	15.4	20.5	19.2	18.3	19.1	21.2	22.3	19.8	16.1	14.8	10.5	14.2	13.5	18.3	13.2	10.5	19.7
3	14.8	18.1	21.2	12.5	17.4	14.6	19.8	15.5	16.9	17.4	17.4	15.5	15.4	16.5	19.4	13.7	14.6	14.2	14.3	13.0	14.7	14.6	15.4	19.8	16.1
4	14.1	15.5	12.7	13.6	13.6	13.5	16.5	14.4	16.0	14.3	15.4	14.7	16.5	13.1	16.0	15.9	11.9	11.4	9.7	9.8	10.3	9.4	10.3	14.2	13.4
5	12.4	14.2	16.1	15.3	22.5	10.8	23.6	17.0	17.0	21.8	22.7	28.6	45.2	51.7	53.9	35.3	38.5	47.4	31.3	12.2	38.3	21.8	35.9	16.4	27.1
6	36.3	40.8	27.9	25.9	28.2	29.0	13.5	36.8	15.9	25.6	40.0	44.6	36.6	33.6	31.8	30.8	23.5	24.0	24.8	16.4	21.6	55.4	50.1	33.0	31.1
7	20.9	15.2	21.0	15.9	20.5	20.7	14.2	13.2	14.7	19.2	17.0	21.3	20.1	25.2	23.2	19.2	23.6	21.8	12.5	27.9	26.2	14.8	14.8	22.7	19.4
8	43.9	19.8	15.8	13.9	18.6	16.5	15.4	14.7	12.1	15.0	14.8	13.8	12.0	14.8	13.5	12.7	11.5	25.9	15.8	11.4	12.4	12.8	12.2	13.2	15.9
9	19.7	11.7	12.1	14.8	11.9	14.8	14.1	13.9	9.7	10.6	11.5	14.1	11.9	13.6	14.4	14.6	12.5	10.8	8.7	11.9	10.8	12.0	13.5	14.2	12.8
10	14.7	14.4	12.2	14.4	14.4	15.4	15.2	16.6	16.5	14.7	21.0	21.6	33.3	24.8	36.8	13.5	25.1	14.7	10.0	11.2	11.7	11.6	10.8	14.7	17.1
11	7.8	8.9	11.1	10.1	10.4	13.7	8.3	10.5	13.0	17.6	22.6	27.5	35.3	40.7	36.4	22.9	17.9	17.0	24.2	14.1	56.5	32.4	9.2	8.4	19.9
12	11.6	8.1	12.1	8.1	6.8	11.4	10.4	13.8	24.9	54.8	54.3	38.4	36.7	50.1	49.2	30.0	25.7	15.4	22.9	22.5	38.8	10.3	10.0	11.4	24.1
13	11.1	9.4	23.4	69.8	15.9	19.8	20.1	31.5	42.2	45.2	37.9	33.5	44.3	31.7	27.6	19.0	18.1	9.8	9.0	6.6	7.9	8.8	10.0	10.9	23.5
14	10.9	12.5	7.7	12.1	23.5	22.4	18.0	16.4	23.4	41.9	46.0	30.2	30.7	29.7	27.5	19.8	18.2	11.9	30.6	15.9	11.9	8.7	9.3	9.7	20.4
15	9.2	12.4	16.8	10.5	11.0	12.0	7.2	10.0	21.6	27.1	33.0	21.2	22.3	26.0	25.3	19.3	17.0	11.9	8.6	7.7	8.6	7.8	9.2	9.3	15.2
16	8.9	17.7	13.0	12.4	12.4	13.5	13.1	15.3	13.1	19.6	23.4	17.5	21.2	18.5	20.9	16.6	13.7	13.8	9.5	8.8	8.2	12.6	11.4	18.7	14.7
17	52.6	27.1	20.1	20.8	8.1	18.7	16.9	16.3	16.3	20.2	20.3	26.2	27.9	37.7	28.5	18.3	11.1	9.0	9.9	10.4	9.7	9.9	9.5	9.0	18.9
18	9.8	9.2	12.1	12.8	7.7	7.3	9.0	13.1	14.7	20.8	27.5	34.7	29.8	15.3	11.5	12.6	19.2	42.4	45.9	63.2	29.1	13.8	8.4	8.1	19.9
19	10.8	8.8	17.1	36.8	13.3	10.9	11.1	10.3	12.2	21.6	23.5	52.3	35.7	46.5	54.8	42.1	41.5	14.8	11.7	14.4	17.0	24.8	24.6	26.0	24.3
20	29.0	24.5	19.9	12.8	15.4	16.1	45.7	59.2	40.6	47.3	48.9	37.1	48.3	40.4	55.3	47.9	31.7	19.1	22.9	26.2	22.7	23.7	51.7	11.7	33.3
21	14.3	13.0	17.0	8.1	15.2	13.9	16.0	14.8	15.9	15.0	17.1	17.7	27.4	29.5	24.1	25.1	16.5	13.2	9.5	9.9	14.6	31.9	45.4	15.0	18.3
22	12.5	16.3	26.7	29.5	15.3	20.2	17.2	23.1	20.4	19.3	18.2	19.0	19.1	19.3	17.2	14.7	13.9	14.4	14.1	15.3	14.1	13.8	14.7	14.4	17.6
23	11.7	14.7	15.2	15.8	13.0	15.9	15.0	14.4	14.1	16.4	17.1	21.0	19.4	23.1	18.8	15.4	19.0	13.8	15.2	14.4	10.4	18.7	18.6	11.1	15.9
24	15.2	23.6	16.4	14.2	18.5	12.2	14.4	14.7	13.9	16.5	22.5	27.0	27.5	31.2	44.5	42.8	24.5	14.1	24.7	17.7	39.5	25.2	37.8	43.8	24.3
25	58.7	51.4	12.5	14.7	14.1	13.1	15.7	14.3	14.6	15.5	16.4	20.3	58.8	30.8	24.5	25.9	11.6	8.8	12.1	13.1	9.9	18.6	18.5	28.6	21.8
26	28.2	43.5	21.3	33.6	24.5	30.3	24.7	41.9	18.3	20.9	32.2	24.6	24.9	18.7	19.2	15.8	16.0	10.1	25.6	31.4	26.4	18.0	13.8	25.7	24.6
27	23.8	21.8	21.2	23.0	19.8	18.1	17.2	16.8	19.7	26.2	34.0	53.4	52.5	59.5	28.5	28.5	24.8	14.2	12.4	13.9	16.1	15.7	15.7	22.9	25.0
28	24.3	13.9	13.6	16.0	17.6	16.5	14.3	14.2	16.3	14.1	14.9	14.6	15.4	16.6	14.7	14.6	14.1	13.9	14.6	14.2	13.7	15.8	13.6	13.0	15.2
29	13.7	12.5	13.9	13.9	27.1	18.0	18.0	14.9	15.8	13.5	14.1	18.2	24.6	24.6	25.6	38.8	14.4	14.9	13.0	14.8	13.9	15.0	13.9	13.3	17.5
30	13.9	14.1	15.0	14.7	14.2	12.6	13.0	14.1	15.3	14.3	12.8	13.7	15.7	15.3	13.5	13.7	11.0	12.5	13.1	12.4	14.3	14.3	14.2	13.9	13.8

TOTAL HOURS 720 TOTAL GOOD HOURS 720 DATA CAPTURE 100.0%

ARITHMETIC MEAN 20.3 STANDARD DEV. 11.0

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

10-21-91

11.11-141

HOURLY AVERAGES FOR SIGMA THETA IN DEGREES

		OCTOBER, 1991																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1		13.0	14.3	16.8	13.8	13.2	14.1	13.0	15.2	14.7	12.7	13.3	12.7	11.6	13.7	15.0	11.4	14.7	12.6	14.6	15.5	19.0	14.7	16.1	16.8	14.3
2		21.3	24.6	11.7	30.6	25.6	19.1	12.8	16.5	13.6	17.2	19.9	14.2	12.8	14.4	10.9	10.9	11.1	10.9	11.1	11.4	9.9	10.9	16.5	12.7	15.4
3		23.7	9.9	18.0	14.8	20.1	13.5	13.2	16.4	18.6	16.3	19.0	19.2	16.8	14.8	25.9	12.8	30.4	16.6	12.4	12.6	13.0	22.0	12.8	14.1	16.9
4		29.5	44.6	39.3	40.6	30.0	22.9	20.3	14.3	11.4	15.8	24.6	21.4	18.7	29.2	45.2	13.8	23.2	39.4	44.6	17.6	12.4	10.8	12.5	6.8	24.5
5		6.5	9.4	9.9	10.0	9.8	9.8	8.7	11.9	24.0	19.4	24.0	23.8	23.5	29.3	31.8	50.3	11.9	25.4	35.1	46.1	15.8	27.1	24.5	28.0	21.5
6		43.3	12.1	28.5	34.6	10.0	32.9	23.7	61.4	20.8	25.1	32.4	28.4	22.5	15.8	12.6	46.3	55.1	21.9	16.4	14.3	14.4	16.0	14.1	18.5	25.9
7		16.8	14.2	15.4	17.4	21.0	13.8	15.5	15.4	18.0	17.5	17.0	17.7	19.1	16.5	22.1	17.6	13.6	13.7	12.7	13.8	15.0	13.1	13.8	13.8	16.0
8		13.3	14.6	12.8	13.2	14.1	13.0	12.8	14.4	13.9	13.3	11.7	15.3	14.8	13.7	15.0	13.8	14.4	14.7	14.2	13.6	14.2	12.2	11.0	12.7	13.6
9		12.8	12.6	11.5	12.6	11.9	14.1	13.6	14.1	15.0	14.4	14.2	14.6	14.1	13.9	13.5	14.3	15.3	14.4	14.2	14.1	14.6	13.9	13.9	16.4	13.9
10		15.3	16.9	14.6	17.4	14.8	17.2	17.0	15.5	15.9	18.6	28.2	34.2	40.0	31.4	37.1	31.4	19.4	18.7	21.3	15.9	52.0	Down	Down	21.5	23.4
11		23.1	21.9	32.0	31.3	17.5	26.5	33.4	25.2	18.7	19.3	25.6	30.9	41.1	56.5	44.5	27.8	16.3	9.8	7.9	20.3	21.9	35.7	20.8	22.4	26.3
12		19.6	27.5	34.5	12.7	29.2	45.1	18.2	16.4	15.8	46.6	26.4	21.6	22.0	20.3	13.7	13.8	10.5	8.8	7.0	15.0	8.4	13.9	21.2	16.6	20.2
13		14.4	11.0	14.6	9.2	15.5	27.1	19.9	12.4	18.3	30.2	29.3	42.7	41.7	38.9	38.4	39.1	31.8	24.9	27.0	15.9	21.3	22.3	27.6	15.7	24.6
14		9.3	8.4	9.2	13.2	6.6	9.3	12.7	9.0	11.5	15.5	14.8	15.0	14.8	20.4	14.1	16.5	20.8	20.4	19.9	10.8	10.6	9.9	8.7	8.4	12.9
15		8.8	9.7	6.8	9.5	9.7	13.3	12.1	16.1	17.4	36.7	13.6	21.0	17.9	18.2	28.5	23.4	21.9	18.0	29.6	10.1	15.2	37.8	34.0	22.1	18.8
16		12.1	8.3	11.9	43.4	21.2	26.0	26.3	26.2	23.0	22.5	26.7	28.6	29.6	31.9	28.1</										

KEY FOR MISSING CODES

BadS - Bad Analyzer Status, Pwrf - Power Failure, Down - Operator downed channel, Miss - Missing Data

02/17/92

11.11-142

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR SIGMA THETA IN DEGREES

		NOVEMBER, 1991																							DAILY AVG
DAY	HOUR (EST)	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	9.0	8.6	18.7	8.3	13.3	9.5	11.5	19.3	14.6	13.3	16.6	19.6	26.9	25.3	29.2	33.3	15.2	19.2	10.8	12.2	8.8	13.3	13.6	27.3	16.6
2	16.1	13.2	15.5	30.6	13.0	17.4	16.5	25.1	13.3	13.5	18.5	16.9	17.1	16.9	13.2	17.5	13.8	18.0	59.1	22.1	20.7	25.4	23.4	27.6	20.2
3	21.9	24.9	24.5	16.4	15.4	16.1	13.2	18.5	18.0	18.6	18.6	51.1	34.2	Down	Down	20.4	17.1	14.4	14.6	15.3	13.0	13.2	16.9	17.2	19.7
4	17.2	17.5	17.4	15.3	15.8	17.1	19.0	17.4	16.5	15.7	16.3	16.6	16.3	16.3	16.8	16.5	14.6	18.5	14.8	18.8	18.7	14.9	15.8	14.7	16.6
5	19.9	19.4	19.3	15.8	25.3	24.9	19.1	17.5	15.4	16.0	18.3	18.8	17.6	15.3	17.5	16.6	16.1	15.0	14.8	13.6	14.1	13.7	12.7	13.3	17.1
6	15.3	17.1	18.7	12.6	15.7	17.5	15.4	17.6	20.4	PwrF	23.7	18.8	24.8	33.5	24.7	15.8	18.6	17.1	14.9	13.9	15.9	13.6	13.1	13.3	17.9
7	16.3	12.6	14.1	15.7	16.6	15.2	14.8	15.8	16.8	20.9	32.2	25.3	21.4	21.9	22.0	19.1	15.2	14.2	13.8	12.7	13.1	15.9	11.6	14.1	17.1
8	18.8	15.8	15.4	13.8	14.9	18.0	19.8	23.2	19.8	20.2	19.9	26.3	33.4	Bad<	25.7	18.8	18.2	16.4	16.0	25.2	27.1	17.4	29.0	24.2	20.8
9	29.2	23.6	23.4	25.4	26.0	19.8	24.0	28.0	24.5	24.9	23.5	24.7	34.0	27.9	29.7	30.9	18.5	23.6	20.4	17.2	17.9	26.8	31.3	18.5	24.7
10	16.4	19.0	36.8	35.1	25.7	35.6	18.6	52.0	33.5	31.3	32.6	31.7	33.3	34.7	23.2	14.8	13.1	9.3	19.3	14.1	21.3	17.6	49.9	11.1	26.2
11	14.4	32.2	25.7	21.2	9.0	24.7	15.2	41.9	18.8	27.8	28.5	22.4	34.8	30.3	25.1	18.3	12.1	8.1	12.5	23.5	20.2	21.5	37.3	39.0	23.5
12	25.4	23.2	23.6	18.0	15.5	15.9	20.4	22.0	16.9	19.2	21.2	51.6	45.4	33.3	33.6	34.7	21.5	10.3	14.7	23.1	22.1	26.0	30.9	27.5	24.8
13	23.8	17.1	15.4	14.1	18.1	15.8	16.4	12.5	12.8	14.3	16.6	19.1	20.5	19.4	16.4	19.9	14.4	11.4	7.9	11.0	12.5	10.0	9.9	7.8	14.9
14	9.2	9.4	9.4	11.9	10.3	11.1	10.9	13.5	13.6	13.3	13.6	12.5	18.2	51.5	21.2	15.2	15.2	18.3	9.2	12.2	9.7	9.0	9.0	12.4	14.1
15	12.7	12.2	8.7	8.7	8.1	8.4	8.1	12.7	15.4	15.5	17.7	15.0	16.8	15.9	16.5	15.8	12.2	11.0	11.4	9.5	6.5	7.5	7.6	13.6	12.0
16	12.5	8.9	7.5	8.9	11.2	13.9	12.8	14.7	15.3	15.3	17.6	19.8	18.3	18.0	17.9	15.8	16.1	12.8	11.2	11.9	12.1	10.8	12.0	14.2	13.7
17	14.2	13.0	12.5	11.5	6.4	11.9	12.6	12.4	12.8	14.7	15.5	13.7	14.9	15.5	12.7	11.2	10.6	9.5	10.3	10.8	9.5	7.1	8.9	7.8	11.7
18	10.4	11.2	10.0	10.0	9.3	10.6	12.1	13.8	10.1	15.0	12.6	13.5	12.4	13.1	13.5	10.0	11.1	10.0	7.6	7.2	6.8	7.6	7.0	7.5	10.5
19	8.8	10.5	9.7	9.5	9.7	9.7	7.7	7.5	12.7	10.6	11.2	12.6	12.7	11.2	11.4	10.0	8.1	7.0	7.5	6.0	6.7	7.1	7.7	7.2	9.3
20	9.9	10.4	7.3	9.2	8.2	7.5	8.4	8.6	10.5	10.4	14.8	14.8	13.0	14.1	12.8	14.8	11.1	8.9	11.0	8.6	8.9	9.7	9.4	9.5	10.5
21	8.8	7.9	6.6	6.7	7.0	6.1	6.7	7.5	9.7	13.1	17.0	13.5	13.7	15.3	11.4	14.3	12.6	12.8	9.4	13.2	10.3	7.8	8.2	9.0	10.4
22	14.8	10.4	11.1	10.4	10.6	12.6	13.3	16.0	15.4	12.8	12.1	13.1	15.4	17.9	15.5	15.3	14.3	13.3	14.3	13.3	9.4	14.2	16.0	11.9	13.5
23	13.0	14.8	13.8	23.6	16.8	13.5	11.0	16.8	29.5	31.8	30.4	46.8	36.6	47.2	20.2	15.0	11.0	9.7	10.0	12.1	15.0	17.9	20.5	21.9	20.8
24	12.2	15.4	16.0	18.3	11.2	26.5	18.5	23.5	35.3	22.5	24.6	25.8	25.3	31.2	23.5	28.6	24.5	16.8	18.6	29.8	31.5	23.7	22.5	23.7	22.9
25	18.0	17.4	16.1	14.8	14.8	14.1	14.7	14.3	15.2	14.9	18.1	20.5	18.6	24.3	21.6	19.4	15.7	13.0	11.7	12.7	13.6	12.7	10.3	13.2	15.8
26	15.2	19.2	16.6	14.6	13.1	11.4	11.2	11.4	12.6	13.9	15.8	17.4	16.6	16.1	14.3	15.2	13.0	13.2	13.2	12.8	14.8	13.7	13.3	13.2	14.2
27	13.0	12.1	12.8	13.8	14.2	12.2	13.0	11.6	13.0	14.1	16.0	14.4	14.4	15.2	15.4	14.7	12.7	11.6	13.5	13.2	12.0	12.6	12.1	12.1	13.3
28	13.0	12.6	13.6	12.4	12.6	11.1	11.6	11.0	12.0	14.7	14.4	12.1	12.6	9.9	11.4	11.6	9.5	10.3	10.0	12.5	13.1	10.9	11.5	12.0	11.9
29	11.6	15.4	19.4	12.7	10.9	13.9	14.2	14.8	13.6	12.5	10.3	9.3	8.7	9.9	9.9	10.6	8.8	7.5	7.5	11.1	8.4	8.6	8.2	10.9	11.2
30	11.4	9.0	8.9	8.7	8.7	7.9	8.4	9.2	8.8	11.5	12.0	13.6	12.8	14.1	11.2	10.1	8.9	8.7	7.8	6.5	7.2	7.2	8.6	8.3	9.6

TOTAL HOURS 720 TOTAL GOOD HOURS 716 DATA CAPTURE 99.4%

MAX. 1HR AVG 59.1 11/02/91 18:00:00 2ND MAX. 1 HR AVG 52.0 11/10/91 07:00:00

MIN. 1HR AVG 6.0 11/19/91 19:00:00 ARITHMETIC MEAN 16.2 STANDARD DEV. 7.4

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration
BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data
Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

02/17/92

TAMPA ELECTRIC COMPANY AIR MONITORING SITE AQ-1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR SIGMA THETA IN DEGREES

DECEMBER, 1991																									
DAY	HOUR (EST)																							DAILY AVG	
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22		23
1	9.4	7.6	7.2	9.4	8.6	7.7	7.0	7.9	10.5	13.6	12.5	16.0	18.2	13.5	16.0	13.3	10.4	8.3	6.0	6.5	7.5	7.9	8.4	9.4	10.1
2	8.9	10.1	10.0	9.9	10.5	10.4	10.5	10.8	12.5	13.0	12.1	14.6	16.5	14.3	13.5	15.3	12.6	10.4	10.8	28.6	28.5	40.6	12.1	10.6	14.5
3	9.7	10.9	13.6	11.4	12.4	12.1	11.9	11.4	10.9	12.8	13.6	14.9	15.3	13.9	12.5	12.6	11.6	12.0	11.0	10.9	12.4	23.1	19.8	21.9	13.4
4	25.2	27.0	32.9	27.3	25.9	19.3	21.4	20.1	22.9	20.8	26.9	22.7	19.4	23.1	26.7	31.5	20.4	18.6	16.9	17.9	19.2	20.9	16.1	14.6	22.4
5	12.8	12.8	13.2	14.4	14.8	14.4	11.7	15.5	16.0	15.8	16.8	17.2	18.2	16.6	15.7	17.4	14.1	13.7	14.4	10.9	12.8	7.1	7.6	8.2	13.8
6	8.9	10.0	10.9	10.9	18.1	11.2	13.7	14.4	19.8	13.9	17.9	16.4	24.3	24.7	21.2	17.0	17.4	18.8	9.5	10.5	9.7	12.2	10.3	12.5	14.8
7	11.6	10.5	10.0	6.8	7.2	11.9	12.7	12.5	14.9	17.4	19.0	19.9	28.4	23.2	16.1	19.6	12.2	7.8	6.4	7.3	7.7	5.3	6.1	6.2	12.5
8	6.8	6.1	6.5	19.4	14.3	10.1	12.0	11.1	13.3	11.7	11.0	12.7	19.7	27.4	27.4	18.8	13.3	9.8	8.9	11.9	11.5	12.8	6.5	9.7	13.0
9	9.4	8.4	10.3	9.9	14.7	9.3	12.5	18.6	16.6	25.3	23.5	23.7	26.3	39.0	29.0	24.9	24.6	30.9	13.7	10.4	14.9	20.9	24.5	54.3	20.6
10	49.3	18.3	10.9	26.7	55.9	14.3	16.5	17.2	20.9	14.6	17.9	22.3	19.8	25.2	18.7	16.0	14.4	10.4	9.2	31.1	24.7	14.7	30.8	13.3	21.4
11	10.6	14.1	12.0	10.6	9.9	11.9	10.9	10.3	15.8	17.9	21.6	30.3	32.9	51.6	31.9	25.9	16.9	19.4	7.7	9.8	9.0	9.8	11.1	12.1	17.3
12	10.6	12.5	14.6	13.8	13.7	11.9	14.6	13.9	15.0	13.0	16.6	18.2	14.7	13.3	16.4	8.8	8.8	9.4	8.6	8.7	7.6	7.6	6.0	6.8	11.9
13	6.1	8.4	8.8	8.2	8.8	7.8	9.0	7.8	12.2	13.8	14.2	19.7	20.3	20.1	24.5	22.4	11.0	16.9	11.5	7.0	10.9	23.6	25.2	8.7	13.6
14	10.8	12.6	10.0	10.8	23.8	14.1	16.6	32.9	15.2	15.3	14.8	22.1	20.1	15.8	15.0	13.7	12.5	9.5	8.2	9.2	9.5	29.5	17.7	19.2	15.8
15	11.9	13.8	12.5	13.7	14.4	12.5	13.7	13.2	14.8	14.4	16.1	17.9	16.5	18.6	17.1	15.8	14.9	14.6	13.1	12.1	13.1	13.3	15.0	15.9	14.5
16	16.1	15.0	15.3	12.8	13.9	13.3	14.3	14.7	14.3	15.7	15.0	17.1	16.9	18.6	19.0	16.8	16.1	10.5	11.6	11.1	8.7	11.4	12.8	12.4	14.3
17	13.2	12.8	13.3	14.6	11.9	12.2	14.1	15.9	12.1	15.7	16.9	19.4	18.8	20.1	19.1	15.8	11.7	14.3	9.3	7.8	7.1	6.5	23.4	17.2	14.3
18	19.6	14.8	13.7	10.5	11.7	10.0	9.3	10.6	14.6	13.8	15.5	21.0	34.5	41.2	26.5	40.7	22.3	15.0	20.8	32.2	15.9	16.6	12.6	13.3	19.0
19	14.1	11.7	9.9	12.1	13.0	11.7	12.2	12.1	12.5	13.0	14.1	14.1	12.1	13.0	13.3	12.7	12.4	12.1	12.2	12.1	12.7	13.3	12.4	12.7	12.6
20	13.2	11.6	12.4	12.8	11.6	13.0	13.1	11.5	12.8	12.8	11.5	9.3	8.7	7.9	9.8	9.0	8.2	7.3	11.6	13.7	14.4	10.8	16.6	15.8	11.6
21	8.6	8.6	12.4	11.6	7.9	9.5	7.6	9.2	13.7	16.8	15.0	32.6	35.9	30.0	24.3	14.2	17.9	15.3	15.3	11.4	16.5	8.7	7.5	5.5	14.8
22	7.8	5.7	6.4	8.2	8.2	6.4	11.2	11.0	14.8	30.4	38.8	35.2	33.9	31.3	47.6	37.9	19.3	34.4	13.2	17.0	26.5	17.0	14.8	21.9	20.8
23	27.9	15.0	19.9	15.8	28.5	38.5	25.7	13.7	22.9	21.9	24.9	15.7	18.8	15.2	16.1	14.3	10.3	8.6	10.6	9.7	7.9	7.8	9.0	11.1	17.1
24	14.3	14.2	10.6	10.6	8.8	9.4	9.8	16.6	11.0	12.4	17.2	19.4	19.0	21.9	18.1	22.6	22.5	10.8	12.7	10.1	10.3	23.7	22.3	24.6	15.5
25	25.3	21.4	21.5	19.6	15.4	19.1	17.9	15.9	17.4	29.3	16.1	47.3	40.4	40.6	16.0	18.8	26.2	45.0	34.2	33.6	17.4	13.6	44.8	24.2	25.9
26	22.9	27.1	23.6	18.6	12.2	10.3	10.8	12.1	14.1	15.5	14.3	17.7	24.1	17.2	18.8	16.6	14.7	19.6	47.7	15.5	15.7	22.9	33.7	30.1	19.8
27	21.4	17.2	8.7	17.9	11.4	30.4	11.4	11.2	15.0	13.7	16.0	19.2	17.5	20.4	17.4	12.6	9.2	7.8	5.9	6.7	8.8	39.9	47.2	19.9	17.0
28	24.5	11.5	8.2	8.8	9.3	9.9	9.4	8.6	12.6	12.5	11.9	12.7	12.8	13.7	14.6	17.5	15.0	9.4	9.3	6.5	10.8	6.5	25.2	13.3	12.3
29	12.0	16.3	19.6	8.7	9.3	19.9	21.5	27.3	20.9	24.0	28.7	21.3	16.5	23.8	33.1	19.3	25.2	13.0	22.3	33.7	34.4	49.4	17.7	42.9	23.4
30	15.3	12.1	27.1	53.1	27.0	16.9	21.9	18.6	17.0	33.3	39.6	35.3	25.6	30.7	27.0	28.7	28.0	23.7	12.6	20.7	25.3	21.3	19.9	22.7	25.1
31	19.3	14.8	11.9	15.3	13.0	14.8	19.8	19.9	15.0	21.4	18.3	21.0	19.0	16.3	16.5	17.1	15.0	13.8	12.6	13.8	13.5	13.6	15.3	15.0	16.1

TOTAL HOURS 744 TOTAL GOOD HOURS 744 DATA CAPTURE 100.0%

MAX. 1HR AVG 55.9 12/10/91 04:00:00 2ND MAX. 1 HR AVG 54.3 12/09/91 23:00:00

MIN. 1HR AVG 5.3 12/07/91 21:00:00 ARITHMETIC MEAN 16.4 STANDARD DEV. 8.1

KEY FOR MISSING CODES

Bad< - Too few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qal - Data questionable external influence, Purg - Analyzer in Purge

02/17/92

11.11-144

TEC AQ - 1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR SIGMA THETA IN DEGREES

DAY	JANUARY 1992																								DAILY AVG
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1	13.8	14.9	14.6	16.4	13.5	13.8	13.3	13.5	13.8	13.6	14.7	15.7	15.5	14.4	15.5	14.4	15.3	15.4	14.2	13.9	15.2	15.7	14.4	15.7	14.6
2	15.3	12.1	14.3	14.1	14.1	13.7	16.6	14.8	15.7	15.2	15.9	18.6	17.4	16.0	15.2	13.9	15.2	12.7	14.9	20.7	17.5	11.0	12.4	14.7	15.1
3	14.9	17.7	27.1	27.0	19.8	8.7	11.2	16.3	23.8	23.6	20.5	17.4	19.7	20.1	16.4	12.2	12.0	11.1	11.7	8.4	15.2	12.0	8.3	9.9	16.0
4	9.7	11.5	24.5	17.6	16.6	13.7	10.5	12.0	13.8	13.5	14.8	18.0	18.5	13.5	15.0	13.2	15.2	12.7	18.6	23.0	26.4	28.1	28.1	29.8	17.4
5	30.3	29.6	19.3	16.8	9.5	14.2	15.3	22.0	30.9	25.3	23.4	24.3	36.1	32.4	22.0	25.7	11.7	10.1	11.0	8.6	10.3	12.0	14.7	27.3	20.1
6	26.2	11.1	10.6	28.0	19.4	46.8	17.9	14.1	13.6	14.9	13.2	14.8	17.7	19.0	18.1	13.5	12.6	9.8	7.8	6.1	6.8	15.9	11.9	30.9	16.7
7	19.7	9.7	14.3	10.5	17.5	14.6	21.0	20.4	22.3	19.8	22.7	37.9	47.0	49.4	59.9	28.7	23.5	14.6	9.3	25.6	14.9	8.8	6.8	6.8	21.9
8	6.0	6.8	9.9	18.6	7.2	7.3	7.3	9.4	8.1	12.6	15.0	15.0	19.0	18.6	20.9	15.2	14.9	7.6	7.2	7.9	6.5	7.2	7.7	7.7	11.0
9	6.1	13.2	28.6	29.5	18.6	42.6	21.5	40.2	13.6	14.2	14.9	18.3	19.0	20.3	16.5	15.3	10.6	7.7	6.8	8.6	13.5	Cal	Cal	7.0	17.6
10	8.4	13.0	14.7	11.7	12.0	8.6	13.3	13.6	12.1	10.5	13.1	12.6	11.4	13.2	13.2	21.9	20.8	20.3	26.2	27.5	23.1	20.8	29.2	33.7	16.9
11	25.8	22.7	17.1	16.1	14.2	15.8	16.0	15.0	17.0	19.7	22.9	22.4	30.8	19.7	16.4	20.3	13.7	7.9	14.7	16.8	11.4	6.4	11.4	7.1	16.7
12	8.6	11.9	10.6	9.8	8.4	7.9	7.5	7.7	8.3	9.7	11.9	14.6	15.2	15.7	16.8	14.2	10.0	7.6	6.1	6.6	8.4	10.6	9.9	10.9	10.4
13	11.2	10.9	12.7	10.9	11.7	12.2	10.6	11.4	12.2	12.2	13.9	13.1	14.6	13.9	13.6	13.6	12.1	12.5	13.8	12.5	12.2	13.5	11.6	13.1	12.5
14	12.4	13.3	12.7	12.2	13.0	9.7	7.9	8.9	10.4	13.5	12.6	13.8	11.6	12.1	13.1	14.2	13.9	12.2	13.1	14.8	20.5	26.8	35.0	44.4	15.5
15	33.1	33.7	34.5	29.3	13.8	15.4	16.0	17.5	16.4	18.2	30.2	37.1	29.3	22.5	28.2	27.0	27.1	28.0	34.6	35.1	29.6	46.8	17.0	20.2	26.7
16	25.7	28.6	12.2	15.3	24.8	29.0	18.1	20.2	19.6	22.0	22.7	26.5	29.0	25.6	25.6	30.0	28.2	21.3	13.3	18.7	24.2	23.4	21.2	20.4	22.7
17	13.3	13.5	11.7	10.8	7.5	8.8	9.4	9.4	15.3	16.3	26.8	30.4	26.0	36.7	63.5	54.5	32.4	26.4	22.0	17.6	14.3	18.6	17.2	16.6	21.6
18	18.2	14.4	19.6	15.8	12.7	12.5	12.4	13.9	19.2	17.5	17.5	29.5	42.9	25.1	22.1	18.2	23.6	35.1	31.8	49.0	21.9	20.4	13.3	10.1	21.5
19	12.8	13.7	19.3	22.4	9.2	9.0	11.6	11.6	11.6	11.2	14.1	15.9	14.2	14.6	14.8	14.9	33.4	13.5	13.0	13.3	12.8	14.2	14.4	14.8	14.6
20	13.0	13.6	16.5	14.3	16.3	15.8	16.6	22.1	22.0	23.0	21.0	23.8	25.8	25.8	23.7	26.3	17.5	14.3	14.8	13.9	22.5	19.8	17.2	17.7	19.1
21	16.5	16.9	18.7	19.8	12.4	13.9	12.6	14.1	21.2	18.3	16.5	18.8	23.0	21.6	30.2	17.7	15.7	12.4	7.9	7.0	5.6	5.7	6.1	5.1	14.9
22	4.8	5.3	7.3	6.5	5.3	8.3	9.8	5.5	9.4	10.6	12.1	12.4	12.6	14.4	11.4	11.6	10.8	7.9	7.0	8.7	8.8	8.3	10.0	9.2	9.1
23	10.9	10.6	12.8	12.4	10.9	10.3	10.4	10.4	11.6	12.5	13.6	12.2	11.1	10.1	8.9	12.0	9.2	10.8	9.9	10.8	10.1	8.6	9.4	11.7	10.9
24	10.8	10.4	10.4	9.9	15.7	28.0	31.9	30.1	32.2	29.3	29.1	27.4	31.9	28.4	27.5	27.6	28.2	28.0	20.2	30.3	16.3	29.1	32.4	25.3	24.6
25	17.9	13.6	13.2	12.4	11.9	11.1	10.0	8.8	14.7	15.3	14.2	15.7	20.2	26.9	42.3	58.1	19.1	13.6	10.8	13.5	19.7	19.7	21.3	12.7	18.2
26	11.1	19.9	17.4	13.8	12.4	10.0	19.7	9.8	14.9	14.6	14.4	15.3	16.0	15.2	12.1	9.8	10.8	10.1	10.0	7.6	8.1	7.5	11.6	14.4	12.8
27	10.6	11.5	12.6	13.2	12.1	12.0	11.9	15.3	13.6	11.1	13.2	11.9	10.5	11.2	14.8	12.1	11.4	11.7	8.9	11.4	11.4	8.4	8.6	10.0	11.6
28	7.1	7.8	8.1	7.2	6.6	7.3	7.2	7.0	10.8	11.7	14.1	12.6	13.5	12.8	10.9	12.8	10.9	13.1	11.7	14.2	15.7	14.9	10.4	8.2	10.7
29	9.2	6.8	6.2	6.0	7.6	12.7	10.5	12.7	16.5	33.1	25.1	63.6	49.9	30.1	28.5	26.8	13.0	11.5	12.4	18.5	15.0	13.0	12.8	11.6	18.9
30	14.1	9.8	29.1	31.4	23.0	12.8	31.7	17.1	14.2	19.2	17.6	13.9	18.2	15.2	12.8	12.2	10.9	10.3	9.8	9.3	11.0	10.9	11.0	9.5	15.6
31	10.5	10.9	10.4	11.5	11.6	16.5	18.1	24.1	25.9	14.4	17.0	20.7	22.5	22.1	20.7	24.1	13.1	12.1	7.0	6.5	7.6	8.7	6.5	7.0	14.6

TOTAL HOURS 744 TOTAL GOOD HOURS 742 DATA CAPTURE 99.7%

MAX. 1HR AVG 63.6 01/29/92 11:00:00 2ND MAX. 1 HR AVG 63.5 01/17/92 14:00:00

MIN. 1HR AVG 4.8 01/22/92 00:00:00 ARITHMETIC MEAN 16.5 STANDARD DEV. 8.4

KEY FOR MISSING CODES

Bad< - To few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration
BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data
Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

TEC AQ - 1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR SIGMA THETA IN DEGREES

		FEBRUARY 1992																							DAILY	
HOUR (EST)		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVG
DAY																										
1		7.0	8.4	13.1	12.5	18.1	20.4	19.1	16.6	17.9	25.9	29.1	28.5	28.9	24.3	21.6	19.9	15.9	14.1	8.3	21.0	24.9	22.7	32.0	31.9	20.1
2		18.6	35.0	18.5	15.8	10.9	8.3	17.5	24.7	24.1	14.1	14.7	16.4	23.0	19.6	19.9	26.7	17.9	13.7	11.6	12.1	12.6	12.8	12.4	13.5	17.3
3		13.9	13.0	13.0	15.3	16.5	17.9	10.6	11.5	12.8	13.0	18.1	19.2	49.5	39.0	50.1	58.7	15.9	14.4	14.6	7.3	7.2	6.0	6.7	6.1	18.8
4		7.3	9.0	9.5	18.5	12.1	13.3	11.4	7.3	6.8	10.0	13.2	16.3	18.7	16.3	22.0	14.3	13.7	12.2	8.3	6.7	7.9	8.6	9.2	10.5	11.8
5		10.4	10.6	10.6	11.1	11.1	34.8	58.2	20.5	10.8	17.0	12.6	12.6	13.6	13.9	14.7	13.6	12.7	11.7	13.9	14.2	11.1	10.8	13.0	12.1	15.7
6		12.1	14.3	13.6	13.7	11.4	11.7	10.3	10.0	9.4	10.9	11.1	10.8	10.9	12.1	11.5	12.7	12.4	13.6	13.7	15.8	15.4	14.6	19.1	12.4	12.6
7		13.1	16.3	16.9	19.6	17.5	18.6	19.9	28.0	16.9	21.5	23.7	29.5	43.2	31.5	13.2	15.7	13.2	10.5	10.0	11.1	29.7	25.3	33.0	12.7	20.4
8		6.1	7.7	4.9	8.2	11.0	8.7	17.2	16.5	23.1	31.1	25.1	20.8	16.0	19.4	18.1	14.9	12.7	12.0	9.0	10.5	14.9	15.8	20.7	28.4	15.5
9		32.8	23.7	21.9	14.6	12.8	12.4	13.0	11.6	13.0	13.3	17.0	19.3	18.0	23.4	20.5	18.2	16.8	13.0	13.6	12.0	12.0	12.4	12.4	11.9	16.2
10		11.5	11.9	12.5	11.4	11.7	12.1	11.1	13.0	12.2	15.0	15.9	15.2	15.4	14.4	17.2	16.1	17.9	14.7	9.0	9.8	9.3	11.0	10.5	11.4	12.9
11		11.4	12.1	13.8	14.4	16.0	15.5	15.4	16.6	13.6	15.4	18.8	28.0	36.6	29.3	24.7	27.9	24.1	14.2	8.4	8.1	7.9	16.4	9.8	9.2	17.0
12		9.7	7.3	10.3	11.5	11.2	14.4	15.4	15.2	15.2	14.2	18.5	16.3	16.8	17.4	23.6	29.3	51.5	27.8	19.8	9.3	22.6	17.0	16.0	17.6	17.8
13		41.1	42.2	49.0	19.9	32.0	29.6	15.8	13.0	14.3	17.0	19.0	17.0	49.5	43.2	38.2	24.1	17.6	15.7	15.7	17.0	18.7	26.8	17.4	13.7	25.3
14		17.1	11.4	17.1	10.8	7.1	14.6	7.0	12.2	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Bad<
15	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
16	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
17	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
18	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
19	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
20	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
21	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
22	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
23	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
24	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss	Miss
25		9.8	17.4	23.0	9.9	13.3	7.9	7.2	9.2	PwrF	PwrF	11.5	11.4	13.3	12.8	11.2	22.3	10.9	14.1	11.9	12.5	16.0	13.2	16.3	14.6	13.2
26		15.7	13.5	13.7	14.9	11.0	10.8	12.0	9.8	10.6	10.3	11.6	10.5	PwrF	PwrF	13.5	11.1	11.5	10.5	10.4	10.3	10.5	10.5	8.6	10.6	11.4
27		10.3	11.1	12.2	14.3	18.3	14.6	17.7	13.6	20.1	PwrF	19.0	16.4	16.0	18.7	15.5	13.9	12.6	11.6	12.4	13.7	11.9	16.5	36.3	33.0	16.5
28		41.0	17.2	14.9	21.6	16.4	39.9	26.9	40.0	30.1	28.5	28.5	18.6	19.9	16.8	15.3	11.6	13.6	10.6	7.7	6.4	8.6	5.5	7.1	9.7	19.0
29		8.2	13.2	6.2	6.0	13.1	7.0	7.6	9.7	10.4	17.5	12.4	18.5	19.4	23.2	21.2	17.5	15.4	11.4	7.9	6.8	7.0	7.3	9.0	9.7	11.9

TOTAL HOURS 696 TOTAL GOOD HOURS 435 DATA CAPTURE 62.5X

MAX. 1HR AVG 58.7 02/03/92 15:00:00 2ND MAX. 1 HR AVG 58.2 02/05/92 06:00:00

MIN. 1HR AVG 4.9 02/08/92 02:00:00 ARITHMETIC MEAN 16.3 STANDARD DEV. 8.4

KEY FOR MISSING CODES

Bad< - To few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration

BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data

Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

TEC AQ - 1
Polk County, Florida - Site 001

HOURLY AVERAGES FOR SIGMA THETA IN DEGREES

DAY	MARCH 1992																								DAILY AVG
	HOUR (EST) 00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1	6.8	6.7	6.5	9.7	15.5	12.0	11.5	15.7	33.4	24.2	27.9	33.0	41.3	28.2	40.8	30.6	66.5	53.9	12.7	12.8	17.6	28.1	46.6	17.1	25.0
2	29.5	19.2	25.1	15.0	13.0	15.7	14.2	19.1	16.5	14.4	19.2	23.8	25.6	30.6	51.4	52.0	45.1	29.2	16.9	55.6	24.9	20.2	26.8	9.0	25.5
3	4.8	5.7	4.9	6.4	5.1	7.1	6.0	21.3	19.2	16.8	22.3	20.1	29.5	20.2	22.6	23.7	14.4	17.7	7.9	8.1	8.1	7.7	7.1	6.7	13.1
4	6.7	6.8	9.9	6.1	8.9	10.5	16.1	10.8	15.5	14.4	11.5	14.6	15.2	14.2	12.7	13.2	12.2	13.0	11.6	12.6	12.5	10.9	8.9	7.9	11.5
5	7.8	7.2	6.7	7.0	6.1	6.6	6.5	9.2	10.0	10.5	12.6	16.1	13.3	15.2	13.3	13.6	12.1	11.5	8.1	7.0	7.2	7.1	6.6	7.5	9.5
6	7.0	8.2	7.3	7.1	7.3	8.1	9.4	7.8	10.6	12.2	14.4	13.7	17.2	19.4	18.7	16.5	11.1	9.9	7.9	7.1	5.6	10.4	9.4	9.4	10.7
7	7.6	28.6	10.0	16.0	14.1	13.9	13.3	12.0	16.8	16.3	14.8	17.7	16.6	13.8	15.4	13.3	12.1	11.1	9.0	7.7	9.2	11.6	12.7	13.7	13.6
8	15.0	18.3	16.1	22.1	27.8	27.3	29.7	36.4	36.7	46.3	41.8	42.2	50.7	53.7	62.0	47.7	35.7	30.7	9.8	6.0	13.9	10.5	17.4	15.2	29.7
9	19.1	18.6	20.5	16.0	14.7	8.1	8.8	8.8	12.4	15.5	15.7	17.2	18.1	18.0	17.6	18.7	26.2	12.2	16.9	21.9	26.4	23.1	56.6	8.2	18.3
10	9.3	10.3	13.6	15.0	13.7	11.9	13.8	11.4	13.3	15.3	15.8	15.7	14.6	15.2	13.0	12.4	12.6	11.6	11.2	11.6	15.3	26.5	27.1	20.4	14.6
11	20.2	10.8	8.8	8.2	9.0	15.2	18.1	24.5	25.7	26.3	28.5	41.2	36.3	28.2	22.5	19.2	21.6	9.9	11.1	22.1	33.5	28.1	27.4	13.6	21.3
12	12.8	20.3	17.9	14.7	17.9	34.7	17.5	23.7	24.3	20.8	24.3	41.5	37.3	37.4	26.4	27.3	48.2	33.1	24.0	27.0	28.7	35.7	57.6	62.7	29.8
13	47.8	35.2	33.3	45.0	38.4	46.2	37.9	50.6	25.9	35.6	30.9	30.1	26.3	26.5	25.3	20.3	15.3	15.2	9.7	10.4	9.9	19.3	23.7	28.7	28.6
14	27.1	39.9	38.0	29.7	44.6	30.1	26.4	21.9	15.3	17.6	22.6	21.9	43.9	40.0	39.4	30.7	15.9	10.4	8.8	8.7	11.7	16.3	10.0	10.5	24.2
15	11.6	10.9	19.7	14.4	11.7	12.8	12.8	10.3	14.8	24.3	21.5	25.2	28.6	27.4	24.6	12.8	11.5	9.7	9.3	9.3	9.4	7.0	5.5	4.9	14.6
16	5.5	5.6	8.4	6.6	11.5	12.4	26.7	21.3	15.4	15.3	18.7	19.4	17.7	22.9	24.5	23.2	20.9	18.7	13.3	10.0	9.9	9.5	10.1	11.1	14.9
17	9.3	10.1	8.4	9.2	7.2	7.6	7.5	9.3	10.6	13.0	17.2	21.8	28.5	26.9	38.3	58.6	20.4	20.5	10.6	8.1	21.5	15.5	8.3	8.1	16.5
18	7.9	8.4	10.4	12.1	11.7	12.6	9.5	9.8	12.5	13.2	14.4	18.0	19.4	18.6	19.9	17.7	18.0	13.6	10.4	11.2	8.7	11.7	16.1	18.0	13.5
19	14.2	14.6	13.6	14.4	14.6	11.7	14.8	14.1	13.5	11.1	9.8	10.3	10.1	10.8	10.6	11.9	11.7	10.3	8.7	7.8	6.7	6.8	8.9	8.1	11.2
20	7.2	8.1	7.7	6.8	6.4	8.3	7.7	9.7	15.9	15.0	14.1	12.5	13.5	12.2	13.5	14.4	12.1	11.6	11.1	13.1	18.2	15.5	12.1	10.1	11.5
21	33.5	19.0	19.4	20.2	27.1	23.0	20.1	15.2	18.5	19.1	19.1	34.6	48.4	46.3	54.0	60.0	42.8	20.5	12.0	22.9	24.8	24.2	26.7	19.1	27.9
22	14.1	19.4	18.0	13.1	43.7	46.7	27.8	8.7	8.9	12.6	15.8	14.9	14.2	13.8	13.0	18.3	15.3	24.8	56.6	26.2	11.6	12.2	23.5	14.6	20.3
23	20.7	19.7	17.6	11.2	11.4	12.6	18.3	17.9	11.2	11.0	12.1	14.8	11.9	13.0	13.9	12.6	13.6	15.3	26.3	16.3	19.4	19.9	11.4	29.7	15.9
24	28.9	39.3	12.6	14.4	11.2	11.5	13.6	15.9	15.3	15.9	15.3	17.2	20.7	21.4	21.3	16.9	14.8	13.7	12.0	11.5	11.2	12.6	13.1	10.8	16.3
25	10.9	10.4	11.0	10.1	9.2	9.5	11.0	10.0	8.7	10.0	10.9	11.1	10.0	10.1	11.9	12.5	11.2	12.6	12.4	12.7	14.7	14.7	25.7	11.5	11.8
26	8.1	21.0	21.6	17.9	9.3	12.0	11.6	20.2	15.9	24.0	28.1	24.2	22.5	23.1	15.8	18.2	16.3	18.0	11.6	9.8	7.3	11.2	19.9	13.8	16.7
27	13.2	14.1	13.6	9.8	16.8	27.5	17.2	50.4	21.6	30.3	47.8	50.6	53.9	56.1	46.0	23.1	18.2	11.7	9.2	9.0	9.3	13.2	17.5	11.4	24.6
28	29.3	13.6	12.4	18.3	41.2	24.1	14.1	15.4	15.2	14.9	18.5	19.2	21.4	24.8	28.0	34.2	26.3	19.8	13.3	12.4	13.0	18.6	8.9	7.7	19.4
29	6.4	5.7	6.0	6.2	5.6	9.9	7.8	9.0	12.2	21.0	25.7	21.9	16.5	15.4	20.2	13.8	12.4	14.7	25.4	20.3	19.3	25.6	16.6	6.7	14.4
30	7.9	25.7	17.2	8.2	15.8	33.3	25.7	16.9	18.5	18.2	19.3	21.0	18.2	14.2	13.2	11.4	11.0	11.9	21.8	13.5	12.0	12.1	13.7	13.7	16.4
31	11.0	9.3	8.4	7.8	7.9	8.2	8.7	10.4	13.0	15.4	Cal	Cal	13.0	15.9	66.6	14.4	44.3	10.4	9.8	9.4	7.7	20.4	17.9	35.0	16.6

TOTAL HOURS 744 TOTAL GOOD HOURS 742 DATA CAPTURE 99.7%

MAX. 1HR AVG 66.6 03/31/92 14:00:00 2ND MAX. 1 HR AVG 66.5 03/01/92 16:00:00

MIN. 1HR AVG 4.8 03/03/92 00:00:00 ARITHMETIC MEAN 18.0 STANDARD DEV. 11.0

KEY FOR MISSING CODES

Bad< - To few samples for valid average, Cal - calibration, OCal - Analyzer out of calibration
BadS - Bad Analyzer Status, PwrF - Power Failure, Down - Operator downed channel, Miss - Missing Data
Qad - Data questionable insufficient documentation, Qai - Data questionable external influence, Purg - Analyzer in Purge

11.11-147

APPENDIX 11.12

**NOISE MONITORING PROGRAM AND
SUPPORTING INFORMATION**

24-HOUR MEASUREMENT LOG

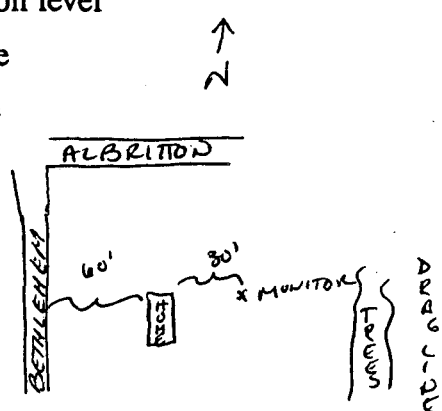
Monitoring Location: NS-1 Operator: RGT/TAB
 Start Date: 6/8/91 Day of Week: SATURDAY
 Survey Meter Model/Serial No.: LARSON-DAVIS 870/870A0155
 Calibrator Model/Serial No.: LARSON-DAVIS CA 250-0702
 Start Time: 1145 AM Stop Time: 1145 AM 6/9/91

CALIBRATED OK

Collocated Measurement Data (Survey Meter Model/Serial No. QUEST 1800-10022
HP0030023)

CALIBRATOR QUEST CA-22/J0040028

Parameter	Collocated Measurement Period		
	Beginning	Middle	End
Date	<u>6/8/91</u>	<u>6/8/91</u>	<u>6/9/91</u>
Calibration level	<u>110.0</u>	<u>110.0</u>	<u>110.0</u>
Start time	<u>1147 AM</u>	<u>947 PM</u>	<u>1141 AM</u>
End time	<u>1152 AM</u>	<u>952 PM</u>	<u>1146 AM</u>
L _{eq}	<u>50.6</u>	<u>57.0</u>	<u>45.1</u>
L ₉₉	<u>31.0</u>	<u>40.0</u>	<u>30.0</u>
L ₉₀	<u>31.0</u>	<u>43.0</u>	<u>30.0</u>
L ₅₀	<u>41.0</u>	<u>50.0</u>	<u>30.0</u>
L ₁₀	<u>50.0</u>	<u>59.0</u>	<u>50.0</u>
L ₁	<u>66.0</u>	<u>71.0</u>	<u>51.0</u>
Minimum L	<u>29.9</u>	<u>38.6</u>	<u>29.9</u>
Maximum L	<u>50.6</u>	<u>73.1</u>	<u>50.6</u>
Sounds heard	<u>WIND IN TREES</u>	<u>INSECTS</u>	<u>INSECTS</u>
	<u>TRAFFIC</u>	<u>DRAGLINE</u>	<u>BIRDS</u>
	<u>BIRDS</u>	<u>TRAFFIC (IN DISTANCE)</u>	<u>DRAGLINE</u>
	<u>DRAGLINE</u>		<u>TREES</u>
Temperature	<u>86°F RH=58%</u>	<u>78°F RH=46% TW=70%</u>	<u>88°F RH=54%</u>
Weather	<u>MOSTLY SUNNY</u>	<u>CLEAR</u>	<u>MOSTLY SUNNY</u>
Windspeed	<u>3-4 mph G 10</u>	<u>2 mph</u>	<u>5-8 mph</u>
Wind direction	<u>NE</u>	<u>NE</u>	<u>N-NW</u>
Other comments:			



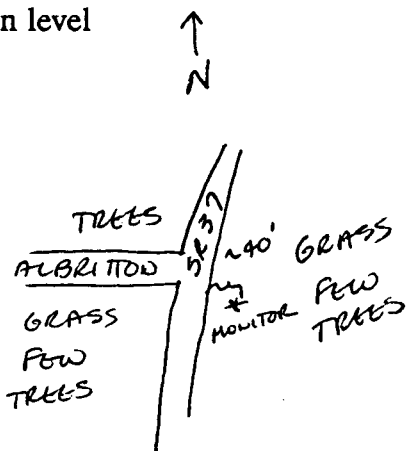
24-HOUR MEASUREMENT LOG

Monitoring Location: NS-2 Operator: RG/TAB
 Start Date: 6/8/91 Day of Week: SATURDAY
 Survey Meter Model/Serial No.: LARSON - DAVIS 870 / 870 A0153
 Calibrator Model/Serial No.: LARSON - DAVIS / CA 250-0702
 Start Time: 1000 AM Stop Time: 1000 AM 6/9/91

CALIBRATED OR

Collocated Measurement Data (Survey Meter Model/Serial No. QUEST 1800-10022 / HP0030032)
 CALIBRATOR QUEST CA-22 / J0040028

Parameter	Collocated Measurement Period		
	Beginning	Middle	End
Date	<u>6/8/91</u>	<u>6/8/91</u>	<u>6/9/91</u>
Calibration level	<u>110.0</u>	<u>110.0</u>	<u>110.0</u>
Start time	<u>1030 AM</u>	<u>1015 PM</u>	<u>954 AM</u>
End time	<u>1035 AM</u>	<u>1020 PM</u>	<u>959 AM</u>
L _{eq}	<u>46.5</u>	<u>45.3</u>	<u>37.6</u>
L ₉₉	<u>33.0</u>	<u>37.0</u>	<u>30.0</u>
L ₉₀	<u>36.0</u>	<u>43.0</u>	<u>31.0</u>
L ₅₀	<u>41.0</u>	<u>45.0</u>	<u>33.0</u>
L ₁₀	<u>48.0</u>	<u>48.0</u>	<u>42.0</u>
L ₁	<u>60.0</u>	<u>49.0</u>	<u>48.0</u>
Minimum L	<u>43.4</u>	<u>36.7</u>	<u>29.9</u>
Maximum L	<u>49.4</u>	<u>48.7</u>	<u>52.4</u>
Sounds heard	<u>TRAFFIC</u>	<u>TRAFFIC</u>	<u>TRAFFIC</u>
	<u>BIRDS, INSECTS</u>	<u>INSECTS</u>	<u>BIRDS, INSECTS</u>
	<u>GRASS RUSTLING</u>		<u>GRASS</u>
	<u>TREES RUSTLING</u>		<u>TREES</u>
Temperature	<u>81°F RH=60%</u>	<u>77°F RH=77%</u>	<u>82°F RH=68%</u>
Weather	<u>MOISTLY SUNNY</u>	<u>T=75°F T_w=70°F CLEAR</u>	<u>MOISTLY SUNNY</u>
Windspeed	<u>3-6 mph G 10</u>	<u>2 mph</u>	<u>3-6 mph G 10</u>
Wind direction	<u>NE</u>	<u>NE</u>	<u>NE</u>
Other comments: _____			



24-HOUR MEASUREMENT LOG

Monitoring Location: NS-3

Operator: RGT/TAB

Start Date: 6/9/91

Day of Week: SUNDAY

Survey Meter Model/Serial No.: LARSON - DAVIS 870 / 870 A0153

Calibrator Model/Serial No.: LARSON - DAVIS / CA 250 - 0702

Start Time: 1045 AM

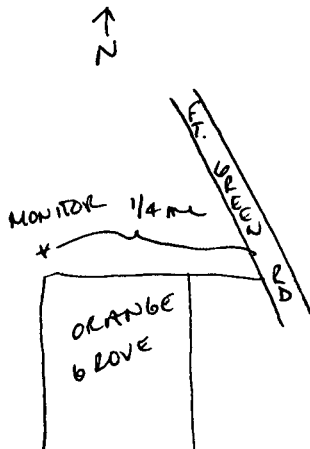
Stop Time: 1045 AM 6/10/91

CALIBRATED OK

Collocated Measurement Data (Survey Meter Model/Serial No. QUEST 1800-10022 / J4P0030023)

CALIBRATOR QUEST CA-22 / J0040028

Parameter	Collocated Measurement Period		
	Beginning	Middle	End
Date	<u>6/9/91</u>	<u>6/9/91</u>	<u>6/10/91</u>
Calibration level	<u>110.0</u>	<u>110.0</u>	<u>110.0</u>
Start time	<u>1103 AM</u>	<u>915 PM</u>	<u>1040 AM</u>
End time	<u>1108 AM</u>	<u>920 PM</u>	<u>1045 AM</u>
L_{eq}	<u>42.7</u>	<u>52.5</u>	<u>30.7</u>
L_{99}	<u>38.0</u>	<u>48.0</u>	<u>31.0</u>
L_{90}	<u>40.0</u>	<u>51.0</u>	<u>31.0</u>
L_{50}	<u>42.0</u>	<u>58.0</u>	<u>31.0</u>
L_{10}	<u>46.0</u>	<u>71.0</u>	<u>31.0</u>
L_1	<u>47.0</u>	<u>77.0</u>	<u>38.0</u>
Minimum L	<u>38.2</u>	<u>52.8</u>	<u>29.9</u>
Maximum L	<u>46.4</u>	<u>52.8</u>	<u>39.7</u>
Sounds heard	<u>BIRDS</u>	<u>INSECTS</u>	<u>BIRDS</u>
	<u>GLASS TREES INSECTS</u>	<u>FROGS</u>	<u>INSECTS TRAIN</u>
	<u>AIRPLANE</u>	<u>TRAFFIC IN DISTANCE</u>	<u>TRAFFIC IN ORANGE GROVE</u>
	<u>TRAFFIC</u>	<u>AIRPLANE</u>	<u>AIRPLANE</u>
Temperature	<u>88°F RH=58%</u>	<u>78°F RH=62%</u>	<u>85°F RH=59%</u>
Weather	<u>MOSTLY SUNNY</u>	<u>MOSTLY CLOUDY</u>	<u>PARTLY CLOUDY</u>
Windspeed	<u>4-7 mph</u>	<u>1-2 mph</u>	<u>3-6 mph</u>
Wind direction	<u>S</u>	<u>S-SW</u>	<u>S</u>
Other comments:			

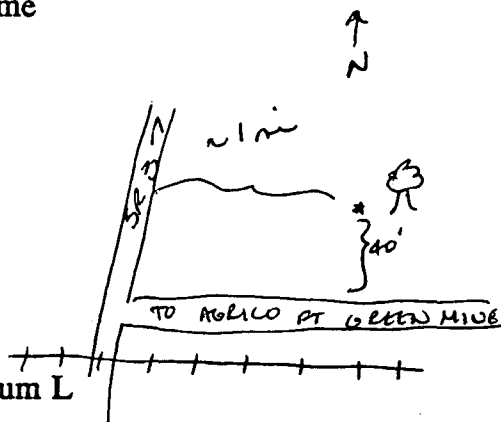


24-HOUR MEASUREMENT LOG

Monitoring Location: NSA Operator: RBT/TAB
 Start Date: 6/9/91 Day of Week: SUNDAY
 Survey Meter Model/Serial No.: LARSON-DAVIS 870/870AD155
 Calibrator Model/Serial No.: LARSON-DAVIS/CA 250-0702
 Start Time: 1225 PM Stop Time: 1225 PM 6/10/91
CALIBRATED OK

Collocated Measurement Data (Survey Meter Model/Serial No. QUEST 1800-10022/HP0030023)
CALIBRATOR QUEST CA-22/10040028

Parameter	Collocated Measurement Period		
	Beginning	Middle	End
Date	<u>6/9/91</u>	<u>6/9/91</u>	<u>6/10/91</u>
Calibration level	<u>110.0</u>	<u>110.0</u>	<u>110.0</u>
Start time	<u>1225 PM</u>	<u>950 PM</u>	<u>1220 PM</u>
End time	<u>1230 PM</u>	<u>955 PM</u>	<u>1225 PM</u>
L _{eq}	<u>40.9</u>	<u>38.5</u>	<u>41.9</u>
L ₉₉	<u>37.0</u>	<u>36.0</u>	<u>30.0</u>
L ₉₀	<u>37.0</u>	<u>37.0</u>	<u>34.0</u>
L ₅₀	<u>38.0</u>	<u>39.0</u>	<u>37.0</u>
L ₁₀	<u>44.0</u>	<u>41.0</u>	<u>47.0</u>
L ₁	<u>46.0</u>	<u>41.0</u>	<u>51.0</u>
Minimum L	<u>36.3</u>	<u>34.4</u>	<u>29.9</u>
Maximum L	<u>45.3</u>	<u>42.3</u>	<u>50.6</u>
Sounds heard	<u>BIRDS</u> <u>AGLICO</u> <u>MINE</u>	<u>INSECTS</u> <u>TRAFFIC</u> <u>MINE</u>	<u>BIRDS</u> <u>TRAIN LOADING</u> <u>MINE</u>
Temperature	<u>88°F RH=57%</u>	<u>77°F RH=69%</u>	<u>88°F RH=51%</u>
Weather	<u>MOISTLY</u> <u>SUNNY</u>	<u>PARTLY</u> <u>CLOUDY</u>	<u>MOISTLY</u> <u>SUNNY</u>
Windspeed	<u>5-7 mph</u>	<u>1-2 mph</u>	<u>8-10 mph</u>
Wind direction	<u>NE</u>	<u>N</u>	<u>W</u>
Other comments:			



24-HOUR MEASUREMENT LOG

Monitoring Location: NS-2740 NS-1 Operator: LET/TAB
 Start Date: 6/11/91 Day of Week: TUESDAY
 Survey Meter Model/Serial No.: LARSON-DAVIS 870/870A 0155
 Calibrator Model/Serial No.: LARSON-DAVIS CA 250-0702
 Start Time: 130 PM Stop Time: 130 PM 6/12/91

CALIBRATED OK

Collocated Measurement Data (Survey Meter Model/Serial No. QUEST 1800-10022/HP00 30023)
CALIBRATOR CA-22/130040028

Parameter	Collocated Measurement Period		
	Beginning	Middle	End
Date	<u>6/11/91</u>	<u>6/11/91</u>	<u>6/12/91</u>
Calibration level	<u>109.9</u>	<u>109.9</u>	<u>110.0</u>
Start time	<u>130 PM</u>	<u>935 AM</u>	<u>125 PM</u>
End time	<u>135 PM</u>	<u>940 PM</u>	<u>130 PM</u>
L _{eq}	<u>40.8</u>	<u>34.2</u>	<u>42.6</u>
L ₉₉	<u>30.0</u>	<u>31.0</u>	<u>40.0</u>
L ₉₀	<u>30.0</u>	<u>31.0</u>	<u>40.0</u>
L ₅₀	<u>37.0</u>	<u>31.0</u>	<u>43.0</u>
L ₁₀	<u>46.0</u>	<u>31.0</u>	<u>46.0</u>
L ₁	<u>49.0</u>	<u>48.0</u>	<u>46.0</u>
Minimum L	<u>29.9</u>	<u>29.9</u>	<u>39.3</u>
Maximum L	<u>48.7</u>	<u>48.7</u>	<u>45.7</u>
Sounds heard	<u>BIRDS</u>	<u>DRAGLINE</u>	<u>DRAGLINE</u>
	<u>PLANES</u>	<u>INSECTS</u>	<u>BIRDS</u>
	<u>DRAGLINE</u>	<u>AIR PLANE</u>	<u>INSECTS</u>
	<u>TRAFFIC</u>	<u>BIRDS</u>	
Temperature	<u>90°F RH=45%</u>	<u>77°F RH=70%</u>	<u>90°F RH=38%</u>
Weather	<u>PARTLY CLOUDY</u>	<u>CLEAR</u>	<u>MOSTLY SUNNY</u>
Windspeed	<u>5-7 mph</u>	<u>3-5 mph</u>	<u>3-5 mph</u>
Wind direction	<u>N</u>	<u>N</u>	<u>NE</u>
Other comments:			

24-HOUR MEASUREMENT LOG

Monitoring Location: NS-2 Operator: RGT/TAB
 Start Date: 6/11/91 Day of Week: TUESDAY
 Survey Meter Model/Serial No.: LARSON-DAVIS 870/870A0153
 Calibrator Model/Serial No.: LARSON-DAVIS CA 250-0702
 Start Time: 1200 PM Stop Time: 1200 PM 6/12/91

CALIBRATED OK

Collocated Measurement Data (Survey Meter Model/Serial No. QUEST 1800-10022/HP 0030023)
 CALIBRATOR QUEST CA-22/10040028

Parameter	Collocated Measurement Period		
	Beginning	Middle	End
Date	<u>6/11/91</u>	<u>6/11/91</u>	<u>6/12/91</u>
Calibration level	<u>109.9</u>	<u>109.9</u>	<u>110.0</u>
Start time	<u>1200 PM</u>	<u>950 PM</u>	<u>1155 AM</u>
End time	<u>1205 PM</u>	<u>955 PM</u>	<u>1200 PM</u>
L _{eq}	<u>38.8</u>	<u>31.4</u>	<u>46.3</u>
L ₉₉	<u>31.0</u>	<u>30.0</u>	<u>44.0</u>
L ₉₀	<u>36.0</u>	<u>30.0</u>	<u>44.0</u> 44.0
L ₅₀	<u>39.0</u>	<u>30.0</u>	<u>49.0</u> 46.0
L ₁₀	<u>41.0</u>	<u>30.0</u>	<u>50.0</u> 49.0
L ₁	<u>42.0</u>	<u>44.0</u>	<u>43.4</u> 50.0
Minimum L	<u>30.3</u>	<u>29.9</u>	<u>43.4</u> 49.0
Maximum L	<u>41.9</u>	<u>44.2</u>	<u>49.4</u>
Sounds heard	<u>Grass</u>	<u>Traffic</u>	<u>Traffic</u>
	<u>traffic Birds</u>	<u>Insects</u>	<u>Birds</u>
	<u>Insects</u>		<u>Insects</u>
	<u>trucks</u>		<u>Airplane</u>
Temperature	<u>85°F RH=52%</u>	<u>77°F RH=70%</u>	<u>89°F RH=43%</u>
Weather	<u>mostly cloudy</u>	<u>clear</u>	<u>mostly sunny</u>
Windspeed	<u>3-5 mph</u>	<u>3-5 mph</u>	<u>3-5 mph</u>
Wind direction	<u>NE</u>	<u>N</u>	<u>NE</u>

Other comments: _____

24-HOUR MEASUREMENT LOG

Monitoring Location: NS-3 Operator: RBT/TAB
 Start Date: 6/10/91 Day of Week: MONDAY
 Survey Meter Model/Serial No.: LARSON DAVIS 870/870A0153
 Calibrator Model/Serial No.: LARSON DAVIS CA 250-0702
 Start Time: 1115 AM Stop Time: 1115 AM 6/11/91

CALIBRATED OK

Collocated Measurement Data (Survey Meter Model/Serial No. QUEST 1800-10022/HP0030023)
 CALIBRATOR QUEST CA-22/J0040028

Parameter	Collocated Measurement Period		
	Beginning	Middle	End
Date	<u>6/10/91</u>	<u>6/10/91</u>	<u>6/11/91</u>
Calibration level	<u>109.6</u>	<u>109.6</u>	<u>109.9</u>
Start time	<u>1125 AM</u>	<u>915 PM</u>	<u>1110 AM</u>
End time	<u>1130 AM</u>	<u>920 PM</u>	<u>1115 AM</u>
L _{eq}	<u>31.5</u>	<u>44.5</u>	<u>35.5</u>
L ₉₉	<u>31.0</u>	<u>30.0</u>	<u>30.0</u>
L ₉₀	<u>31.0</u>	<u>31.0</u>	<u>31.0</u>
L ₅₀	<u>31.0</u>	<u>31.0</u>	<u>32.0</u>
L ₁₀	<u>34.0</u>	<u>35.0</u>	<u>40.0</u>
L ₁	<u>38.0</u>	<u>58.0</u>	<u>43.0</u>
Minimum L	<u>29.9</u>	<u>29.9</u>	<u>29.9</u>
Maximum L	<u>38.6</u>	<u>58.8</u>	<u>42.7</u>
Sounds heard	<u>BIRDS</u>	<u>TRAW</u>	<u>Birds</u>
	<u>INSECTS</u>	<u>INSECTS</u>	<u>insects</u> <i>airplane</i>
	<u>TRACTOR</u>	<u>COW</u>	<u>tree, grass</u>
Temperature	<u>87°F RH=51%</u>	<u>77°F RH=66%</u>	<u>85°F RH=77%</u>
Weather	<u>mostly sunny</u>	<u>clear</u>	<u>mostly sunny</u>
Windspeed	<u>3-5 mph</u>	<u>3-5 mph</u>	<u>5-7 mph</u>
Wind direction	<u>S</u>	<u>S</u>	<u>S</u>

Other comments: _____

24-HOUR MEASUREMENT LOG

Monitoring Location: NS-4 Operator: RGT/TAB
 Start Date: 6/10/91 Day of Week: Monday
 Survey Meter Model/Serial No.: LARSON DAVIS 870/870 A0155
 Calibrator Model/Serial No.: LARSON DAVIS CA 250-0702
 Start Time: 100 PM Stop Time: 100 PM 6/11/91
CALIBRATED OK

QUEST 1800-10022/
 4P0030023

Collocated Measurement Data (Survey Meter Model/Serial No. 4P0030023)
 CALIBRATOR QUEST CA-22 / J0040028

Parameter	Collocated Measurement Period		
	Beginning	Middle	End
Date	<u>6/10/91</u>	<u>6/10/91</u>	<u>6/11/91</u>
Calibration level	<u>109.6</u>	<u>109.6</u>	<u>109.9</u>
Start time	<u>100 PM</u>	<u>942 PM</u>	<u>1255 PM</u>
End time	<u>105 PM</u>	<u>947 PM</u>	<u>100 PM</u>
L _{eq}	<u>48.0</u>	<u>37.5</u>	<u>40.4</u>
L ₉₉	<u>31.0</u>	<u>31.0</u>	<u>36.0</u>
L ₉₀	<u>32.0</u>	<u>32.0</u>	<u>37.0</u>
L ₅₀	<u>33.0</u>	<u>35.0</u>	<u>39.0</u>
L ₁₀	<u>54.0</u>	<u>37.0</u>	<u>44.0</u>
L ₁	<u>55.0</u>	<u>49.0</u>	<u>46.0</u>
Minimum L	<u>30.3</u>	<u>30.7</u>	<u>35.2</u>
Maximum L	<u>55.1</u>	<u>49.4</u>	<u>45.7</u>
Sounds heard	<u>WIDE ORCHESTRATION</u> <u>BIRDS</u> <u>TRAFFIC RUSTLING</u> <u>TRAMP BEING LOADED</u>	<u>Wine Operation</u> <u>Insects</u> <u>Traffic on highway</u>	<u>Wine operation</u> <u>Birds</u> <u>Insects</u>
Temperature	<u>80°F RH=51%</u>	<u>75°F RH=69%</u>	<u>80°F RH=33%</u>
Weather	<u>MOSTLY SUNNY</u>	<u>Clear</u>	<u>PARTLY CLOUDY</u>
Windspeed	<u>8-10 mph</u>	<u>1-2 mph</u>	<u>3-5 mph</u>
Wind direction	<u>W</u>	<u>NE</u>	<u>NE</u>
Other comments:			

Period 01:00 h:m

Time	LVL	SEL	Lmin	Lmax	Lpk	Lwpk	Ex	Pk	Ov
12:00:00	49.9	85.4	40.9	66.4	80.2	110.5	1	6	0
13:00:00	49.5	84.9	40.9	68.9	83.7	111.0	1	12	0
14:00:00	48.1	83.6	39.9	68.9	80.7	109.0	3	10	0
15:00:00	49.4	84.8	41.1	62.3	80.2	111.0	0	4	0
16:00:00	50.4	85.8	42.1	66.4	84.7	115.0	1	7	0
17:00:00	51.6	87.0	45.1	60.2	80.3	115.0	0	4	0
18:00:00	51.6	87.0	45.2	53.2	80.3	108.7	0	2	0
19:00:00	50.9	86.3	44.4	61.4	82.7	108.7	0	4	0
20:00:00	49.3	84.7	41.8	55.8	80.2	99.0	0	3	0
21:00:00	52.1	87.6	44.0	57.7	82.6	95.0	0	3	0
22:00:00	52.3	87.7	46.2	55.7	84.1	92.7	0	4	0
23:00:00	51.6	87.0	44.9	56.6	76.5	92.7	0	0	0
00:00:00	50.9	86.3	44.6	52.9	70.4	96.5	0	0	0
01:00:00	51.8	87.2	44.8	52.8	68.4	96.5	0	0	0
02:00:00	51.4	86.8	44.8	57.6	85.4	96.5	0	5	0
03:00:00	51.2	86.6	42.8	58.5	79.4	104.5	0	0	0
04:00:00	50.3	85.7	41.7	52.8	79.4	106.5	0	0	0
05:00:00	48.8	84.3	40.5	52.7	79.8	108.7	0	0	0
06:00:00	50.4	85.9	41.5	68.5	79.8	115.0	2	0	0
07:00:00	48.3	83.7	40.4	52.7	70.3	111.0	0	0	0
08:00:00	49.3	84.7	42.5	66.5	79.8	108.7	1	0	0
09:00:00	49.5	85.0	42.6	52.9	79.4	108.7	0	0	0
10:00:00	47.8	83.2	40.7	58.1	79.5	108.7	0	0	0
11:00:00	48.4	82.6	39.7	70.7	96.1	108.7	8	13	0

OVERALL LEQ: 50.4

$$L_d = 49.9$$

$$L_n = 51.1$$

$$L_{dn} = 57.4$$

Period 01:00 h:m

Time	LVL	SEL	Lmin	Lmax	Lpk	Lwppk	Ex	Pk	Ov	L5	L10	L33	L50	L67	L90
10:00:00	55.0	90.4	27.6	74.7	162.4	151.9	0	0	1	61	58	52	50	48	46
11:00:00	56.2	91.6	41.9	75.9	91.5	111.2	0	0	0	60	59	56	52	49	45
12:00:00	53.8	89.3	38.5	70.3	88.7	108.7	0	0	0	60	58	51	48	46	43
13:00:00	54.1	89.6	37.6	73.4	90.8	112.5	0	0	0	60	58	51	48	46	42
14:00:00	52.8	88.2	39.6	76.2	92.5	112.2	1	0	0	58	55	50	47	46	43
15:00:00	55.6	91.1	40.6	74.9	87.8	116.4	0	0	0	61	59	53	51	49	45
16:00:00	54.4	89.8	39.4	69.5	82.7	110.0	0	0	0	60	59	53	50	46	45
17:00:00	55.6	91.0	42.6	70.5	84.3	112.2	0	0	0	61	59	55	52	50	46
18:00:00	55.5	90.9	42.9	72.4	86.6	109.6	0	0	0	62	59	53	51	49	47
19:00:00	56.0	91.4	40.8	73.1	91.7	105.6	0	0	0	63	59	52	49	47	44
20:00:00	56.9	92.3	40.1	73.1	86.7	101.0	0	0	0	64	60	54	52	47	43
21:00:00	56.9	92.3	41.3	73.3	87.3	96.3	0	0	0	63	60	56	54	52	46
22:00:00	57.3	92.7	40.7	75.2	95.3	102.0	0	0	0	64	60	54	53	52	49
23:00:00	55.8	91.2	37.9	73.9	90.3	98.4	0	0	0	63	58	53	50	42	40
00:00:00	53.7	89.1	38.1	71.4	86.8	101.4	0	0	0	60	55	45	41	40	39
01:00:00	54.2	89.6	37.9	73.6	86.7	97.3	0	0	0	60	56	46	43	41	40
02:00:00	55.1	90.6	37.6	74.4	91.7	99.3	0	0	0	61	57	51	45	41	40
03:00:00	52.6	88.0	38.4	73.1	87.7	101.4	0	0	0	57	51	45	43	42	41
04:00:00	48.7	84.1	36.6	69.6	84.9	103.7	0	0	0	51	45	43	41	40	38
05:00:00	50.6	86.1	36.1	68.8	81.9	106.7	0	0	0	58	54	45	42	41	38
06:00:00	58.5	94.0	40.8	86.2	103.4	112.7	1	0	0	64	61	54	50	48	44
07:00:00	56.0	91.5	41.1	74.1	87.6	114.4	0	0	0	63	58	50	48	47	44
08:00:00	56.8	92.3	40.6	74.8	93.7	111.4	0	0	0	63	59	51	48	46	44
09:00:00	57.1	92.5	42.3	75.6	94.4	107.7	0	0	0	63	59	52	51	50	47

OVERALL LEQ: 55.4

$L_d = 55.7$

$L_n = 54.9$

$L_{dn} = 61.4$

Period 01:00 h:m

Time	LVL	SEL	Lmin	Lmax	Lpk	Lwpk	Ex	Pk	Qv	L5	L10	L33	L50	L67	L90
11:00:00	45.0	80.4	32.7	66.9	97.8	117.4	0	0	0	50	48	42	40	38	36
12:00:00	43.1	78.5	32.5	65.3	84.2	114.1	0	0	0	49	47	42	40	38	35
13:00:00	44.7	80.1	32.2	62.8	82.1	115.6	0	0	0	51	48	43	41	38	35
14:00:00	45.1	80.5	32.4	60.0	79.2	114.2	0	0	0	53	49	42	39	37	34
15:00:00	41.5	76.9	32.4	59.0	80.8	114.9	0	0	0	47	45	42	40	38	35
16:00:00	41.4	76.8	32.9	60.6	75.7	112.1	0	0	0	47	45	41	39	38	35
17:00:00	42.9	78.3	32.9	66.3	86.2	117.3	0	0	0	48	46	42	40	38	35
18:00:00	42.7	78.1	33.0	69.8	83.2	113.8	0	0	0	47	44	40	39	38	35
19:00:00	47.7	83.2	33.3	68.1	94.3	114.0	0	0	0	55	51	44	40	39	37
20:00:00	44.2	79.7	33.9	59.7	74.8	106.4	0	0	0	51	48	43	42	40	36
21:00:00	48.6	84.0	42.5	69.0	93.1	105.7	0	0	0	50	50	49	49	48	46
22:00:00	60.1	95.5	46.7	67.2	81.1	102.4	0	0	0	66	65	61	57	54	49
23:00:00	48.9	84.4	46.1	53.6	68.3	97.0	0	0	0	50	50	50	49	49	48
00:00:00	48.6	84.0	45.5	49.9	72.4	101.0	0	0	0	50	50	49	49	48	48
01:00:00	49.4	84.9	44.0	60.7	78.9	101.7	0	0	0	56	50	48	48	48	45
02:00:00	46.2	81.7	43.6	48.2	70.1	108.8	0	0	0	48	48	47	46	46	45
03:00:00	51.2	86.6	44.1	60.1	80.0	131.4	0	0	0	58	54	50	48	47	46
04:00:00	52.9	88.3	41.5	68.7	94.9	139.5	0	0	0	61	50	46	45	44	43
05:00:00	48.3	83.7	41.5	54.1	72.2	133.2	0	0	0	52	52	50	46	45	44
06:00:00	48.3	83.7	39.0	59.1	74.2	126.3	0	0	0	55	54	47	44	43	41
07:00:00	50.7	86.1	36.0	77.4	96.2	121.8	1	0	0	58	56	45	43	41	39
08:00:00	43.7	79.1	34.6	59.8	74.8	106.7	0	0	0	50	47	43	41	39	37
09:00:00	59.9	95.3	34.4	78.6	98.8	113.0	4	0	0	66	59	49	44	42	38
10:00:00	55.4	90.0	36.0	69.5	95.0	110.4	0	0	0	62	60	54	52	48	42

OVERALL LEQ: 51.7

$L_d = 50.8$

$L_n = 52.9$

$L_{dn} = 59.1$

INTERVAL REPORT
DATA FROM: TECN54

LARSON-DAVIS LABORATORIES

MODEL 870 SN A0155
09Jun1991 12:25:00

Period 01:00 h:m

Time	LVL	SEL	Lmin	Lmax	Lpk	Lwvpk	Ex	Pk	Ov
13:00:00	56.2	91.6	53.1	77.2	96.3	108.7	53	255	0
14:00:00	53.3	88.8	52.9	69.1	88.2	108.7	1	9	0
15:00:00	55.0	90.4	53.0	69.1	88.2	108.7	19	162	0
16:00:00	53.5	88.9	53.0	69.0	80.1	108.7	5	12	0
17:00:00	53.4	88.9	52.9	69.0	80.1	108.7	4	3	0
18:00:00	53.8	89.3	52.9	69.0	80.0	108.7	6	9	0
19:00:00	54.2	89.6	52.9	68.9	96.0	112.7	10	34	0
20:00:00	55.8	91.3	52.9	68.9	88.0	104.7	13	3	0
21:00:00	58.2	93.6	52.9	76.9	96.0	104.5	20	8	0
22:00:00	57.1	92.5	52.8	68.9	79.9	92.7	9	0	0
23:00:00	58.2	93.6	56.5	68.9	79.9	92.7	8	0	0
00:00:00	57.4	92.9	52.8	68.8	79.9	98.1	10	0	0
01:00:00	56.2	91.7	52.8	72.8	87.9	104.7	13	6	0
02:00:00	56.8	92.2	52.7	72.8	87.9	104.7	26	11	0
03:00:00	54.1	89.5	52.7	72.7	87.8	108.7	5	1	0
04:00:00	53.9	89.4	52.7	68.7	79.8	112.7	8	0	0
05:00:00	53.2	88.7	52.6	68.7	87.8	112.7	5	3	0
06:00:00	53.5	89.0	51.9	68.7	79.7	120.7	8	0	0
07:00:00	58.2	93.6	52.0	73.3	88.3	120.7	29	255	0
08:00:00	55.5	90.9	51.8	73.5	88.6	116.7	11	79	0
09:00:00	54.1	89.6	51.6	68.7	87.8	108.7	10	7	0
10:00:00	56.3	91.8	52.6	72.7	87.8	104.7	10	7	0
11:00:00	55.3	90.8	52.7	72.7	87.8	108.7	14	5	0
12:00:00	55.6	87.3	52.7	68.7	79.9	108.7	5	0	0

OVERALL LEQ: 55.7

$L_d = 55.5$

$L_n = 56.0$

$L_{dn} = 62.3$

INTERVAL REPORT
DATA FROM: TECN51A

LARSON-DAVIS LABORATORIES

MODEL 870 SN A0155
11Jun1991 13:09:28

Period 01:00 h:m

Time	LVL	SEL	Lmin	Lmax	Lpk	Lwpk	Ex	Pk	Ov
14:00:00	46.5	81.9	37.3	69.3	80.4	104.5	5	18	0
15:00:00	45.1	80.5	37.3	60.4	80.4	108.5	0	5	0
16:00:00	49.6	85.1	37.3	69.3	96.4	104.5	37	255	0
17:00:00	53.2	88.6	41.1	69.3	96.4	108.6	85	255	0
18:00:00	50.4	85.9	41.2	73.3	96.4	103.7	8	26	0
19:00:00	49.3	84.8	41.1	69.2	88.3	108.7	36	75	0
20:00:00	47.5	82.9	41.0	53.2	80.2	92.7	0	3	0
21:00:00	49.7	85.1	45.0	53.1	80.1	102.7	0	20	0
22:00:00	50.0	85.5	44.9	57.0	80.1	108.7	0	83	0
23:00:00	50.8	86.2	44.9	53.0	72.1	92.7	0	0	0
00:00:00	50.3	85.7	44.3	52.9	80.0	88.7	0	0	0
01:00:00	49.6	85.1	44.7	52.9	71.9	88.7	0	0	0
02:00:00	49.7	85.1	44.7	62.8	87.9	92.7	0	1	0
03:00:00	51.5	87.0	44.8	60.8	79.9	96.9	0	0	0
04:00:00	51.3	86.7	44.7	72.7	95.8	116.7	1	5	0
05:00:00	50.0	85.4	43.5	62.4	72.4	120.7	0	0	0
06:00:00	51.1	86.5	44.3	68.7	80.2	128.7	1	1	0
07:00:00	48.7	84.1	40.5	68.6	79.7	132.7	3	0	0
08:00:00	47.6	83.0	39.7	57.4	73.2	116.7	0	0	0
09:00:00	47.4	82.9	40.6	56.8	71.9	104.7	0	0	0
10:00:00	47.2	82.6	36.9	69.0	88.0	92.7	2	3	0
11:00:00	44.1	79.5	37.0	57.0	80.1	104.5	0	1	0
12:00:00	46.1	81.5	37.0	73.1	88.2	104.2	1	25	0
13:00:00	49.6	82.0	37.1	81.1	104.2	97.7	2	47	0

OVERALL LEQ: 49.5

$$L_d = 48.7$$

$$L_n = 50.5$$

$$L_{dn} = 56.7$$

Period 01:00 h:m

Time	LVL	SEL	Lmin	Lmax	Lpk	Lwppk	Ex	Pk	Ov	L5	L10	L33	L50	L67	L90
12:00:00	29.7	65.1	29.6	30.3	45.1	69.4	0	0	0	30	30	30	30	30	30
13:00:00	29.7	65.1	29.6	29.9	45.6	66.0	0	0	0	30	30	30	30	30	30
14:00:00	29.7	65.1	29.6	29.9	45.0	62.5	0	0	0	30	30	30	30	30	30
15:00:00	29.7	65.1	29.6	29.9	45.4	58.1	0	0	0	30	30	30	30	30	30
16:00:00	29.7	65.1	29.6	29.9	45.3	54.7	0	0	0	30	30	30	30	30	30
17:00:00	29.7	65.1	29.6	29.9	45.1	52.2	0	0	0	30	30	30	30	30	30
18:00:00	29.7	65.1	29.6	29.8	45.1	50.3	0	0	0	30	30	30	30	30	30
19:00:00	29.6	65.1	29.6	29.8	44.9	48.5	0	0	0	30	30	30	30	30	30
20:00:00	29.6	65.0	29.5	29.8	44.8	46.6	0	0	0	30	30	30	30	30	30
21:00:00	29.5	65.0	29.5	29.8	44.9	45.0	0	0	0	30	30	30	30	30	30
22:00:00	29.5	64.9	29.4	29.7	45.2	43.8	0	0	0	30	30	30	30	30	29
23:00:00	29.5	64.9	29.4	29.7	44.8	42.6	0	0	0	30	30	29	29	29	29
00:00:00	29.5	64.9	29.4	29.6	45.1	41.5	0	0	0	30	30	29	29	29	29
01:00:00	29.4	64.8	29.3	29.6	44.8	41.3	0	0	0	30	30	29	29	29	29
02:00:00	29.4	64.8	29.3	29.6	44.9	40.2	0	0	0	30	30	29	29	29	29
03:00:00	29.4	64.8	29.3	29.6	44.5	39.4	0	0	0	30	30	29	29	29	29
04:00:00	29.4	64.8	29.3	29.5	44.6	38.9	0	0	0	30	30	29	29	29	29
05:00:00	29.3	64.8	29.2	29.5	44.5	39.3	0	0	0	30	30	29	29	29	29
06:00:00	29.3	64.7	29.2	29.6	44.7	38.7	0	0	0	30	30	29	29	29	29
07:00:00	29.3	64.7	29.2	29.6	44.6	38.7	0	0	0	30	30	29	29	29	29
08:00:00	29.3	64.7	29.2	29.5	44.8	38.7	0	0	0	30	30	29	29	29	29
09:00:00	29.4	64.8	29.2	29.6	45.2	38.7	0	0	0	30	30	29	29	29	29
10:00:00	29.5	64.9	29.3	29.7	44.7	38.7	0	0	0	30	30	30	30	30	29
11:00:00	29.6	65.1	29.5	29.8	45.1	38.9	0	0	0	30	30	30	30	30	30

OVERALL LEQ: 29.5

$$L_d = 29.8$$

$$L_n = 29.4$$

$$L_{dn} = 35.9$$

Period 01:00 h:m

Time	LVL	SEL	Lmin	Lmax	Lpk	Lwv	Ex	Pk	Ov	L5	L10	L33	L50	L67	L90
12:00:00	42.3	77.8	32.3	60.3	74.7	111.5	0	0	0	49	46	41	39	37	34
13:00:00	47.7	83.2	33.3	61.9	74.7	114.1	0	0	0	54	53	47	44	42	37
14:00:00	47.1	82.6	35.4	61.9	77.8	117.8	0	0	0	54	51	46	44	42	39
15:00:00	45.3	80.8	32.9	70.8	88.6	113.0	0	0	0	47	45	42	41	38	36
16:00:00	43.2	78.6	33.0	69.1	82.1	114.8	0	0	0	48	46	41	39	37	35
17:00:00	45.3	80.8	34.0	65.7	80.5	117.7	0	0	0	52	48	44	41	40	36
18:00:00	48.6	84.0	33.8	63.6	79.5	115.4	0	0	0	55	49	42	40	38	36
19:00:00	42.8	78.3	33.5	59.1	77.3	119.0	0	0	0	49	46	41	39	38	36
20:00:00	44.4	79.8	33.4	62.8	77.3	112.5	0	0	0	48	45	42	41	39	36
21:00:00	52.6	88.1	41.5	69.4	97.0	107.5	0	0	0	58	56	53	49	47	44
22:00:00	55.0	90.5	45.8	66.3	78.1	95.6	0	0	0	60	60	55	55	53	47
23:00:00	50.1	85.5	44.5	61.6	79.6	92.8	0	0	0	57	52	48	47	47	46
00:00:00	44.7	80.1	40.8	47.9	69.0	101.1	0	0	0	48	47	47	44	44	44
01:00:00	44.8	80.2	42.2	51.5	71.8	111.4	0	0	0	46	46	45	45	44	44
02:00:00	44.1	79.5	41.0	50.6	70.6	123.4	0	0	0	47	46	45	44	43	43
03:00:00	42.0	77.4	39.4	46.6	72.5	124.4	0	0	0	44	44	43	43	41	41
04:00:00	43.0	78.4	39.9	49.4	76.3	129.2	0	0	0	48	46	43	42	42	42
05:00:00	40.3	75.7	38.0	47.4	68.0	120.5	0	0	0	43	42	41	41	40	40
06:00:00	49.0	84.5	37.9	76.2	92.6	112.6	1	0	0	54	50	46	44	42	40
07:00:00	47.9	83.3	37.4	65.9	80.7	106.0	0	0	0	56	53	43	42	41	39
08:00:00	49.3	84.7	35.0	67.4	85.2	103.1	0	0	0	56	53	46	43	42	38
09:00:00	44.4	79.8	34.1	65.8	81.8	111.2	0	0	0	49	48	45	43	40	37
10:00:00	46.8	82.2	32.8	69.1	99.2	114.8	0	0	0	54	50	44	42	39	36
11:00:00	41.1	70.5	32.5	57.2	90.3	112.2	0	0	0	47	45	41	39	37	35

OVERALL LEQ: 47.6

$L_d = 47.0$

$L_n = 48.5$

$L_{dn} = 54.7$

Period 01:00 h:m

Time	LVL	SEL	Lmin	Lmax	Lpk	Lwpk	Ex	Pk	Ov
13:00:00	56.1	91.5	52.3	73.3	88.4	108.7	199	199	0
14:00:00	55.2	90.6	49.2	73.2	88.3	112.7	60	88	0
15:00:00	55.8	91.2	50.7	81.2	96.3	108.7	19	74	0
16:00:00	58.6	94.0	53.1	84.7	96.3	112.7	31	111	0
17:00:00	55.3	90.8	53.1	69.1	96.2	108.7	37	48	0
18:00:00	58.3	93.8	53.1	77.1	96.2	112.7	114	229	0
19:00:00	56.1	91.6	53.1	73.4	96.2	112.7	18	100	0
20:00:00	57.5	92.9	53.1	69.1	88.2	108.7	143	115	0
21:00:00	62.7	98.1	56.5	81.0	96.1	96.8	255	255	0
22:00:00	60.1	95.6	53.0	69.0	80.1	96.8	255	255	0
23:00:00	57.4	92.8	53.0	69.0	80.1	88.7	12	20	0
00:00:00	57.0	92.5	52.9	69.0	80.1	91.2	12	47	0
01:00:00	57.4	92.8	52.9	72.9	88.1	96.7	35	139	0
02:00:00	57.0	92.4	52.5	68.9	88.0	104.7	11	29	0
03:00:00	56.7	92.1	52.8	69.6	80.8	115.0	10	11	0
04:00:00	55.2	90.6	52.9	68.9	80.0	124.7	7	0	0
05:00:00	54.2	89.6	52.8	69.3	88.3	128.7	15	23	0
06:00:00	55.3	90.7	52.4	69.6	80.9	124.7	21	15	0
07:00:00	53.8	89.3	50.7	68.8	79.9	128.7	16	0	0
08:00:00	55.2	90.6	50.8	72.9	95.9	104.7	33	72	0
09:00:00	53.7	89.2	52.4	69.1	80.4	104.8	2	9	0
10:00:00	55.5	90.9	52.6	72.9	88.0	108.7	25	25	0
11:00:00	57.8	93.2	52.0	76.7	89.0	112.7	93	89	0
12:00:00	53.9	89.4	50.8	69.2	96.0	104.7	8	79	0

OVERALL LEQ: 57.1

$L_d = 57.1$

$L_n = 57.0$

$L_{dn} = 63.4$

OCTAVE BAND NOISE SURVEY DATA SHEET

Date: 4/8/91 Day of week: SATURDAY Season: SPRING

Location number/description: NS-1 W of PROPOSED SITE CLOSE TO HILLSBOROUGH COUNTY

Windspeed: 3-6 mph 610 Wind direction: NE Temperature: 86°F

Weather: MOSTLY SUNNY

Survey meter model/serial number: QUEST 1800-100 22 / HP0030023 (SLM)
(OCTAVE BAND)

Calibrator model/serial number: QUEST CA-22 / J0040028

Meter response to calibrator: 110.0 dB

Time of survey: 1147 am

Data:

Octave Band Levels (dB)										A-weighted (dBA)
Center Frequency (Hertz)										
<u>31.5 Hz</u>	<u>63</u>	<u>125</u>	<u>250</u>	<u>500</u>	<u>1K</u>	<u>2K</u>	<u>4K</u>	<u>8K</u>	<u>16K</u>	
51.0	32.5	37.3	36.5	42.6	51.6	43.4	39.6	37.5	30.3	53.0

Sources of noise: WIND IN TREES, TRAFFIC IN DISTANCE, BIRDS,
DRAGLINE IN PROGRESS

Comments: COLLOCATED WITH LARSON DAVIS 870 AT BEGINNING
OF RUN

Jaf Baraid
Operator's signature

OCTAVE BAND NOISE SURVEY DATA SHEET

Date: 6/8/91 Day of week: SATURDAY Season: SPRING

Location number/description: NS-1

Windspeed: 2 mph Wind direction: NE Temperature: 78 °F

Weather: Clear

Survey meter model/serial number: QWST 1800-10022 / 11P0030023 (SLM)
HW 0100007 (OCTAVE BAND)

Calibrator model/serial number: QWST CA-22 / J0040028

Meter response to calibrator: 110.0 dB

Time of survey: 947 PM

Data:

Octave Band Levels (dB)

Center Frequency (Hertz)

31.5 Hz	63	125	250	500	1K	2K	4K	8K	16K	A-weighted (dBA)
30.3	30.7	44.8	58.5	48.6	50.8	57.0	41.4	43.1	30.7	59.8

Sources of noise: Insects, dragonfly, traffic in distance

Comments: Collocated with Larson Davis in the middle of the run.

J. G. Gaudard
Operator's signature

OCTAVE BAND NOISE SURVEY DATA SHEET

Date: 6/9/91 Day of week: Sunday Season: Spring

Location number/description: NS-1

Windspeed: 5-8 mph Wind direction: N-NW Temperature: 88°F

Weather: Mostly Sunny

Survey meter model/serial number: Quest 03-100 / HP0030023 (SLM)
1800-10022 / HW 0100007 (OCTAVE BAND)

Calibrator model/serial number: Quest CA-22 / J0040028

Meter response to calibrator: 110.0 dB

Time of survey: 1141 am

Data:

Octave Band Levels (dB)										A-weighted
Center Frequency (Hertz)										(dBA)
31.5 Hz	63	125	250	500	1K	2K	4K	8K	16K	
45.1	32.6	31.2	35.2	34.7	37.9	44.9	59.7	37.9	32.3	60.9

Sources of noise: Insects, Birds, Dragline, wind in Trees

Comments: Collocated with Larson Davis at end
of run

W. Baird
Operator's signature

OCTAVE BAND NOISE SURVEY DATA SHEET

Date: 6/8/91 Day of week: SATURDAY Season: SPRING

Location number/description: N-S W EDGE OF SITE

Windspeed: 3-6 mph 6/10 Wind direction: NE Temperature: 81°F

Weather: MOSTLY SUNNY

Survey meter model/serial number: QUEST 1800-10022 ^{DB-100} / HP0030023 ^(SLM) HW0100007 ^(OCTAVE BAND)

Calibrator model/serial number: QUEST CA-22 / 10040028

Meter response to calibrator: 110.0 dB

Time of survey: 1030 AM

Data:

Octave Band Levels (dB)										A-weighted
Center Frequency (Hertz)										(dBA)
31.5 Hz	63	125	250	500	1K	2K	4K	8K	16K	
30.4	33.9	48.4	42.0	40.2	49.2	38.6	44.6	43.6	32.1	52.3

Sources of noise: TRAFFIC ON SR 37, BIRDS, INSECTS,
GRASS RUSTLING

Comments: COLLOCATED W/ LARSON DAVIS 870 30 MINUTES
INTO ITS RUN

LaBarack
 Operator's signature

OCTAVE BAND NOISE SURVEY DATA SHEET

Date: 6/8/91 Day of week: Saturday Season: Spring

Location number/description: NS-2

Windspeed: 2 mph Wind direction: NE Temperature: 75°F

Weather: Clear

Survey meter model/serial number: Quest 0B-100 1800-10022 / HP 0030023 (SLM)
HW 01 00047 (OCTAVE BAND)

Calibrator model/serial number: Quest CA-22 / J0040028

Meter response to calibrator: 110.0 dB

Time of survey: 10:15 PM

Data:

Octave Band Levels (dB)										
Center Frequency (Hertz)										
31.5 Hz	125 63 Hz	250 125 Hz	500 250 Hz	1000 500 Hz	1K	2K	4K	8K	16K	A-weighted (dBA)
45.3	40.0	33.5	40.0	52.8		38.3	45.7	46.7	43.4	54.7

Sources of noise: Traffic, Insects

Comments: Collocated with Larson Davis at middle of run.

Ja Bonard
Operator's signature

OCTAVE BAND NOISE SURVEY DATA SHEET

Date: 6/9/91 Day of week: Sunday Season: Spring

Location number/description: NS-2

Windspeed: 3-6 mph @ 610' Wind direction: NE Temperature: 82°F

Weather: Mostly Sunny

Survey meter model/serial number: Quest 1800-10022 / OB-100 / HP0030023 (SLM) / HW0100007 (OCTAVE BAND)

Calibrator model/serial number: Quest CA-22 / J0040028

Meter response to calibrator: 110.0 dB

Time of survey: 954 am

Data:

Octave Band Levels (dB)										A-weighted (dBA)
31.5 Hz	63	125	250	500	1K	2K	4K	8K	16K	
37.6	34.0	34.5	30.2	33.1	45.3	46.7	39.1	40.2	30.3	50.6

Sources of noise: Traffic, Birds, Insects, wind in trees
and Grass

Comments: Collocated with Larson Davis at the
end of its run.

JA Baird
Operator's signature

OCTAVE BAND NOISE SURVEY DATA SHEET

Date: 6/9/91 Day of week: SUNDAY Season: SPRING
 Location number/description: N5-3 1 1/2 mi S of 630, 1/4 mi ^W of ^{PT} GREEN RD
 Windspeed: 4-7 mph Wind direction: S Temperature: 88°F
 Weather: MOSTLY SUNNY
 Survey meter model/serial number: QUEST 1800-10022 / HP0030023 (5CM) / HWO100007 (OCTAVE BAND)
 Calibrator model/serial number: QUEST CA-22 / J0040028
 Meter response to calibrator: 110.0 dB
 Time of survey: 1103 am
 Data:

Octave Band Levels (dB)										A-weighted (dBA)
Center Frequency (Hertz)										
<u>31.5 Hz</u>	<u>63</u>	<u>125</u>	<u>250</u>	<u>500</u>	<u>1K</u>	<u>2K</u>	<u>4K</u>	<u>8K</u>	<u>16K</u>	
42.7	32.3	34.6	32.1	30.8	32.1	34.7	34.8	37.4	30.3	42.3

Sources of noise: BIRDS, INSECTS, AIRPLANE, GRASS & TREES
RUSTLING, TRAFFIC ON PT GREEN RD
 Comments: COLLOCATED WITH 870 AT BEGINNING OF PWD.


 Operator's signature

OCTAVE BAND NOISE SURVEY DATA SHEET

Date: 6/9/91 Day of week: Sunday Season: Spring

Location number/description: N 5-3

Windspeed: 1-2 mph Wind direction: S-SW Temperature: 78°F

Weather: Mostly Cloudy

Survey meter model/serial number: Quest 9B-100 / HP 0030023 (SLM)
1800-10022 / HW 0100007 (OCTAVE BAND)

Calibrator model/serial number: Quest CA-22 / J0040028

Meter response to calibrator: 110.0 dB

Time of survey: 9:15 PM

Data:

Octave Band Levels (dB)
Center Frequency (Hertz)

31.5 Hz	63	125	250	500	1K	2K	4K	8K	16K	A-weighted (dBA)
<u>66.1</u>	<u>29.9</u>	<u>40.4</u>	<u>46.6</u>	<u>31.2</u>	<u>38.0</u>	<u>37.2</u>	<u>50.6</u>	<u>43.0</u>	<u>30.6</u>	<u>52.4</u>

Sources of noise: Insects, Frogs, Traffic in Distance, Airplane

Comments: Collocated with Larson Davis at
middle of the run.

J. Barnard
Operator's signature

OCTAVE BAND NOISE SURVEY DATA SHEET

Date: 6/10/91 Day of week: Monday Season: Spring
 Location number/description: NS-3
 Windspeed: 3-6 mph Wind direction: S Temperature: 85°F
 Weather: Partly Cloudy
 Survey meter model/serial number: Quest OB-100 1800-10022 / HP0030023 (SLM)
HW0100007 (OCTAVE BAND)
 Calibrator model/serial number: Quest CA-22 / J0040028
 Meter response to calibrator: 109.7 dB
 Time of survey: 1040 am
 Data:

Octave Band Levels (dB)										A-weighted (dBA)
Center Frequency (Hertz)										
<u>31.5 Hz</u>	<u>63</u>	<u>125</u>	<u>250</u>	<u>500</u>	<u>1K</u>	<u>2K</u>	<u>4K</u>	<u>8K</u>	<u>16K</u>	
30.7	31.7	37.1	31.1	36.4	40.7	34.2	36.8	37.0	30.3	44.4

Sources of noise: Birds, Insects, Tractor, Airplane, Train in distance.
 Comments: Collocated with Larson Davis at end of run.

LaBarnard
 Operator's signature

OCTAVE BAND NOISE SURVEY DATA SHEET

Date: 6/9/91 Day of week: SUNDAY Season: SPRING
 Location number/description: NS-4 AT AGRICO FT GREEN MINE
 Windspeed: 5-7 mph Wind direction: NE Temperature: 88°F
 Weather: MOSTLY SUNNY
 Survey meter model/serial number: QVET 1800-10022 / HP0030023 (SLM)
HW0100007 (OCTAVE BAND)
 Calibrator model/serial number: QVET CA-22/10040028
 Meter response to calibrator: 110.0 dB
 Time of survey: 1225 PM
 Data:

Octave Band Levels (dB)										A-weighted (dBA)
Center Frequency (Hertz)										
<u>31.5 Hz</u>	<u>63</u>	<u>125</u>	<u>250</u>	<u>500</u>	<u>1K</u>	<u>2K</u>	<u>4K</u>	<u>8K</u>	<u>16K</u>	
40.9	40.0	37.7	42.6	50.1	48.2	45.6	43.2	38.5	30.5	53.0

Sources of noise: BIRDS, MINE OPERATION, TRAFFIC ON
ENTRANCE ROAD

Comments: COLLOCATED WITH 870 AT BEGINNING OF RUN.

M. B. Baird
 Operator's signature

OCTAVE BAND NOISE SURVEY DATA SHEET

Date: 6/9/91 Day of week: Sunday Season: Spring

Location number/description: NS-4

Windspeed: 1-2 mph Wind direction: N Temperature: 77°F

Weather: Partly Cloudy

Survey meter model/serial number: Quest 1800-10022 / HP0036623 (SLM)
OB-100 / HWO100007 (OCTAVE BAND)

Calibrator model/serial number: QUEST CA-22 / J00 40028

Meter response to calibrator: 110.0 dB

Time of survey: 9:50 PM

Data:

Octave Band Levels (dB)										A-weighted (dBA)
Center Frequency (Hertz)										
<u>31.5 Hz</u>	<u>63</u>	<u>125</u>	<u>250</u>	<u>500</u>	<u>1K</u>	<u>2K</u>	<u>4K</u>	<u>8K</u>	<u>16K</u>	
38.5	42.1	40.8	43.0	52.3	51.3	45.7	43.0	45.3	31.1	55.1

Sources of noise: Insects, Traffic, Mine Operation

Comments: Collocated w/ Larson Davis at middle
of the run

M. Barnd
Operator's signature

OCTAVE BAND NOISE SURVEY DATA SHEET

Date: 6/10/91 Day of week: Monday Season: Spring
 Location number/description: NS-4
 Windspeed: 8-10 mph Wind direction: W Temperature: 88°F
 Weather: Mostly Sunny
 Survey meter model/serial number: Quest 0B-100 / HP0030023 (S.M.)
1800-10022 / HW0100007 (OCTAVE BAND)
 Calibrator model/serial number: Quest CA-22 / J0040028
 Meter response to calibrator: 109.6 dB
 Time of survey: 1220 PM
 Data:

Octave Band Levels (dB)										A-weighted (dBA)
Center Frequency (Hertz)										
<u>31.5 Hz</u>	<u>63</u>	<u>125</u>	<u>250</u>	<u>500</u>	<u>1K</u>	<u>2K</u>	<u>4K</u>	<u>8K</u>	<u>16K</u>	
41.9	43.2	36.9	52.9	49.5	44.8	47.2	42.3	38.7	30.3	52.9

Sources of noise: Mine Operation, Train being loaded, Birds

Comments: Collocated with Larson Davis at the
end of the run.

MaBarard
 Operator's signature

OCTAVE BAND NOISE SURVEY DATA SHEET

Date: 6/11/91 Day of week: TUESDAY Season: SPRING

Location number/description: NS-1

Windspeed: 5-7 mph Wind direction: N Temperature: 90°F

Weather: PARTLY CLOUDY

Survey meter model/serial number: QUEST 1800-100-22 / HP0030023 (SLM) / HW0100007 (OCTAVE BAND)

Calibrator model/serial number: QUEST CA-22 / J0040028

Meter response to calibrator: 109.9 dB

Time of survey: 130 PM

Data:

Octave Band Levels (dB)										A-weighted (dBA)
Center Frequency (Hertz)										
<u>31.5 Hz</u>	<u>63</u>	<u>125</u>	<u>250</u>	<u>500</u>	<u>1K</u>	<u>2K</u>	<u>4K</u>	<u>8K</u>	<u>16K</u>	
40.8	32.9	45.0	39.1	35.6	34.1	37.3	36.6	37.0	30.3	43.6

Sources of noise: BIRDS, PLANES, DRAGLINE, TRAFFIC

Comments: COLLOCATED W/ 870 AT BEGINNING OF RUN

MyBarnard
Operator's signature

OCTAVE BAND NOISE SURVEY DATA SHEET

Date: 6/11/91 Day of week: Tuesday Season: Spring

Location number/description: NS-1

Windspeed: 3-5 mph Wind direction: N Temperature: 77°F

Weather: Clear

Survey meter model/serial number: QWST 0B-100 1800-10022 / HP 00300 23 (SLM) HW 01,00007 (OCTAVE BAND)

Calibrator model/serial number: QWST CA-22 / J004028

Meter response to calibrator: 109.9 dB

Time of survey: 9 35 PM

Data:

Octave Band Levels (dB)										A-weighted (dBA)
31.5 Hz	63	125	250	500	1K	2K	4K	8K	16K	
<u>55.6</u>	<u>30.3</u>	<u>34.0</u>	<u>35.0</u>	<u>42.7</u>	<u>40.0</u>	<u>33.6</u>	<u>42.1</u>	<u>40.0</u>	<u>34.2</u>	<u>47.1</u>

Sources of noise: Dragline, Insects, Airplane, Birds

Comments: Collocated with Larson Davis at middle
of run.

LaBarrard
Operator's signature

OCTAVE BAND NOISE SURVEY DATA SHEET

Date: 6/12/91 Day of week: Wednesday Season: Spring

Location number/description: N5-1

Windspeed: 3-5 mph Wind direction: NE Temperature: 90°F

Weather: Mostly Sunny

Survey meter model/serial number: Quest 1800-10022 / HP 0030023 (SLM)
HW 0100007 (OCTAVE BAND)

Calibrator model/serial number: Quest CA-22 / 50040028

Meter response to calibrator: 110.0 dB

Time of survey: 125 PM

Data:

Octave Band Levels (dB)										
Center Frequency (Hertz)										
31.5 Hz	63	125	250	500	1K	2K	4K	8K	16K	A-weighted (dBA)
42.6	37.8	35.9	39.3	44.6	40.4	41.7	39.3	36.8	30.2	47.8

Sources of noise: Dragline, Buds, Insects

Comments: Collocated with Larson Davis at the end of the run.

Sh. Barand
Operator's signature

OCTAVE BAND NOISE SURVEY DATA SHEET

Date: 6/11/91 Day of week: TUESDAY Season: SPRING
 Location number/description: NS-2
 Windspeed: 3-5 mph Wind direction: NE Temperature: 85°F
 Weather: MOSTLY CLOUDY
 Survey meter model/serial number: QUEST 1300-10022 ^{OB-100} / HP 003 0023 ^(3M) HW0100007 ^(OCTAVE BAND)
 Calibrator model/serial number: QUEST CA-22/J0040028
 Meter response to calibrator: 109.9 dB
 Time of survey: 1200 PM
 Data:

Octave Band Levels (dB)										A-weighted (dBA)
Center Frequency (Hertz)										
<u>31.5 Hz</u>	<u>63</u>	<u>125</u>	<u>250</u>	<u>500</u>	<u>1K</u>	<u>2K</u>	<u>4K</u>	<u>8K</u>	<u>16K</u>	
38.8	31.6	48.8	38.8	36.0	41.7	37.1	37.1	41.2	31.4	46.4

Sources of noise: BIRDS, INSECTS, TREES & GRASS rustling
TRAFFIC ON SR 37
 Comments: COLLOCATED WITH 870 AT BEGINNING
OF RUN

LaBarnard
 Operator's signature

OCTAVE BAND NOISE SURVEY DATA SHEET

Date: 6/11/91 Day of week: Tuesday Season: Spring

Location number/description: N5-2

Windspeed: 3-5 mph Wind direction: N Temperature: 77°F

Weather: clear

Survey meter model/serial number: Qwest OB-100 HP0050023 (SLM)
1800-10022 HW0100007 (OCTAVE BAND)

Calibrator model/serial number: Quest CA-22 / J0040028

Meter response to calibrator: 109.9 dB

Time of survey: 950 PM

Data:

Octave Band Levels (dB)

Center Frequency (Hertz)

31.5 Hz	63	125	250	500	1K	2K	4K	8K	16K	A-weighted (dBA)
---------	----	-----	-----	-----	----	----	----	----	-----	---------------------

58.6 33.0 37.3 41.6 47.8 45.6 39.1 31.4 52.2

Sources of noise: Traffic Insects

Comments: Collocated with Larson Davis at
middle of the run

M. Barard
Operator's signature

OCTAVE BAND NOISE SURVEY DATA SHEET

Date: 6/12/91 Day of week: Wednesday Season: Spring

Location number/description: NS-2

Windspeed: 3-5 mph Wind direction: NE Temperature: 89°F

Weather: Mostly Sunny

Survey meter model/serial number: Quest 0B-100 / HP0030023 (SLM)
1800-10022 / HW0100007 (OCTAVE BAND)

Calibrator model/serial number: Quest CA-22 / J0040028

Meter response to calibrator: 110.0 dB

Time of survey: 1155 AM

Data:

Octave Band Levels (dB)										A-weighted (dBA)
Center Frequency (Hertz)										
<u>31.5 Hz</u>	<u>63</u>	<u>125</u>	<u>250</u>	<u>500</u>	<u>1K</u>	<u>2K</u>	<u>4K</u>	<u>8K</u>	<u>16K</u>	
46.3	41.5	41.6	41.0	45.6	44.7	43.1	40.8	41.6	31.5	50.1

Sources of noise: Traffic, Birds, Insects, Airplane

Comments: Collocated with Larson Davis at the
end of the run.

Jo Barard
Operator's signature

OCTAVE BAND NOISE SURVEY DATA SHEET

Date: 6/10/91 Day of week: MONDAY Season: SPRING

Location number/description: NS-3

Windspeed: 3-5 mph Wind direction: S Temperature: 87°F

Weather: MOSTLY SUNNY

Survey meter model/serial number: QUEST 1800-10022 / OB-100 / HP0030023 (SLM)
HW0100007 (OCTAVE BAND)

Calibrator model/serial number: QUEST CA-22 / J0040028

Meter response to calibrator: 109.6 dB

Time of survey: 1125 AM

Data:

Octave Band Levels (dB)										A-weighted (dBA)
Center Frequency (Hertz)										
<u>31.5 Hz</u>	<u>63</u>	<u>125</u>	<u>250</u>	<u>500</u>	<u>1K</u>	<u>2K</u>	<u>4K</u>	<u>8K</u>	<u>16K</u>	
31.5	32.0	30.3	32.0	32.5	32.0	36.8	39.4	37.6	30.4	43.5

Sources of noise: BIRDS, INSECTS, TRACTOR

Comments: COLLOCATED WITH B70 AT BEGINNING OF RUN

M. Barnard
Operator's signature

OCTAVE BAND NOISE SURVEY DATA SHEET

Date: 4/10/91 Day of week: Monday Season: Spring

Location number/description: NS-3

Windspeed: 3-5 mph Wind direction: S Temperature: 77°F

Weather: clear

Survey meter model/serial number: Quest 0B-100 / 1800-10022 / HP 0030023 (SLM) / HW 0100007 (OCTAVE BAND)

Calibrator model/serial number: Quest CA-22 / 50040028

Meter response to calibrator: 109.4 dB

Time of survey: 9:15 PM

Data:

Octave Band Levels (dB)										A-weighted (dBA)
Center Frequency (Hertz)										
<u>31.5 Hz</u>	<u>63</u>	<u>125</u>	<u>250</u>	<u>500</u>	<u>1K</u>	<u>2K</u>	<u>4K</u>	<u>8K</u>	<u>16K</u>	
44.5	37.7	30.3	30.7	39.1	36.8	37.2	51.8	42.2	30.5	53.4

Sources of noise: Train, Insects, cow

Comments: Collocated with Larson Davis at middle
of the run

M. Barrard
Operator's signature

OCTAVE BAND NOISE SURVEY DATA SHEET

Date: 4/11/91 Day of week: Tuesday Season: Spring

Location number/description: N5-3

Windspeed: 5-7 mph Wind direction: S Temperature: 85°F

Weather: Mostly Sunny

Survey meter model/serial number: Quist OB-100 1800-10022 / HP0030023 (SLM)
HW 0100007 (OCTAVE BAND)

Calibrator model/serial number: Quist CA-22 / J0040028

Meter response to calibrator: 109.9 dB

Time of survey: 1110 am

Data:

Octave Band Levels (dB)										A-weighted (dBA)
Center Frequency (Hertz)										
<u>31.5 Hz</u>	<u>63</u>	<u>125</u>	<u>250</u>	<u>500</u>	<u>1K</u>	<u>2K</u>	<u>4K</u>	<u>8K</u>	<u>16K</u>	
35.5	30.3	30.3	30.3	32.8	31.9	38.5	39.2	36.5	30.4	44.2

Sources of noise: Birds, Insects, Airplane, wind in trees
and grass, Traffic in distance

Comments: collocated with Larson Davis at mid-stab
the end of the run

J. A. Baurand
 Operator's signature

OCTAVE BAND NOISE SURVEY DATA SHEET

Date: 6/10/91 Day of week: MONDAY Season: SPRING

Location number/description: NS-4

Windspeed: 8-10 mph Wind direction: W Temperature: 88°F

Weather: MOSTLY SUNNY

Survey meter model/serial number: QUEST 0B-100 / HP0030023 (SLM)
1800-19022 / HW0100007 (OCTAVE BAND)

Calibrator model/serial number: QUEST CA-22 / J0040028

Meter response to calibrator: 109.6 dB

Time of survey: 100 PM

Data:

Octave Band Levels (dB)										A-weighted (dBA)
Center Frequency (Hertz)										
<u>31.5 Hz</u>	<u>63</u>	<u>125</u>	<u>250</u>	<u>500</u>	<u>1K</u>	<u>2K</u>	<u>4K</u>	<u>8K</u>	<u>16K</u>	
48.0	41.7	35.3	37.9	47.8	44.4	42.2	39.0	36.8	30.3	49.7

Sources of noise: MINE OPERATION, BIRDS, TREES, RUSTLING,

TRAIN BEING LOADED, TRAFFIC ON ENTRANCE RD

Comments: COLLOCATED W/ 870 AT BEGINNING OF RUN.

M. Barnard
Operator's signature

OCTAVE BAND NOISE SURVEY DATA SHEET

Date: 6/10/91 Day of week: Monday Season: Spring

Location number/description: N5-4

Windspeed: 1-2 mph Wind direction: NE Temperature: 75°F

Weather: Clear

Survey meter model/serial number: Quest 08-100 1800-10022 / HP0030023 (SLM) HW0100007 (OCTAVE BAND)

Calibrator model/serial number: Quest CA-22 / J0040028

Meter response to calibrator: 109.6 dB

Time of survey: 9:12 PM

Data:

Octave Band Levels (dB)
Center Frequency (Hertz)

31.5 Hz	63	125	250	500	1K	2K	4K	8K	16K	A-weighted (dBA)
37.5	41.9	43.3	43.4	51.6	48.6	44.6	41.9	45.2	30.7	57.2

Sources of noise: Mine Operation, Insects, Traffic

Comments: Collocated with Larson Dams at middle of run

John Barnard
Operator's signature

OCTAVE BAND NOISE SURVEY DATA SHEET

Date: 6/11/91 Day of week: Tuesday Season: Spring
 Location number/description: NS-4
 Windspeed: 3-5 mph Wind direction: NE Temperature: 86°F
 Weather: Partly Cloudy
 Survey meter model/serial number: Quest OB-100 / HP003 0023 (SLM)
1800-10022 / HW 0100007 (OCTAVE BAND)
 Calibrator model/serial number: Quest CA-22 / J6040028
 Meter response to calibrator: 109.9 dB
 Time of survey: 1255 PM
 Data:

Octave Band Levels (dB)										A-weighted (dBA)
Center Frequency (Hertz)										
<u>31.5 Hz</u>	<u>63</u>	<u>125</u>	<u>250</u>	<u>500</u>	<u>1K</u>	<u>2K</u>	<u>4K</u>	<u>8K</u>	<u>16K</u>	
<u>40.4</u>	<u>39.6</u>	<u>36.6</u>	<u>43.3</u>	<u>44.4</u>	<u>48.3</u>	<u>46.3</u>	<u>42.8</u>	<u>37.2</u>	<u>30.3</u>	<u>52.9</u>

Sources of noise: Mine Operation, Birds, Insects

Comments: Collocated at end of the run with the
Larson Davis

Ja Barone
 Operator's signature

APPENDIX 11.13

HAZARDOUS MATERIALS/WASTES SUPPORTING INFORMATION

- 11.13.1 PRELIMINARY SPILL PREVENTION, CONTROL, AND COUNTERMEASURE PLAN**
- 11.13.2 PRELIMINARY RESOURCE CONSERVATION AND RECOVERY ACT CONTINGENCY PLAN**
- 11.13.3 TOXICITY CHARACTERISTIC LEACHING PROCEDURE ANALYSES OF GASIFICATION PROCESS MATERIALS**

**11.13.1 PRELIMINARY SPILL
PREVENTION, CONTROL,
AND COUNTERMEASURE PLAN**

PRELIMINARY
SPILL PREVENTION, CONTROL, AND
COUNTERMEASURE PLAN
FOR
TAMPA ELECTRIC COMPANY
POLK POWER STATION

July 1992

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Discussion of Conformance of SPCC Plan with Sections of 40 CFR 112.7	4
Water Pollution Contingency Plan	8

PRELIMINARY
SPILL PREVENTION, CONTROL, AND
COUNTERMEASURE PLAN (SPCC)

FACILITIES COVERED BY SPCC PLAN

Tank Number	Product Stored	Capacity (gallons)	Containment
1	No. 2 fuel oil	3,000,000	Secondary containment berm
2	No. 2 fuel oil	3,000,000	Secondary containment berm
3	No. 2 fuel oil	3,000,000	Secondary containment berm

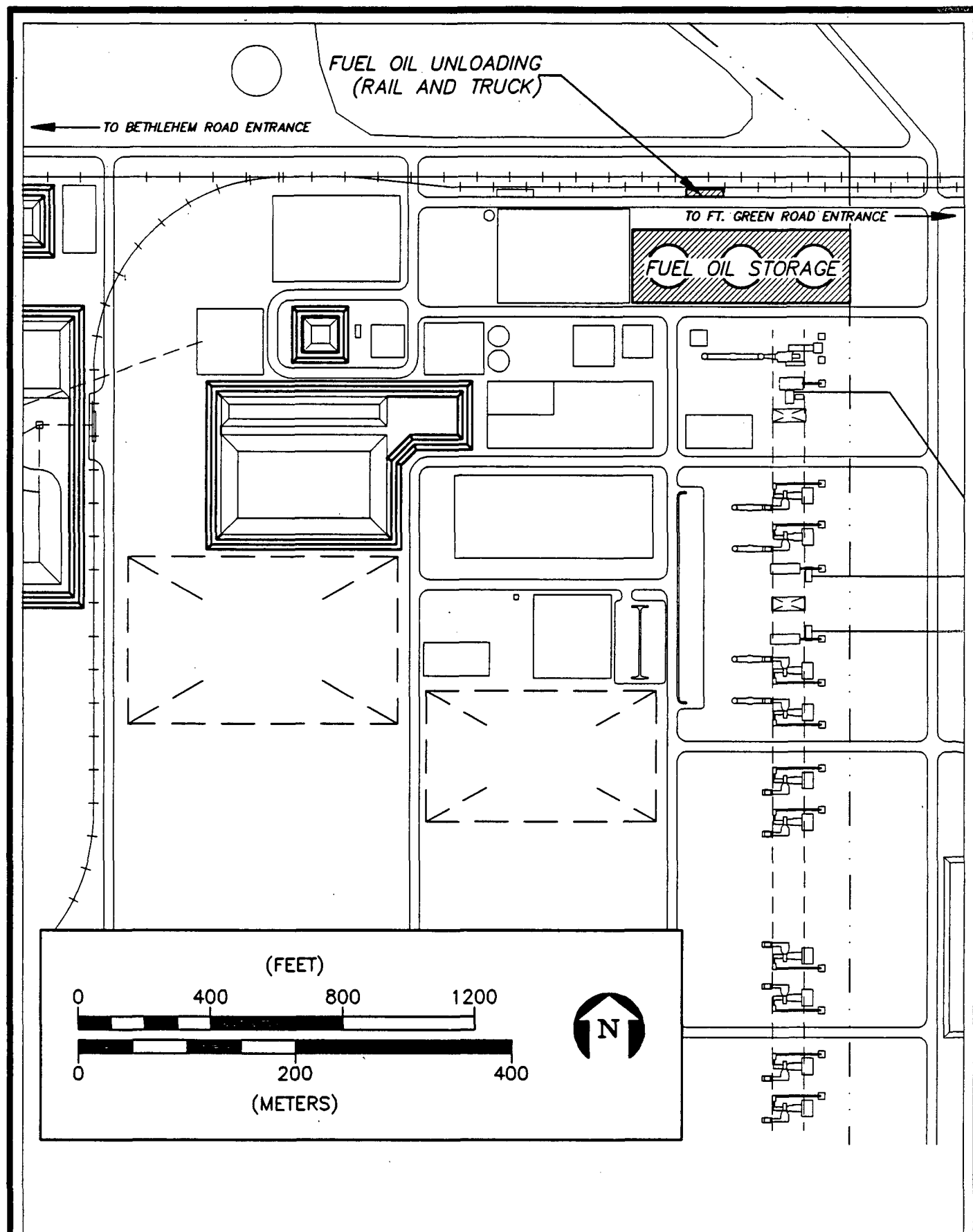


FIGURE 1.

POLK POWER STATION FUEL OIL STORAGE
LOCATION

Source: ECT, 1992.



**POLK
POWER
STATION**

**DISCUSSION OF CONFORMANCE OF SPCC PLAN
WITH SECTIONS OF 40 CFR 112.7**

Section

Discussion

- 112.7 (a) No spill events have been experienced by Polk Power Station. The facility is scheduled to begin operations in 1995.
- (b) Experience has indicated the potential for a spill due to equipment failure is low. However, any spill due to equipment failure could be controlled by proposed containment structures.
- (c) All fuel oil storage facilities will be surrounded by berms which are sufficiently impervious to prevent discharged oil from reaching a navigable water course. The facilities covered by this SPCC Plan will be equipped with the preventive system identified:

<u>Tank No.</u>	<u>Product Stored</u>	<u>Preventive System</u>
1	No. 2 fuel oil	Secondary containment berm
2	No. 2 fuel oil	Secondary containment berm
3	No. 2 fuel oil	Secondary containment berm

- (d) Not applicable since 112.7(c) is practicable.
- (e) (1) Facility Drainage
- (i) Drainage from bermed areas will be restrained by valves. If the operator detects the presence of oil in the accumulated water, appropriate cleanup procedures would be completed prior to discharge.
- (ii) Valves used for drainage of bermed areas will be of manual, open-and-close design.
- (iii) Not applicable since other preventive measures will be employed.
- (iv) Not applicable since (i), (ii), and (iii) will be met.
- (v) Not applicable since (i), (ii), and (iii) will be met.

(2) Bulk Storage Tanks (No. 2 Fuel Oil Storage Tanks)

- (i) All tanks used for the storage of petroleum products will be constructed of cathodically protected coated steel which is compatible with the material stored and the conditions of storage.
- (ii) Bulk storage tank installations will be constructed so that a secondary means of containment is provided for the entire contents of the single largest tank plus sufficient freeboard to allow for precipitation. Berms will be constructed of material impervious to spilled contents.
- (iii) Accumulated rainwater in the bermed areas will be inspected for the presence of oil prior to being discharged to the drainage system. If water is contaminated, cleanup procedures will be completed prior to pumping.
- (iv) Not applicable since tanks will be aboveground.
- (v) Not applicable since tanks will be aboveground.
- (vi) Aboveground tanks will be frequently observed for signs of deterioration or leaking. Leaks will be immediately reported and repaired.
- (vii) Not applicable since heating lines will be external.
- (viii) A gauger will be present during all unloading or transferring operations. When a tank becomes full, the gauger will either begin filling another tank or contact the pumping station to suspend pumping.
- (ix) Not applicable since there will be no discharge of effluents from facility to navigable waters.
- (x) Visible leaks causing an accumulation of oil in bermed areas will be immediately repaired.
- (xi) Not applicable since no mobile or portable oil storage tanks will be onsite.

(3) Facility Transfer Operations, Pumping, and In-Plant Process

- (i) All buried piping will be protected against corrosion using coatings suitable for the surrounding soils.

- (ii) Pipelines, when out-of-service for an extended period of time, will be blank-flanged and marked as to origin.
 - (iii) Pipe supports for aboveground piping will be designed to minimize abrasion and corrosion and allow for expansion and contraction.
 - (iv) All aboveground valves and pipelines will be inspected at least quarterly.
 - (v) When aboveground piping is located close to roadways, appropriate signs will be placed to warn vehicle operators of their presence.
- (8) Inspections and Records
- (i) Inspection records required by this plan will be made part of this SPCC Plan and will be maintained for a period of 3 years.
- Inspections will be conducted according to the following schedule:
Storage tanks--at least quarterly, and
Transfer facilities--at least quarterly.
- (9) Security
- (i) Polk Power Station will be surrounded by a fence. The station and gates will be manned 24 hours per day.
 - (ii) Any valves which would allow direct outward flow of oil will be securely locked in the closed position when not in use.
 - (iii) The oil transfer pumps will be located in areas of the facility accessible only to authorized personnel.
 - (iv) All transfer pipelines which will have a potential for oil spillage will be capped or blank-flanged when not in use.
 - (v) The lighting in the areas of the bulk storage facility and oil pipelines will be adequate to detect oil spills and deter vandalism.

(10) Personnel, Training, and Spill Prevention Procedures

- (i) An annual briefing will be conducted for plant operators and fuel-handling personnel to assure adequate understanding of the SPCC Plan.
- (ii) A person will be designated to be responsible for oil spill prevention at Polk Power Station.
- (iii) The annual briefing will emphasize proper operating procedures, maintenance of equipment, inspections, reporting procedures, oil containment and cleanup procedures, and a review of any recent oil spills.

WATER POLLUTION CONTINGENCY PLAN

Tampa Electric Company will establish a contract with a qualified Responding Agent prior to commercial operation of the Polk Power Station. The contract with the Responding Agent will be for the following environmental services which may include, but are not limited to the following:

1. Emergency response;
2. Operation and maintenance of pollution control, containment, and cleanup equipment; and
3. Hazardous material cleanup.

RESPONSE PROCEDURES

DISCOVERY AND NOTIFICATION

If an accidental, minor, or major oil spill occurs or any person observes an oil spill or sheen of any quantity that was generated by Tampa Electric Company, the Supervisor of Plant Operations (SPO) or Environmental Coordinator will be notified immediately. The SPO or Environmental Coordinator will then notify the following:

1. Responding Agent, and
2. Tampa Electric Company Environmental Department.

Information such as source, quantity, oil type, and whether or not the discharge has been stopped will be provided if possible. When notifying the responding agent, only those individuals designated as representatives of Tampa Electric Company may issue a Notice to Proceed or a Purchase Order.

SOURCE ELIMINATION

Commensurate with notification, appropriate steps will be taken to stop the discharge. Steps will include, but not be limited to, securing valves, capping lines, damming drainage ditches, etc. Appropriate measures will be taken to minimize any fire hazard should conditions warrant.

CONTAINMENT

In accordance with Section 376.065(3), Florida Statutes, Tampa Electric Company facilities will have the requisite amount of boom to initiate a first response and attempt to contain an oil spill.

CLEANUP

Facility cleanup capability will be limited to a potential first containment response. The designated Responding Agent will be retained for actual cleanup. Cleanup will include, but not be limited to, the following:

1. Use of available oil skimmers, vacuum pumps, oil separators, etc.;
2. Transfer of contaminated water to other containment such as slop tanks, tank trucks, barges, unused storage tanks, etc.; and
3. Manual removal of contamination from the water-using absorbents.

**11.13.2 PRELIMINARY RESOURCE CONSERVATION
AND RECOVERY ACT CONTINGENCY PLAN**

PRELIMINARY
RESOURCE CONSERVATION AND RECOVERY ACT
CONTINGENCY PLAN
FOR
TAMPA ELECTRIC COMPANY
POLK POWER STATION

July 1992

**PRELIMINARY
RESOURCE CONSERVATION AND RECOVERY ACT
CONTINGENCY PLAN**

In the event of a fire or explosion involving hazardous wastes, the Emergency Response Plan for the Plant will be implemented to contain, control, and extinguish the fire. In the event of a spill or other release to the land or stormwater drainage system, the employee who observes the event will first take steps to contain or control the spill until additional assistance is obtained. At this time, the Spill Prevention Countermeasures and Control (SPCC) Plan for Polk Power Station will be implemented to contain and control the release. In the event of a fire or explosion, the Emergency Response Plan for Polk Power Station will be implemented. The following sequence of actions are followed in response to a spill, fire, explosion, or other release of hazardous wastes:

- In all cases, the Plant Environmental Coordinator is the primary Emergency Coordinator. The Emergency Coordinator will activate the onsite communications system in order to direct cleanup activities, as needed. In the absence of the Emergency Coordinator, the Supervisor of Plant Operations will carry out immediate activities until the Emergency Coordinator arrives at the release location.
- The Emergency Coordinator or Supervisor of Plant Operations will identify the character, source, amount, and areal extent of released materials by any means appropriate.
- The Emergency Coordinator will make arrangements with emergency response teams, police, and fire departments and hospitals, as required, to obtain appropriate emergency services.
- The Emergency Coordinator will notify Tampa Electric Company Environmental Department with information regarding the incident.
- The Emergency Coordinator will supervise cleanup activities at the site ensuring that all hazardous wastes and contaminated materials are collected and disposed of properly. Emergency equipment will be rehabilitated before normal operations resume.

- Environmental Department will notify appropriate local, State, and Federal agencies with a written report within 15 days of the event.

Prior to commencement of operation of the Polk Power Station, the following will be incorporated in addition to the previous discussion in order to make this a final Contingency Plan:

- The final arrangements agreed with local police, fire departments, hospitals, and emergency response contractors;
- Names, addresses, and phone numbers of all personnel qualified to act as emergency coordinator;
- List of available emergency equipment; and
- Evacuation plan.

**11.13.3 TOXICITY CHARACTERISTIC LEACHING
PROCEDURE ANALYSES OF GASIFICATION
PROCESS MATERIALS**

Worn Refractory

CHEMICAL DATA

Ignitability

No

Corrosivity

No

Reactivity

No

Solid Trace Elements

Aluminum	ug/g	1.0E+3
Antimony	ug/g	<2.0E-01
Arsenic	ug/g	<4.0E-01
Barium	ug/g	5.6E+00
Beryllium	ug/g	<2.0E-01
Boron	ug/g	9.5E+01
Cadmium	ug/g	<4.0E-01
Calcium	ug/g	2.9E+03
Chromium +6	ug/g	<9.0E-02
Chromium, total	ug/g	
Cobalt	ug/g	<1.2E+00
Copper	ug/g	1.9E+00
Iron	ug/g	2.5E+03
Lead	ug/g	3.0E-01
Magnesium	ug/g	8.8E+04
Manganese	ug/g	5.4E+01
Mercury	ug/g	1.3E-01
Molybdenum	ug/g	1.4E+00
Nickel	ug/g	2.9E+01
Potassium	ug/g	1.2E+03
Selenium	ug/g	<3.0E+00
Silicon	ug/g	1.1E+03
Silver	ug/g	6.1E-01
Sodium	ug/g	1.3E+03
Strontium	ug/g	5.1E+00
Thallium	ug/g	<2.0E-03
Tin	ug/g	2.6E+01
Titanium	ug/g	2.0E+01
Vanadium	ug/g	9.4E+02
Zinc	ug/g	1.3E+00

EP Leachate Parameters

Arsenic	mg/L	<6.0E-02
Barium	mg/L	2.2E-02
Cadmium	mg/L	<2.0E-03
Chromium, total	mg/L	1.5E-01
Hydrogen Ion (pH)	pH	4.1E+00
Lead	mg/L	<8.0E-02
Mercury	mg/L	1.2E-03
Selenium	mg/L	<8.0E-02
Silver	mg/L	3.0E-03

PARAMETER

UNITS

Worn Refractory Slag

CHEMICAL DATA

Solid Trace Elements

Aluminum	ug/g	7.2E+03
Antimony	ug/g	<2.0E-01
Arsenic	ug/g	<4.0E-03
Barium	ug/g	7.3E+01
Beryllium	ug/g	2.8E-01
Boron	ug/g	5.9E+01
Cadmium	ug/g	<4.0E-01
Calcium	ug/g	1.3E+04
Chromium, +6	ug/g	<1.3E-01
Chromium, total	ug/g	1.5E+05
Cobalt	ug/g	2.1E+00
Copper	ug/g	6.1E+00
Iron	ug/g	5.3E+03
Lead	ug/g	<3.0E-01
Magnesium	ug/g	8.5E+04
Manganese	ug/g	7.3E+01
Mercury	ug/g	<5.0E-02
Molybdenum	ug/g	6.7E-01
Nickel	ug/g	6.7E+00
Potassium	ug/g	1.8E+03
Selenium	ug/g	<3.0E+00
Silicon	ug/g	2.3E+04
Silver	ug/g	1.8E+00
Sodium	ug/g	4.3E+03
Strontium	ug/g	9.3E+01
Thallium	ug/g	<2.0E-03
Tin	ug/g	5.2E+01
Titanic	ug/g	3.6E+02
Vanadium	ug/g	1.1E+03
Zinc	ug/g	1.2E+01

PARAMETER

UNITS

Worn Refractory

WET Leachate Parameters

Antimony	mg/L	1.1E-01
Arsenic	mg/L	<2.0E-03
Barium	mg/L	4.4E-01
Beryllium	mg/L	<1.0E-03
Cadmium	mg/L	<2.0E-03
Chromium +6	mg/L	5.0E-02
Chromium, total	mg/L	4.9E+00
Cobalt	mg/L	<6.0E-03
Cooper	mg/L	<1.0E-03
Fluoride	mg/L	6.0E-02
Iron	mg/L	9.4E+00
Lead	mg/L	<2.0E-03
Mercury	mg/L	1.8E-03
Molybdenum	mg/L	6.8E-02
Nickel	mg/L	5.7E-02
Selenium	mg/L	<2.0E-03
Silver	mg/L	<2.0E-03
Thallium	mg/L	<6.0E-03
Vanadium	mg/L	5.8E-01
Zinc	mg/L	2.9E-02

No: SAMPLE DID NOT EXHIBIT THIS CHARACTERISTIC.

Spent Sulfur Recovery Unit Catalyst Typical Reactor Bed

CHEMICAL DATA

Ignitability		No
Corrosivity		No
Reactivity		No

Chlorine	wt. %	1.0E-02
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Total Extractable Loading

GRAV	ug/g	1.1E+03
TCO	ug/g	4.4E+01
Total Extractable Loading	ug/g	1.1E+03

EP Leachate Parameters

Arsenic	mg/L	<6.0E-02
Barium	mg/L	2.2E-02
Cadmium	mg/L	<2.0E-03
Chromium, total	mg/L	<5.0E-03
Lead	mg/L	1.1E+00
Mercury	mg/L	8.0E-04
Selenium	mg/L	<8.0E-02
Silver	mg/L	<2.0E-03

WET Leachate Parameters

Antimony	mg/L	2.9E-01
Arsenic	mg/L	2.6E-01
Barium	mg/L	<1.0E-03
Beryllium	mg/L	5.5E-03
Cadmium	mg/L	8.0E-03
Chromium+6	mg/L	<1.0E-02
Chromium, total	mg/L	2.5E-02
Cobalt	mg/L	<6.0E-03
Copper	mg/L	<1.0E-03
Fluoride	mg/L	<1.0E-01
Hydrogen Ion (pH)	pH	1.4E+00
Iron	mg/L	2.0E+01
Lead	mg/L	2.6E-01
Mercury	mg/L	<4.0E-04
Molybdenum	mg/L	6.2E-02
Nickel	mg/L	2.2E-02
Selenium	mg/L	8.5E-01
Silver	mg/L	<2.0E-03
Thallium	mg/L	2.7E-01
Vanadium	mg/L	<3.0E-03
Zinc	mg/L	1.2E-01

ASTM Leachate Parameters

GRAV	mg/L	2.0E+01
TCO	mg/L	6.6E+00
Total Extractable Loading	mg/L	2.7E+01

Semivolatile Organic Compounds		ND
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No: SAMPLE DID NOT EXHIBIT THIS CHARACTERISTIC.

ND: NOT DETECTED

Spent Sulfur Recovery Unit Catalyst - Reactor Bed #1

Solid Trace Elements

Aluminum	ug/g	3.2E+05
Antimony	ug/g	<1.0E+00
Arsenic	ug/g	<4.0E+00
Barium	ug/g	<2.0E+01
Beryllium	ug/g	<2.0E+00
Boron	ug/g	<2.0E+01
Cadmium	ug/g	<2.0E+00
Calcium	ug/g	6.3E+04
Chromium, total	ug/g	1.1E+01
Cobalt	ug/g	3.6E+01
Cooper	ug/g	5.2E+00
Iron	ug/g	3.5E+03
Lead	ug/g	<2.0E+01
Magnesium	ug/g	2.5E+03
Manganese	ug/g	2.2E+01
Mercury	ug/g	6.0E-02
Molybdenum	ug/g	1.9E+01
Nickel	ug/g	1.0E+01
Potassium	ug/g	6.1E+02
Selenium	ug/g	<8.0E+00
Silicon	ug/g	7.1E+03
Silver	ug/g	2.9E+00
Sodium	ug/g	<7.0E+01
Strontium	ug/g	4.5E+01
Thallium	ug/g	<2.0E+01
Tin	ug/g	1.2E+00
Titanium	ug/g	2.2E+02
Vanadium	ug/g	<4.0E+01
Zinc	ug/g	6.7E+01

Spent Sulfur Recovery Unit Catalyst - Reactor Bed #2

Solid Trace Elements

Aluminum	ug/g	3.0E+05
Antimony	ug/g	<1.0E+00
Arsenic	ug/g	<4.0E+00
Barium	ug/g	<2.0E+01
Beryllium	ug/g	<2.0E+00
Boron	ug/g	<2.0E+01
Cadmium	ug/g	<2.0E+00
Calcium	ug/g	5.9E+04
Chromium, total	ug/g	2.1E+01
Cobalt	ug/g	3.8E+01
Copper	ug/g	6.6E+00
Iron	ug/g	8.7E+02
Lead	ug/g	<2.0E+01
Magnesium	ug/g	2.6E+03
Manganese	ug/g	7.3E+00
Mercury	ug/g	2.6E-01
Molybdenum	ug/g	<9.0E+00
Nickel	ug/g	<4.0E+01
Potassium	ug/g	2.1E+01
Selenium	ug/g	<7.0E+00
Silicon	ug/g	4.3E+03
Silver	ug/g	4.5E+00
Sodium	ug/g	<6.0E+01
Strontium	ug/g	3.8E+01
Thallium	ug/g	<2.0E+01
Tin	ug/g	1.0E+00
Titanium	ug/g	5.0E+01
Vanadium	ug/g	<4.0E+01
Zinc	ug/g	6.2E+01

Spent Sulfur Recovery Unit Catalyst - Reactor Bed #3

Solid Trace Elements

Aluminum	ug/g	3.1E+05
Antimony	ug/g	<1.0E+00
Arsenic	ug/g	<4.0E+00
Barium	ug/g	<2.0E+01
Beryllium	ug/g	<2.0E+00
Boron	ug/g	<2.0E+01
Cadmium	ug/g	<2.0E+00
Calcium	ug/g	6.0E+04
Chromium, total	ug/g	1.5E+01
Cobalt	ug/g	4.1E+01
Cooper	ug/g	7.3E+00
Iron	ug/g	1.1E+03
Lead	ug/g	<2.0E+01
Magnesium	ug/g	2.2E+03
Manganese	ug/g	2.2E+01
Mercury	ug/g	1.4E-01
Molybdenum	ug/g	<9.0E+00
Nickel	ug/g	2.9E+01
Potassium	ug/g	7.0E+01
Selenium	ug/g	<7.0E+00
Silicon	ug/g	2.2E+03
Silver	ug/g	2.7E+00
Sodium	ug/g	<6.0E+01
Strontium	ug/g	4.4E+01
Thallium	ug/g	<2.0E+01
Tin	ug/g	5.0E-01
Titanium	ug/g	<5.0E+01
Vanadium	ug/g	<4.0E+01
Zinc	ug/g	6.6E+01

PARAMETER

UNITS

Spent Hydrogenation Reactor Catalyst

CHEMICAL DATA

Ignitability	No	No
Corrosivity	No	No
Reactivity	No	No

Solid Trace Elements

Aluminum	ug/g	4.1E+05	3.6E+05
Antimony	ug/g	<1.0E+01	7.7E+00
Arsenic	ug/g	6.1E+02	5.5E+02
Barium	ug/g	<2.0E+02	4.6E+01
Beryllium	ug/g	<4.0E+00	<2.0E+00
Boron	ug/g	<4.0E+01	9.2E+00
Cadmium	ug/g	<4.0E+00	3.9E+00
Calcium	ug/g	2.4E+02	1.0E+02
Chromium, total	ug/g	<2.0E+01	<2.2E+01
Cobalt	ug/g	1.1E+00	1.5E+04
Cooper	ug/g	<4.0E+00	<2.0E+01
Iron	ug/g	1.2E+03	4.6E+03
Lead	ug/g	<2.0E+01	4.9E+01
Magnesium	ug/g	6.1E+02	<1.0E+02
Manganese	ug/g	9.0E+00	1.2E+01
Mercury	ug/g	1.4E-01	5.0E-02
Molybdenum	ug/g	5.0E+00	4.5E+04
Nickel	ug/g	5.3E+03	3.1E+02
Potassium	ug/g	1.5E+02	1.7E+03
Selenium	ug/g	<1.0E+01	7.7E+00
Silicon	ug/g	5.8E+02	2.5E+04
Silver	ug/g	<4.0E+00	3.9E+00
Sodium	ug/g	1.8E+02	2.6E-01
Strontium	ug/g	<4.0E+01	1.9E+01
Thallium	ug/g	<4.0E+00	3.9E+00
Tin	ug/g	<1.0E+01	7.7E+00
Titanium	ug/g	1.1E+02	1.5E+03
Vanadium	ug/g	<4.0E+01	1.4E+01
Zinc	ug/g	7.3E+01	6.2E+01

EP Leachate Parameters

Arsenic	mg/L	6.8E-01	1.4E-01
Barium	mg/L	1.2E-02	7.0E-03
Cadmium	mg/L	1.8E-01	2.0E-02
Chromium, total	mg/L	1.2E-01	<7.0E-03
Hydrogen Ion (pH)	pH	3.9E+00	4.6E+00
Lead	mg/L	<2.0E-03	<2.0E-02
Mercury	mg/L	<2.0E-04	2.0E-04
Selenium	mg/L	<3.0E-02	<3.0E-02
Silver	mg/L	1.2E-01	<7.0E-03

PARAMETER

UNITS

Spent Hydrogenation Reactor Catalyst

WET Leachate Parameters

Antimony	mg/L	1.2E+00	<2.4E-02
Arsenic	mg/L	4.6E+00	3.0E+00
Barium	mg/L	<9.0E-03	<3.0E-03
Beryllium	mg/L	5.1E-02	<1.0E-03
Cadmium	mg/L	5.4E-01	1.5E-01
Chromium +6	mg/L		<2.0E-02
Chromium, total	mg/L	5.2E-01	<3.0E-03
Cobalt	mg/L	4.1E+02	7.5E+02
Cooper	mg/L	8.8E.01	1.2E+00
Fluoride	ag/L		8.0E-02
Hydrogen Ion (pH)	pH	4.9E+00	4.6E+00
Iron	mg/L	5.3E+01	1.5E+02
Lead	mg/L	<4.0E-03	<4.0E-03
Mercury	mg/L	<2.0E-04	<1.2E-04
Molybdenum	mg/L	1.5E+03	2.1E+03
Nickel	mg/L	1.4E+02	1.4E+01
Selenium	mg/L	<1.0E-01	<3.0E-01
Silver	mg/L	4.2E-01	4.1E-01
Thallium	mg/L	<3.0E-03	1.8E+00
Vanadium	mg/L	8.4E-01	5.4E+00
Zinc	mg/L	7.3E-01	<3.0E-03

No: SAMPLE DID NOT EXHIBIT THIS CHARACTERISTIC.

APPENDIX 11.14

NEED DETERMINATION

11.14.1 NEED DETERMINATION PETITION

**11.14.2 FLORIDA PUBLIC SERVICE COMMISSION ORDER
DETERMINING NEED**

11.14.1 NEED DETERMINATION PETITION

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Petition of Tampa Electric	)	
Company for a Determination of Need	)	DOCKET NO. 910883-EI
for a Proposed Electrical Power	)	Submitted for Filing 9/05/91
Plant and Related Facilities.	)	

PETITION TO DETERMINE NEED
FOR ELECTRICAL POWER PLANT

Tampa Electric Company ("Tampa Electric or "the company") hereby petitions the Florida Public Service Commission ("Commission") pursuant to §403.519, Fla. Stat., (Supp. 1990) and Fla. Admin. Code Rule 25-22.081, to determine the need for a proposed electrical power plant and related facilities described herein, and to file its order making that determination with the Department of Environmental Regulation ("DER") pursuant to §403.507(2)(a)2, Fla. Stat. In support thereof, Tampa Electric says:

1. Tampa Electric's full name and business address are as follows:

Tampa Electric Company
Post Office Box 111
Tampa, Florida 33601

2. The name and address of Tampa Electric's representatives to receive communications regarding this docket are:

Mr. Russell D. Chapman
Manager, Regulatory
Coordination
Tampa Electric Company
Post Office Box 111
Tampa, Florida 33601

Mr. Lee L. Willis
Mr. James D. Beasley
Ausley, McMullen, McGehee,
Carothers and Proctor
Post Office Box 391
Tallahassee, Florida 32302

3. Tampa Electric is a Commission regulated investor-owned electric utility providing electric service to approximately 460,000 retail Customers located in Hillsborough and portions of Polk, Pinellas and Pasco Counties.

Proposed Electrical Power Plant

4. The company's current Power Resource Plan reflects the need for an additional 440 MW of generating capacity during the period 1995-2000. Tampa Electric plans to meet this need through the construction of two 220 MW^{1/} units with in-service dates of 1996 and 2000. This application requests the certification of need for the first unit, Polk Unit One, as a 220 MW integrated coal gasification combined cycle unit ("IGCC") with a projected commercial operation date of July 1996. This state-of-the-art unit will be constructed with modular components consisting of a 150 MW advanced combustion turbine ("CT") with an in-service date of July 1995 followed by a heat recovery steam generator ("HRSG"), steam turbine and coal gasifier to be placed in service in July 1996 to complete the 220 MW IGCC. The 150 MW CT was selected for its greater efficiency and its compatibility with the coal gasification system.

5. Tampa Electric's proposal in this docket is consistent with its plan submitted in Docket No. 910004-EU that required the construction of two 220 MW combined cycle ("CC") generating units phased in over the period

^{1/} All unit MW ratings as used in this Petition, the Polk Unit One Need Determination Study and in the testimony and exhibits of Tampa Electric's witnesses in this proceeding are "nominal" ratings which reflect the expected average output of the rated unit.

1995-2000. However in Docket No. 910004-EU the Company projected that the first CC unit was to have been comprised of a 75 MW CT with an in-service date of January 1995, followed by a second 75 MW CT addition in 1996 and a 70 MW HRSG in 1997. The company has modified its plan to take advantage of \$120 million in funding provided by DOE under a cooperative agreement which will contribute to \$62 million in net savings for Tampa Electric's customers. This project will demonstrate state-of-the-art hot gas clean up technology in an integrated coal gasification combined cycle system as an environmentally acceptable means of generating electricity with coal.

6. The clean-coal project will not change any requirements for the site itself since the company plans to build a CC power plant. Instead of pairing two natural gas-fired CT's and one HRSG, the company will build one larger 150 MW CT and a single HRSG. The entire facility will be more efficient.

7. The IGCC technology selected has been proven to be a technically viable way to use coal more efficiently as a primary fuel source while protecting the environment. The IGCC technology is the right choice for Polk Unit One based on sound engineering, fuel choice, economic principles, the availability of DOE funding and environmental considerations.

8. Tampa Electric projects that Polk Unit Two, a 220 MW CC, will be needed in the year 2000 with the addition of CTs in 1998 and 1999 and an HRSG in the year 2000. However, authority to construct Polk Unit Two is not sought in this Petition because such action would be premature.

9. The above described units, their associated facilities, and their directly associated 230 kv transmission lines (collectively, "the proposed

electrical power plant") are subject to the Florida Electrical Power Plant Siting Act (the "Act"), §403.501 to 403.519, Fla. Stat.

Proposed Site

10. Tampa Electric plans to construct the proposed electric power plant at a 4,300 acre site located in Polk County, Florida. The company decided to utilize this property following an exhaustive year-long effort by the Tampa Electric Power Plant Siting Task Force which last year recommended that Tampa Electric build its next power plants inland in Polk County rather than adjacent to Tampa Bay. This independent group was comprised of community leaders, environmentalists, and policy makers, all of whom were dedicated to insuring that the need for electricity would be balanced with community needs and the protection of the environment. After approximately three months of review the siting task force unanimously concurred with Tampa Electric's assessment that the additional generating capacity was needed.

11. The task force went on to analyze approximately 40 potential sites in a six-county study area, and ultimately recommended a group of three alternative inland sites to Tampa Electric in September of 1990. The three sites were all located in southwestern Polk County on phosphate mining land that was soon to be vacated by the phosphate industry. Tampa Electric accepted the recommendation and initiated steps to acquire the Polk Power Station site at which Polk Unit One will be constructed. The entire siting task force process took over a year to complete.

12. Approximately 3,572 acres of the Polk Power Station site are under contract to be acquired by Tampa Electric and the company is

negotiating to acquire the remainder. The site will also accommodate the company's next projected base load needs which will not be required until beyond the year 2000.

Construction Plans

13. Tampa Electric proposes to competitively bid the construction of components of the 220 MW IGCC unit that will be owned and operated by Tampa Electric.

14. Pursuant to the Florida Electrical Power Plant Siting Act, including §403.519, Fla. Stat., and to Fla. Admin. Code Rules 25-22.080 to 25-22.081, the Commission has jurisdiction to determine the need for the proposed electrical power plant, applying the standards set forth in §403.519, Fla. Stat.

15. As authorized by Rule 25-22.080(1), Tampa Electric has elected to commence this proceeding for a determination of need prior to the filing with DER of an application for site certification of the proposed electrical power plant.

The Need for the Proposed Electrical Power Plant

16. The information supporting this petition is contained in Tampa Electric's Polk Unit One Need Determination Study and the Appendices thereto (collectively, the "Study"), which are filed hereith and incorporated herein by reference. The Study contains Tampa Electric's analysis of the need for the proposed electrical power plant and includes the information required by Fla. Admin. Code Rule 25-22.081. The 1995 through 1997 need should be met through the DOE funded coal gasification

project. Tampa Electric requests that the Commission fully certify the need for the first 220 MW IGCC at the Polk County site, to be placed in service during the 1995-1996 time frame.

17. The accompanying information demonstrates the need for the proposed electrical power plant in the proposed time frame as constituting the most cost-effective alternative available, taking into account the need for electric system reliability and integrity, the need for adequate electricity at a reasonable cost, the lead time necessary to put the plant into operation and other relevant matters.

18. Tampa Electric requests that a public hearing be scheduled in this matter and that it be conducted as a formal hearing pursuant to §120.57(1), Fla. Stat.

WHEREFORE, Tampa Electric Company respectfully requests that:

(1) pursuant to Fla. Admin. Code Rule 25-22.080(2), the Commission within seven days set a date for hearing on this Petition not more than 90 days after the date of filing hereof;

(2) the hearing in this matter be held as a formal hearing pursuant to §120.57(1), Fla. Stat.;

(3) the Commission give notice of the proceeding as required by §403.519, Fla. Stat. (Supp. 1990) and Fla. Admin. Code Rule 25-22.080(3);

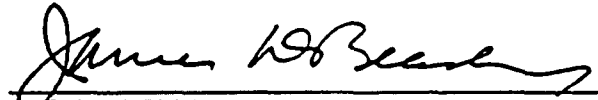
(4) the Commission submit a preliminary statement of issues to DER pursuant to §403.507(1), Fla. Stat. (Supp. 1990); and

(5) the Commission determine that there is a need for the proposed 220 MW IGCC to be placed in service in 1995 and 1996, along with the

associated facilities and directly associated four 230 kv transmission lines, and submit its report making such determination to the DER pursuant to §403.507(2)(a)2, Fla. Stat. (Supp. 1990).

DATED this 5th day of September, 1991.

Respectfully submitted,



LEE L. WILLIS
JAMES D. BEASLEY
Ausley, McMullen, McGehee,
Carothers and Proctor
Post Office Box 391
Tallahassee, Florida 32302
(904) 224-9115

Attorneys for Tampa Electric Company

**11.14.2 FLORIDA PUBLIC SERVICE COMMISSION
ORDER DETERMINING NEED**

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In Re: Petition for Determination)	DOCKET NO. 910883-EI
of Need for a Proposed Electrical)	ORDER NO. PSC-92-0002-FOF-EI
Power Plant and Related)	ISSUED: 03/02/92
Facilities in Polk County by)	
Tampa Electric Company.)	
_____)	

The following Commissioners participated in the disposition of this matter:

SUSAN F. CLARK
BETTY EASLEY

ORDER DETERMINING THE NEED
FOR A PROPOSED ELECTRICAL POWER PLANT

BY THE COMMISSION:

Pursuant to Notice, a formal hearing was held in this docket on December 10-11, 1991 in Tallahassee, Florida. Having considered the record in this proceeding, the Commission now enters its Final Order.

BACKGROUND

Tampa Electric Company (TECO or Tampa Electric) filed a Petition for Determination of Need with the Commission on September 5, 1991. In that petition TECO requested that the Commission approve the construction of a 220 MW Integrated Coal Gasification Combined Cycle (IGCC) unit and related facilities at a site located in Polk County. The proposed IGCC project will consist of a 150 MW advanced combustion turbine (CT) unit to be placed in service in July, 1995, and a 70 MW heat recovery steam generator (HRSG) and coal gasifier to be placed in service in July, 1996. Transmission facilities associated with the construction of the plant include two circuits looping the Pebbledale-Hardee Power Station circuit and two circuits looping the Pebbledale-Mines circuit into a transmission switching station at Polk Unit One. Fuel transportation facilities associated with the construction of the plant include a natural gas lateral to the adjacent FGT pipeline for economy gas purchases, and an oil pipeline lateral to the GATX oil pipeline under construction next to the plant site.

The coal gasifier will employ a new technology that efficiently cleans coal gas at high temperatures. This technology will be a demonstration project for the U. S. Department of Energy (DOE). DOE has signed a cooperative agreement with TECO to provide

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a \$120 million grant to offset some of the costs associated with the construction of the plant and the demonstration of the new technology.

In Docket No. 910004-EU, TECO's 220 MW phased combined cycle unit was designated as its avoided unit for pricing cogeneration. Upon learning of the availability of the \$120 million grant from DOE to build the coal gasification plant, TECO estimated the cost of the IGCC unit and compared the project's impact on TECO's expansion plan with eight other expansion plans. When TECO determined that the IGCC unit, with the benefit of \$120 million of DOE funding, cost less than the "avoided unit" proposed in Docket No. 910004-EU, TECO initiated this proceeding to determine the need for the IGCC unit.

Destec Energy (Destec), Ark Energy (Ark), Florida Industrial Cogeneration Association (FICA), and Floridians for Responsible Utility Growth (FRG) intervened in this proceeding. Prior to the pre-hearing conference, held on November 20, 1991, Destec and Ark withdrew from this proceeding. Prior to the hearing, held on December 10-11, 1991, FICA also withdrew from the case.

Post-hearing briefs were filed by Tampa Electric Company and Floridians for Responsible Utility Growth on January 3, 1992. FRG filed proposed findings of fact with its brief, and a ruling on each proposed finding is included in Appendix A attached to this order.

The basic issue we are called upon to decide in this proceeding is whether under the provisions of section 403.519, Florida Statutes, Tampa Electric Company has adequately demonstrated the need to construct its proposed plant. The Florida Public Service Commission is the sole forum to determine the need for the proposed power plant, and only issues relating to that need were considered in this proceeding. Separate public hearings will be held by the Department of Environmental Regulation before the Division of Administrative Hearings to consider environmental and other impacts of the proposed plant and its associated facilities.

Section 403.519 delineates five major topics for our consideration in making a determination of need:

1. the need for electric system reliability and integrity;
2. the need for adequate electricity at a reasonable cost;
3. whether the proposed plant is the most cost-effective alternative available;

4. conservation measures taken by or reasonably available to the applicant which might mitigate the need for the proposed power plant; and
5. other matters within the Commission's jurisdiction which it deems relevant.

We have considered all issues relevant to those topics and we hold, for the reasons set out below, that Tampa Electric has demonstrated the need for the proposed 220 MW IGCC plant. We approve the plant's construction on the condition that TECO does receive the \$120 million dollar grant from the Department of Energy to help defray the costs of the project.

The Need for Electric System Reliability and Integrity.

TECO used a combination of criteria to determine its need for 220 MW of additional capacity in the 1995-1997 time frame, including a minimum 20% winter reserve margin and assisted Loss of Load Probability (LOLP) of 0.1 days per year. We find these criteria to be reasonably adequate for planning purposes. The 0.1 days per year LOLP criteria is consistent with the LOLP criteria used by the Florida Electric Power Coordinating Group (FCG), and the winter reserve margin is a reasonable one for a utility of Tampa Electric's size. The planning criteria are applied to TECO's load forecast to determine whether TECO will need additional capacity in 1995 and beyond.

In developing its load forecast, TECO first produces a single demand and energy forecast by combining end-use, multi-regression, and trend analysis techniques. A model of demand and energy use of phosphate customers is forecasted separately, as are the effects of TECO's conservation, load management, and cogeneration programs. The final forecast is a combination of all these methods. It includes projections of population, income, employment, appliance energy use, appliance saturations, appliance efficiency standards, price elasticity, weather (including temperature sensitivities), and residential, commercial and industrial consumption patterns. We believe that the forecasting methodology has produced a reasonably adequate prediction of TECO's future load. The forecast demonstrates that TECO does have a need for additional capacity beginning in 1995 to meet its reliability criteria.

To meet its reliability criteria, TECO shows a need for 65 MW of capacity in 1995, 66 MW in 1996, and 43 MW in 1997. TECO's proposed need for capacity is similar to the need demonstrated in TECO's expansion plan in Docket No. 910004-EU. That plan provided

for 75 MW in 1995, 75 MW in 1996, and 70 MW in 1997. Since TECO's proposed unit consists of a 150 MW advanced combustion turbine and a 70 MW heat recovery steam generator, TECO will build a large portion (150 MW) of the needed 220 MWs of capacity at one time, somewhat earlier than needed. TECO had planned to phase in a 220 MW combined cycle unit by bringing a 75 MW combustion turbine (CT) on line in each of the years 1995 and 1996 with a 70 MW heat recovery steam generator being added in 1997. Given the participation of the DOE in the IGCC demonstration project, Tampa Electric will construct some portion of the needed 220 MW slightly sooner and some portion slightly later than under the old plan, but it will do so at a significantly lower cost. Since TECO does not anticipate any adverse effects on the reliability of its system by placing some of the capacity into service earlier than needed, and since early construction of part of the needed capacity is reasonable in order to obtain DOE funding for a substantial portion of the project and thus lower the cost, we believe early construction is justified.

It is clear from the record that if additional capacity is not placed into service by 1996, TECO's winter reserve margin is expected to fall below 20 percent and its LOLP is projected to rise above the 0.1 days per year maintained for system reliability. The first 150 MW of the IGCC unit is due to be put into service in just over three years, in mid-1995. Given the lead time necessary for utilities to construct new generating facilities, TECO's petition was filed at a reasonable time.

TECO's reliability criteria will not be met unless the proposed IGCC unit is completed in the time frame requested. TECO would also risk losing the DOE funding it will receive for design, construction, and operation of the unit. Thus any delays in the construction of the plant could ultimately cost TECO its most cost-effective alternative for meeting future capacity needs.

TECO's reliability criteria of 0.1 days per year LOLP and minimum winter reserve margin of 20 percent would be violated with a delay in the in-service date of the proposed unit (Exhibit 1, p. 60). If no capacity is added to TECO's system in 1995, TECO's Loss of Load Probability (LOLP) is estimated to be 0.140 days per year and its winter reserve margin will be 19.1 percent. If no capacity is added in 1996, the net LOLP will deteriorate to 0.199 days per year and the winter reserve margin will drop to 16.2 percent. Thus, the addition of capacity from the proposed IGCC unit is needed for TECO to maintain acceptable reliability criteria.

TECO's proposed 220 MW IGCC unit is also needed to contribute to the reliability and integrity of the electric system of the State as a whole. Shahla Speck, of the Florida Electric Power Coordinating Group (FCG) testified in this proceeding that the phased-in capacity from Polk Unit One is consistent with the needs of Peninsular Florida, and will provide a portion of the additional generating capacity that is needed between 1995 and 1997 for the peninsula to maintain an adequate level of reliability.

Ms. Speck based her conclusion on an analysis of FCG's 1989 Planning Hearing document entitled "Generation Expansion Planning Studies", with consideration of all known changes which have occurred since that study was performed. Peninsular Florida's utilities plan to have 39,050 MW of total capacity, not including the proposed Polk Unit One, in the winter of 1996/1997 to meet a projected firm winter peak demand of 34,310 MW. The reserve margin is expected to be 4,740 MW. With the addition of TECO's proposed IGCC, the reserve margin will increase to 4,960 MW (14.5%), and with the projected capacity increase from 220 MW to 260 MW in the IGCC unit, Peninsular Florida's reserve margin will be 5000 MW (14.6%) in the winter of 1996/1997. We believe the addition of the proposed IGCC plant will contribute to the reliability of the electric system of the State of Florida by providing capacity in the time frame in which it is needed.

The proposed IGCC unit, which will burn gas extracted from coal, will not contribute to the fuel diversity of TECO's system, which is already heavily reliant on coal as a fuel. We are not persuaded by TECO's argument that coal gas is a new fuel that will contribute to fuel diversity on TECO's system. Regardless of the fact that gas is the end product of a coal gasification process, the source fuel is still coal. Currently, about 99% of the energy generated by TECO's units comes from coal. The IGCC unit will only increase TECO's reliance on coal as a major fuel source.

Furthermore, the proposed unit will not contribute to the fuel diversity of peninsular Florida. Peninsular Florida has a wide variety of generating technologies that use a diverse range of fuels, including coal, natural gas, oil, and nuclear. TECO's proposed IGCC unit will not significantly affect the fuel mix of Peninsular Florida's generating units, and therefore will not contribute to fuel diversity.

Nevertheless, in this proceeding the determinative issue is whether it is cost-effective for TECO and TECO's ratepayers to incur the higher capital cost of an IGCC unit to enable use of lower cost coal fuel. That appears to be the case here, because the DOE grant significantly lowers the total capital cost of the

project. As we will explain in detail below, the IGCC unit is the most cost-effective alternative to meet TECO's capacity needs. That fact drives our decision to grant TECO's petition.

The Need for Adequate Electricity at a Reasonable Cost

Fuel forecasts and Fuel Costs

With certain reservations we find that TECO's fuel price forecast is reasonably adequate for planning purposes. TECO Witness Mr. Smith stated that coal prices are expected to remain relatively stable through the year 2000, while natural gas and oil prices are projected to increase rapidly. TECO's forecasting methodology includes reliance on data from government sources and industry association forecasts, trends, and two independent outside consultants. Forecasted transportation prices are added to obtain total delivered prices.

It appears that different fuel price forecasts have little impact on the proposed IGCC project's cost effectiveness. We are concerned, though, that TECO's forecast favors the use of coal over oil or natural gas over the long term for projects with similar costs. An extremely low natural gas price forecast favors an expansion plan which contains just combustion turbine and combined cycles. A low natural gas price forecast does not favor an expansion plan that includes the DOE IGCC project.

The type of new generating unit chosen is not necessarily driven by fuel cost per se; rather, it is the difference in cost among competing fuels. TECO's fuel forecast projects a widening cost differential between coal and natural gas or oil, when in fact for many years the cost differential between the cost of coal and the cost of natural gas and oil has remained relatively constant. In the future, TECO should pay close attention to this differential, and must be ready to substantiate continued reliance upon fuel price forecasts that have not accurately predicted the relationship between the price of coal and the price of natural gas and oil.

TECO provided sufficient assurance in this case that primary and secondary fuel will be available for the proposed plant on a long and short term basis at a reasonable cost. Fuel purchases will be made at market prices. TECO proposes to use the following fuels at its IGCC facility:

- Natural Gas

TECO is proposing to use natural gas on an interruptible basis to the extent available from Florida Gas Transmission. Dependence on interruptible gas means interruptions during peak demand or when the gas is most needed, and it is therefore practical to have on-site storage of No. 2 oil.

- No. 2 Oil

TECO proposes to use No. 2 oil as the primary fuel in the first year and a backup or secondary fuel in all subsequent years. The Tampa Bay area is one of the key distribution areas for No. 2 oil. Delivery of No. 2 oil will be by truck from Port Manatee or by the GATX oil pipeline adjacent to the project site.

- Coal

Coal will be the primary fuel for the IGCC unit. The coal to be used will be similar in sulfur content and price to that burned at TECO Big Bend Unit 4, and is the cheapest of all fuels. Delivery of coal to the plant will be by rail. Partial water borne delivery may be possible depending on the total delivered cost. Tests done using Eastern United States coals during the first two years will aid selecting the more cost-effective sources.

In conjunction with our semi-annual fuel cost recovery proceedings, we will of course evaluate all fuel related expenses to determine that the costs are reasonable and justified. We are satisfied here, though, that TECO has provided adequate assurances on the availability of primary and secondary fuel to the proposed facility on a long and short term basis at a reasonable cost.

Costs of Clean Air Act Compliance

The record in this case demonstrates that TECO adequately took into account the costs of environmental compliance associated with the Clean Air Act when it evaluated its future generation needs. TECO plans to comply with the Clean Air Act by one or more of the following: fuel switching; installing scrubbers; alternative technologies; and, purchasing allowances. Phase I compliance with the Clean Air Act will not be affected by the proposed IGCC plant, but the plant will be an asset to TECO in Phase II compliance. The Company estimates savings in the range of \$50 to \$100 million over the life of the proposed IGCC unit, compared to fuel switching or other Clean Air Act compliance strategies.

Site, Design, and Engineering Characteristics

TECO provided sufficient information on the site, design and engineering characteristics of its 220 MW IGCC unit to enable us to adequately evaluate its proposal. A Power Plant Site Selection Task Force, consisting of private citizens from environmental groups, businesses and universities, provided guidance and recommendations to TECO throughout the site selection process. The task force recommended the Polk County site, consisting of 3572 acres of mined out phosphate land. The site is located near the FGT/Hardee Power Station natural gas lateral and close to rail transportation for coal delivery. Distillate (No. 2) oil can be made available to the site by truck or pipeline.

Originally, TECO's proposed unit was to be a 220 MW IGCC with an estimated heat rate of 9060 BTU/kWh. Results from the FLUOR Engineering Study, received after TECO's need petition was filed on September 5, 1991, showed that the projected capacity of the unit increased to 260 MW and the heat rate dropped to 8486 BTU/kWh. These improvements result largely from two factors: TECO's decision to use a more efficient General Electric 7F turbine instead of a 7EA turbine, and TECO's determination that the heating value of natural gas is greater than that of coal gas.

TECO's proposed IGCC unit will present a demonstration of hot gas clean-up on a large scale. Hot gas clean-up technology has been successfully demonstrated on a 2 MW scale, but not on the scale TECO will attempt to demonstrate. No evidence was presented by any party that a scale-up in size was not viable. Rather, DOE Witness Bechtel's rebuttal testimony stated that "Tampa Electric has this capability as well as the presence in the industry to showcase effectively the project's results, thereby resulting in the successful commercialization of this technology".

The project will have redundant (hot and cold) gas clean-up capabilities to offset the risk that the hot gas clean-up technology will not perform as expected. No evidence was presented that showed that the back-up cold gas clean-up technology is not a reliable procedure. Although no utility currently has in its rate base a plant the size of TECO's proposed IGCC using cold gas clean-up, TECO presented evidence that cold gas clean-up has been successfully demonstrated in the United States with a number of projects, including:

- The 120 MW Cool Water Facility, located in California. Based on the Texaco gasification process and a General Electric combustion turbine unit, this plant operated for over 26,000 hours and achieved a capacity factor of 87%

in its final quarter of operation. This plant will be expanded and returned to commercial operation in a few years.

- The 160 MW facility owned by Dow Chemical in Louisiana. Consisting of a Dow gasifier and a combustion turbine that originally burned natural gas prior to being modified to burn gasified coal, this plant achieved a success similar to that experienced at the Cool Water Facility.

We therefore believe that TECO's proposed project is commercially viable. The record in this proceeding shows that TECO will be able to demonstrate the technical and economic viability of oxygen-blown, entrained-bed IGCC with hot gas clean-up, and generate clean, efficient, coal based power for the increasing demands of the region.

Most Cost-Effective Alternative

TECO has demonstrated that the proposed IGCC unit is the most cost-effective alternative to provide the additional needed capacity for TECO and peninsular Florida. Using TECO's most recent financial estimates, the proposed IGCC unit is estimated to save TECO's ratepayers \$195 million over the life of the unit compared to TECO's next best option. These savings are primarily attributable to fuel savings (resulting from the use of coal) and the \$120 million DOE contribution. The unit is projected to have an installed cost of \$389 million dollars (1996), including the DOE funding. This estimate does not include the economic effects of potential EPRI funding for the project, which would result in even more savings. Clearly the \$120 million in DOE funding and the potential for some additional assistance from EPRI have favorably affected the cost-effectiveness of the IGCC project.

The DOE Grant

Of the \$120 million grant to be awarded to TECO by DOE, \$100 million will go toward plant construction and \$20 million will go toward the first two years of operation and maintenance of the proposed unit. TECO estimates that the hot gas clean-up equipment for its proposed unit will cost approximately \$11.5 million (\$1991). If the hot gas clean-up experiment fails and TECO is required to fully operate the cold gas clean-up system, TECO predicts a minimal reduction in plant efficiency that would result

in a \$3 million reduction in savings associated with the IGCC plant. This financial penalty is extremely low, considered in light of the \$62 million savings (\$195 million based on revised estimates) expected to result from choosing the IGCC plant.

DOE Witness Bechtel testified that the \$120 million grant money is not refundable by TECO under any condition, and thus we believe TECO's ratepayers are adequately protected if the demonstration technology fails. If TECO profits from the sale of the plant to another party or utility, or if TECO profits from the commercialization of the technology by other utilities for future projects, TECO would typically be expected to pay 5% of future profits in royalties to DOE. We note that in the future if TECO does profit from the commercialization of the hot gas clean-up technology, we would expect TECO's ratepayers to share in the project's profits, just as they will have shared in the project's costs.

A final version of the DOE Cooperative Agreement was not available for our review in this proceeding. TECO is awaiting DOE approval of certain modifications to the agreement. These modifications include a change in the original site location to the Polk County site and use of the Texaco coal gasification technology. We were assured by the Department of Energy and TECO at the hearing that the final agreement will be forthcoming shortly and that it will issue in substantially the same form that it presently exists. We are confident that the grant will be available to TECO to defray a significant portion of the costs of the IGCC project, and therefore we approve the project. Because of the importance of the DOE grant to the cost-effectiveness of the project, however, we must condition our approval on TECO's receipt of the \$120 million grant with no requirement that TECO repay any part of the \$120 million grant.

Fuel forecast Comparisons

Due to concerns regarding the sensitivity of TECO's fuel forecasts, our staff asked TECO to perform an economic comparison of its proposed IGCC unit (using coal) and the phased combined cycle unit from Docket No. 910004-EU (using five different gas forecasts for the phased CC unit). The five fuel forecast scenarios used to compare TECO's proposed IGCC Unit and its phased combined cycle unit were:

1. TECO base fuel forecast;
2. FCG fuel forecast;
3. City of Tallahassee's latest (9/91) fuel forecast;

4. FPC base case and high case fuel forecast; and
5. Fuel forecast specified by staff. Because our staff believes that the price of natural gas will not escalate as rapidly as TECO estimated, TECO was asked to compare the economics of the IGCC unit and the phased combined cycle unit by using currently projected costs for coal and natural gas in 1995 and holding the 1995 cost differential between the two fuels constant over the life of the IGCC unit. Our staff considered this fuel forecast to be the "acid test", or "worst-case" forecast.

TECO also performed both a "break-even capacity factor" analysis and a "revenue requirements" analysis using the above mentioned fuel forecasts. In the "break-even capacity factor" analysis, the levelized in-service cost of the two plants (IGCC and CC) was determined at various capacity factors ranging from 30% to 100%. Throughout the capacity factor range in which TECO plans to operate its IGCC unit (around 80%), the IGCC plant was cost-effective under all fuel price scenarios.

In the "revenue requirements" analysis, the nominal costs of the two plants (IGCC and CC) were determined at a capacity factor of both 60% and 80% for each year of the life of the plant. The analysis concluded that TECO's proposed IGCC unit is cost-effective under all fuel price scenarios, including our staff's "acid test", at both the low capacity factor of 60% and the expected operating capacity factor of 80%.

TECO also performed a cost comparison between its proposed IGCC project and FPL's current avoided unit, a 1997 IGCC unit. Compared to FPL's avoided unit, TECO's proposed project is more cost-effective.

The cost savings testified to by TECO Witness Ramil do not include the estimated \$50 to \$100 million of savings (over the unit's life) which will derive from the fact that the IGCC unit will assist TECO in meeting the stringent requirements of Phase II of the Clean Air Act amendments. It is not possible at this time to determine a firm estimate of TECO's cost of complying with Phase II requirements. It is clear at this time, however, that the IGCC unit will enable TECO to back down on the dispatch of dirtier units on its system, and thus save TECO some costs of Phase II compliance.

Alternative Generating Technologies

TECO demonstrated in this proceeding that it adequately explored the construction of alternative generating technologies. TECO initially evaluated 46 different generating technologies to meet its future capacity needs. Each of these technologies were screened on the basis of geographic viability, construction lead time required, public acceptance, environmental compliance, cost, safety, and proven demonstration and commercialization. After performing a screening curve analysis, TECO selected the following seven technologies for an economic optimization analysis:

1. Conventional Pulverized Coal
2. Integrated Coal Gasification Combined Cycle (IGCC)
3. Combustion Turbine (CT)
4. Combined Cycle (CC)
5. Phosphoric Acid Fuel Cell
6. Solar Thermal
7. Photovoltaic Solar Cell

After evaluating the economics of expansion plans involving the technologies that passed the initial screening, TECO found that the expansion plan which included the IGCC unit - with the \$120 million grant from the Department of Energy - was the most cost-effective plan. In other words, the IGCC unit had the lowest present worth revenue requirements (PWRR) of the other generating alternatives available.

Conservation

TECO projects that its 1996 winter peak demand will be reduced by 205 MW as a result of load management, and 277 MW as a result of its conservation programs. This 482 MW total represents 13% of TECO's projected 1996 winter peak demand (3703 MW). TECO currently spends 95% of its demand-side management dollars on programs targeted at residential customers. Between 1981 and 1990, 94% of the demand reductions TECO achieved through conservation were achieved through its residential programs, and it appears that TECO's residential conservation programs are doing a reasonable job of saturating the eligible market. The participation rates for some of TECO's commercial and industrial programs, however, appear to be low.

None of the parties in this proceeding presented quantitative evidence regarding the possibility of expanding participation in TECO's approved programs that are projected to have a participation rate of less than 10%. There is little evidence in the record to conclusively demonstrate either the feasibility or the difficulty

of increasing participation rates in those programs. Furthermore, TECO's conservation programs appear to be deferring peaking units only, not baseload or intermediate load units.

We do believe TECO has adequately considered the conservation measures that would be reasonably available to avoid the need for this proposed plant. It does not appear that additional timely and cost effective conservation measures can reliably defer the need for capacity in 1995. System savings due to conservation programs are difficult to measure, and it is difficult to project the achievable penetration rate for each program. However, we also believe that TECO needs to demonstrate to us why it cannot be more aggressive in pursuing conservation, particularly for its commercial and industrial customers. We will therefore require TECO to resubmit its conservation plan no later than one year prior to filing its next need determination petition. This resubmission shall explain in a detailed and definitive manner why market penetration cannot be increased for each of TECO's approved conservation programs. We expect TECO to conduct market achievability studies, and to experiment with control and test groups. We will not accept conjecture about market penetration feasibility. In addition, TECO should consider expanding its conservation plan to include programs that would defer the need for baseload and intermediate load units.

Floridians for Responsible Utility Growth does not agree that TECO has adequately demonstrated that the proposed IGCC unit is the most cost-effective alternative to meet its future capacity needs. FRG urges us to deny TECO's petition because the company has failed to meet its statutory obligation to take available conservation measures and propose the most cost-effective resource alternative.

FRG argues that under section 403.519, the phrase "most cost-effective alternative" available means "least cost" option or combination of options available, and under that section utilities must demonstrate that proposed power plants are the least cost options available to meet system requirements. FRG states that because section 403.519 requires the Commission to take into account the need for adequate electricity "at a reasonable cost", as well as whether the proposed plant is "the most cost effective alternative," it follows that "cost-effective" must be given a meaning that is congruent with "reasonable cost" as well as with its common usage meanings. By common usage definition, FRG states, "cost-effective" means that an investment's benefits are equal to or greater than its costs and that the costs are less than those of other reasonable alternatives. In the context of resource options to meet electricity needs, then, the requirement to provide "reasonable cost electricity must be deemed to require electricity

that can be provided at the lowest cost because it would not be "reasonable" to pay more than what is necessary for electric resources.

FRG acknowledges that there are other matters to consider besides cost in choosing a resource option, and FRG mentions that system reliability and integrity are two examples specifically mentioned in the statute. FRG concludes though that because TECO did not propose an alternative standard to assist us in determining what is "most cost-effective", and because "least cost" is the most logical standard in light of the provisions of section 403.519, we should adopt the interpretation that the terms "most cost-effective alternative" and "least cost option or combination of options" are synonymous.

We do not agree with FRG's interpretation of the phrase "most cost-effective alternative available". We believe that the Florida Legislature contemplated our consideration of a broad range of factors to determine the need for a proposed power plant, including electric system integrity and reliability and other strategic matters that might be relevant to a particular case. If the Legislature intended that the Commission use the more restrictive analysis contemplated by the term "least cost" in its determination of the need for a proposed power plant, the Legislature would have adopted that phrase. Rules of statutory construction require the inference that the phrase that the Legislature did use does not mean simply "least cost option". Our disagreement with FRG over the interpretation of section 403.519 may be more a matter of semantics than substance, because we believe that either interpretation attempts to reach the same result - the provision of adequate and reliable electric service at a reasonable cost.

FRG has asked us to determine what obligation TECO has under section 403.519 to demonstrate what measures have been taken or were reasonably available to TECO which might mitigate the need for TECO's proposed unit. FRG proposes that section 403.519 requires that utilities seeking a determination of need for new power plants must demonstrate that they have fully examined the energy efficiency and other DSM alternatives reasonably available to them, based on their own research and experience, the studies and experience of other Florida utilities, and the research and DSM programs of utilities nationwide. FRG contends that the statute also requires utilities to demonstrate that they have reasonably implemented (i.e., have undertaken well designed programs that are comprehensive in their coverage of customer market segments and electric end-uses) the cost-effective DSM measures available to mitigate the need for proposed plants.

It is our opinion that TECO, the petitioner in this case, has the burden to prove to the Commission by a preponderance of the evidence that it has a need to construct an IGCC unit in Polk County by 1996, taking into account all the factors set out in section 403.519, Florida Statutes. Specifically, TECO has the obligation to show the conservation measures it has taken to mitigate the need for the proposed unit, and it has the obligation to show that the measures taken were consistent with its conservation plans required by section 366.81, Florida Statutes, and approved by Commission order.

Section 403.519, Florida Statutes specifically directs the Commission to consider "the conservation measures taken by or reasonably available to the applicant . . . that might mitigate the need for the proposed plant. . . ." This provision of section 403.519 should be construed in a manner that is consistent with and gives effect to the terms of FEECA, specifically sections 366.81 and 366.82(3) and (4). We are of the opinion that a consistent construction of the two statutes is achieved by requiring a utility in a need determination proceeding to show that it has reasonably implemented conservation measures included in its conservation plans, as directed by section 366.82(3) and as approved by Commission order, and that it has reasonably considered conservation measures that might mitigate the need for this proposed plant.

While the record in this proceeding shows that TECO can improve its conservation efforts, the record in this proceeding does not show that additional conservation can be implemented quickly enough to avoid construction of this particular power plant, and thus additional conservation cannot "mitigate the need" for the IGCC plant. FRG's proposal to expand our review and analysis of TECO's conservation efforts may have merit in another forum, but they exceed the scope of our review of those efforts here.

Purchased Power Alternatives

The record demonstrates that TECO adequately explored and evaluated the availability of purchased power from other electric utilities. TECO currently plans to purchase firm capacity from TECO Power Service (TPS) in 1993. At that time, TECO and SEC will share 295 MW of firm capacity generated at Hardee Power Station. The availability of this 295 MW is based on the projected backup energy requirements of SEC.

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TECO also evaluated the possibility of importing capacity from the Southern Company via the 500 kV transmission line with a capacity of 3200 MW, 50% participation in an 800 MW coal unit, with a 1998 in-service date, and the possibility of purchasing 100 MW of firm capacity in both 1998 and 1999. These evaluations indicated that the proposed IGCC plan was still the most cost-effective alternative.

We note that all the cogenerators that intervened initially in this proceeding withdrew their intervention prior to the hearing. Thus the record does not show that any cogenerator offered to build capacity which would avoid the need for the IGCC project, or that cogeneration projects could fill TECO's capacity needs in a cost-effective manner. The \$120 million DOE grant lowered the avoided cost of the project, thereby lowering the potential payments to cogenerators. It is, we suppose, theoretically possible that the DOE grant would be transferable to a cogenerator to demonstrate the new coal gasification technology, but practically speaking it is not likely that would happen. The transfer could not be made without DOE approval and it is clear from the record that DOE expects TECO to construct and demonstrate the project. Furthermore, a cogenerator, or any other party, would have difficulty securing a site, gaining permits and completing the construction of capacity in the short amount of time remaining to meet TECO's capacity needs.

TECO currently has a total of 289 MW of cogeneration on its system, with 41 MW from firm purchase contracts with three cogenerators and 248 MW from self service generation. TECO forecasts a total of 364 MW of cogeneration by 1996, with 68 MW of firm power purchases from cogenerators and 296 MW from phosphate mine self-service generation. A large percentage of the industrial load on TECO's system comes from phosphate mining operations.

We encourage TECO to actively pursue non-utility generation for its next needed capacity, particularly through negotiations for firm capacity purchases from qualifying facilities. Cogenerators who do not get satisfactory results by negotiating with TECO may intervene in TECO's next need determination proceeding. Here we will not require TECO to allow outside parties an opportunity to bid against its proposed IGCC unit. Currently, there is no Commission rule that requires bidding. Furthermore, TECO's IGCC unit with DOE funding is more cost effective than the combined cycle unit in Docket No. 910004-EU. It is unlikely that a bid lower than the cost of TECO's proposed IGCC could be obtained.

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Conclusion

Based on our resolution of the factual and legal issues presented in this case, for the reasons explained above, and with the conditions explained above, we grant TECO's petition for determination of need for a 220 MW IGCC unit, with 150 MW on-line in 1995 and 70 MW on-line in 1996. We believe that TECO's petition satisfies the statutory requirements of section 403.519, Florida Statutes. The addition of 150 MW in 1996 and 70 MW in 1996 will serve TECO's capacity needs and contribute to meeting its reliability criteria of 0.1 days/year LOLP and 20% winter reserve margin. Phased-in capacity from Polk Unit One is consistent with the needs of Peninsular Florida, and will provide a portion of the additional generating capacity needed between 1995 and 1997 for the peninsula to maintain an adequate level of reliability. As a result of receiving \$120 million in funding from DOE, TECO's proposed IGCC facility is the most cost-effective generation alternative. TECO estimates its proposed plant will save customers \$195 million over the life of the unit, compared to the next best (most cost-effective) alternative. Operation of the IGCC will allow TECO to back down the dispatch of dirtier units, thereby assisting TECO with compliance with Phase II requirements of the Clean. It appears that further timely and cost effective conservation measures cannot reliably defer the need for the IGCC unit.

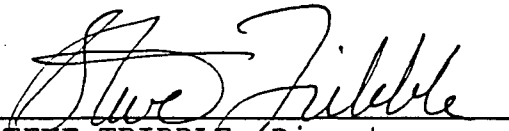
Based on the foregoing, it is

ORDERED by the Florida Public Service Commission that, for the reasons, and with the conditions, set out in the body of this order, Tampa Electric Company's Petition for Determination of Need for a Proposed Electrical Power Plant and Related Facilities in Polk County is hereby granted. It is further

ORDERED that this Docket shall be closed.

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By ORDER of the Florida Public Service Commission this 2nd
day of MARCH, 1992.


STEVE TRIBBLE, Director
Division of Records and Reporting

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NOTICE OF FURTHER PROCEEDINGS OR JUDICIAL REVIEW

The Florida Public Service Commission is required by Section 120.59(4), Florida Statutes, to notify parties of any administrative hearing or judicial review of Commission orders that is available under Sections 120.57 or 120.68, Florida Statutes, as well as the procedures and time limits that apply. This notice should not be construed to mean all requests for an administrative hearing or judicial review will be granted or result in the relief sought.

Any party adversely affected by the Commission's final action in this matter may request: 1) reconsideration of the decision by filing a motion for reconsideration with the Director, Division of Records and Reporting within fifteen (15) days of the issuance of this order in the form prescribed by Rule 25-22.060, Florida Administrative Code; or 2) judicial review by the Florida Supreme Court in the case of an electric, gas or telephone utility or the First District Court of Appeal in the case of a water or sewer utility by filing a notice of appeal with the Director, Division of Records and Reporting and filing a copy of the notice of appeal and the filing fee with the appropriate court. This filing must be completed within thirty (30) days after the issuance of this order, pursuant to Rule 9.110, Florida Rules of Appellate Procedure. The notice of appeal must be in the form specified in Rule 9.900 (a), Florida Rules of Appellate Procedure.

APPENDIX

Responses to FRG's Proposed Findings of Fact

ISSUE 16 -- Conservation Measures Taken By & Available to TECO

A. EXAMINATION OF CONSERVATION OPTIONS:

1. TECO's reliance on the RIM test for economic screening of DSM leads to the rejection of economical savings opportunities. (Chernick, TR 344-345)

We reject the above proposed finding of fact because this statement is a conclusion drawn by FRG, not a fact.

2. TECO uses the Rate Impact Measure (RIM) test as its primary cost-effectiveness screen for DSM. (Kordecki, TR 520)

We accept the above proposed finding of fact.

3. TECO knows that the Commission has directed the utility to analyze DSM measures and programs with three tests: the RIM, the TRC test, and the "Participant" test, and that the Commission has not directed it eliminate measures that fail the RIM. (Kordecki, TR 522)

We reject the above proposed finding of fact because the Commission has directed utilities to use these three tests to analyze only programs proposed for Commission approval, not all programs. The Commission has not directed utilities to screen DSM programs with these three tests.

4. Contrary to the Commission directive, TECO only used the RIM test to screen most DSM measures; and measures that failed the "revenue losses" part of the RIM were eliminated from further consideration. (Kordecki, TR 538 & 552)

We reject the above proposed finding of fact because the Commission does not have a directive which states how a utility should screen DSM programs. The commission directs utilities on how to evaluate programs that they propose as part of the conservation plan.

5. The last "complete" DSM program examination by TECO was done prior to February 12, 1990 -- not as a part of the company's preparation for this need determination proceeding -- and only

22 potential new DSM programs were identified for further investigation and analysis. (Kordecki, TR 497)

We accept the above proposed finding of fact.

6. Five of the 22 potential new programs were eliminated for one reason or another, and two were dropped for reasons unrelated to cost-effectiveness: (1) the Energy Management Systems program, because it did not assure peak demand control -- even though the systems "functioned well for energy savings" -- and (2) residential lighting, because it failed the company's "ten-year life policy." (Kordecki, TR 498-499 & 540)

We accept the above proposed finding of fact.

7. Nine of the remaining 17 DSM measures were eliminated through TECO's application of a "revenue reduction" test (the "lost revenue" portion of the RIM test), excluding from further consideration measures whose cost saving benefits were lower than associated revenue reductions. (Kordecki, TR 499)

We accept the above proposed finding of fact.

8. TECO did not analyze any of these nine eliminated measures in combination with DSM measures that passed the RIM to determine whether the combination would permit greater energy savings and also pass the RIM test. (Kordecki, TR 541-542)

We accept the above proposed finding of fact.

9. Five of the final 8 DSM measures reviewed by TECO were then eliminated by application of the full RIM to determine whether the combination would permit greater energy savings and also pass the RIM test. (Kordecki, TR 499)

We reject the above proposed finding of fact because the statement is vague.

10. Although utility recovery of part or all of a DSM programs's costs from participants could lower the impact of that program on nonparticipants, TECO did not examine cost sharing or DSM financing approaches for measures that failed the RIM. By discarding upfront all DSM that failed the RIM, TECO never examined whether cost recovery or rate design changes could mitigate nonparticipant impacts. (Kordecki, TR 547-548 and

549-550)

We reject the above proposed finding of fact because the first sentence is an opinion, not a fact based on substantial competent evidence.

11. TECO directs its attention to "the most cost-effective" (emphasis added) DSM programs that provide "cost-effective" conservation for the utility ratepayers." (Kordecki, TR 501)

We accept the above proposed finding of fact.

12. TECO's DSM focus is on residential customers because a focus on commercial & industrial customers would yield larger kWh savings; residential applications, by their very nature, "will not save large numbers of kilowatt-hours." (Kordecki, TR 512)

We reject the above proposed finding of fact because this statement is an opinion drawn by FRG, not a fact.

13. TECO did not investigate the option of directly installing DSM measures in residences or facilities. (Kordecki, TR 571)

We accept the above proposed finding of fact.

14. TECO did not examine appliance labeling programs for the residential sector in its last investigation of potential DSM measures (although it had done so in the early 1980's); nor did it examine motor efficiency measures or retail buy-down/deal rebate programs. (Kordecki, TR 572-573)

We accept the above proposed finding of fact.

15. TECO did not consider the development of conservation programs that would reduce the need for baseload capacity or evaluate DSM measures against baseload units. (Kordecki, TR 245)

We accept the above proposed finding of fact.

B. IMPLEMENTATION OF CONSERVATION MEASURES:

16. TECO has under-invested in economical energy efficiency resources. (Chernick, TR. 342)

We reject the above proposed finding of fact because it is an

opinion drawn by FRG, not a fact.

17. TECO's DSM planning weaknesses include the failure to target DSM market sectors comprehensively (leaving out customer sectors, end-uses and measures) and the failure to address market barriers adequately (keeping incentives too low, not doing direct installation, and using a fragmented approach). (Chernick, TR 345)

We reject the above proposed finding of fact because it is an opinion drawn by FRG, not a fact.

18. Although TECO is pursuing some "lost opportunity" resources, it is neglecting cost-effective lost opportunity options in all customer sectors -- programs that target appliance replacement, new construction in both the commercial and residential sectors, commercial remodeling and renovation, and C&I equipment replacement. (Chernick, TR 348-349)

We reject the above proposed finding of fact because it is an opinion drawn by FRG, not a fact.

19. TECO does not offer efficiency measures for many end-uses in the residential and C&I sectors -- e.g., for important household appliances and lighting in the residential sector and for HVAC and refrigeration in the C&I sector. (Chernick, TR 353-354)

We accept the above proposed finding of fact.

20. To be reasonably comprehensive, a utility DSM program should attempt to cover all customer segments and end-uses, and it should be comprehensive in terms of technologies treated, the technical and financial assistance offered, and the strategies for overcoming market barriers. (Chernick, TR 306)

We reject the above proposed finding of fact because it is an opinion, not a fact.

21. Many of TECO's current DSM programs are inadequate to overcome the market barriers to customers participation, and the major problems are insufficient incentives, the absence of direct delivery mechanisms, and a fragmented treatment of DSM market sectors. Chernick, TR 356-362)

We reject the above proposed finding of fact because the statement is a conclusion drawn by FRG, not a fact.

22. One of the 3 new DSM programs that survived TECO's RIM screen -- a duct efficiency program -- was not filed with the PSC in February 1990 "because the distribution delivery mechanism was not in place." (Kordecki, TR 500)

We accept the above proposed finding of fact as it is stated. However, Witness Kordecki testified that TECO will be filing the program soon. Furthermore, the finding is duplicative in substance to FRG proposed finding 24.

23. The duct efficiency program has significant potential for both peak and energy savings in TECO's service territory -- with at least 50% of the homes needing the service and with .9 kW of peak and 650 kWh of energy savings available per household (significantly lower than the Florida Solar Energy Center's estimates of 1.6 kW of peak reduction on average); and the cost would average only \$150 to \$250 per residence, depending on the severity of duct leakage. (Kordecki, TR 577-579)

We accept the above proposed finding of fact.

24. As of November 1991, nearly 3 years after the Solar Center study and 2 years after the duct service was examined by the company and passed the RIM test, TECO had not yet filed for PSC approval of the program. (Kordecki, TR 577)

We accept the above proposed finding of fact.

25. Among the reasons for the low customer penetration of certain TECO DSM programs, the company cited customer cost (in the case of the comprehensive C&I audit), tenant/owner differences or split incentives (with commercial indoor lighting), and performance bond requirements (with the conservation value program). (Kordecki, TR 573-574)

We accept the above proposed finding of fact.

26. TECO's HVAC program had an incentive for purchasers which was discontinued and then reinstated when customer participation fell dramatically. The reinstatement resulted in higher

customer participation, and a high incentive would tend to increase participation even more. (Kordecki, TR 575-577)

We reject the above proposed finding of fact because Witness Kordecki stated that, generally, an increased incentive would increase participation but that for this specific program it would not (Kordecki, TR 576).

27. TECO saved about 133 gigawatt hours of energy use during the 1980's, approximately 4% of the growth experienced over the 10 years, and expects to capture approximately 4% of the likely growth during the 1990's. (Kordecki, TR 240-241)

We reject the above proposed finding of fact because the record is unclear and confusing on this finding.

28. The low customer participation levels in TECO's commercial indoor lighting program for 1991 and 1996 are defended as reasonable on the basis of "the conditions of that program and what is involved in the program" -- not on the basis of other utility experience or industry standards. (Kordecki, TR 255-256)

We reject the above proposed finding of fact because Witness Kordecki does not state that the reasonableness of TECO's programs is not judged on the basis on other utility experience or industry standards. This is an assumption made by FRG.

29. The DSM program designs, savings results, and projected energy savings of other utilities clearly indicate that TECO could be implementing many additional conservation measures that could displace or postpone the Polk Unit. (Chernick, TR 321-341)

We reject the above proposed finding of fact because the projected savings from other utilities that Witness Chernick discussed are not yet proven savings and therefore cannot be considered to be completely reliable estimates of savings that might displace or postpone the Polk Unit.

ISSUE 21 -- Most Cost-Effective Alternative

C. EVALUATION OF DEMAND-SIDE AND SUPPLY-SIDE OPTIONS:

30. Conservation and other DSM measures that failed the rim test were excluded from further consideration by TECO, even if they passed the total resource cost (TRC) test. (Kordecki, TR 521)

We accept the above proposed finding of fact.

31. Although treated as a "cost" in the RIM evaluation, the "lost revenue" or "stranded investment" part of the RIM calculation does not represent an additional "cost" of DSM to the utility on its customers; rather, it is a transfer between customers within the utility system that does not affect utility revenue requirements or total system costs. (Kordecki, TR 526)

We accept the above proposed finding of fact.

32. TECO's goal in using the RIM to screen DSM is to assure that nonparticipants are not worse off with DSM than without DSM; that nonparticipants' electric bills will be no higher with DSM than without it; and that nonparticipants do not suffer inequity from participants' enjoyment of DSM benefits. (Kordecki, TR 527, 528)

We accept the above proposed finding of fact.

33. No nonparticipant analysis is made of supply options -- no examination of whether customers who did not need additional power are worse off with new supply than without it or suffer inequity from other customers' enjoyment of the new supply. (Ramil, TR 81-82)

We reject the above proposed finding of fact because Witness Ramil stated that he was unsure whether TECO noted every single criteria it used on pages 70 and 71 of the Need Study (TR 80). FRG did not ask specifically if this criteria was used. Instead, FRG concluded that TECO did not analyze supply-side options based on this criteria.

34. TECO does not eliminate supply options from further review solely on the basis that they would increase rates to some degree or raise revenue requirements. (Ramil, TR 81-82)

We accept the above proposed finding of fact.

35. In evaluating supply options TECO attempts to determine which option is "least cost" -- has the lowest present worth revenue

requirements -- and uses a model called PROVIEW that optimizes on the basis of lowest revenue requirements. (Ramil, TR 78-79)

We accept the above proposed finding of fact.

36. No DSM portfolio or individual conservation program was evaluated alongside the final supply options to determine whether DSM measures would have lower present worth revenue requirements and lower system costs to customers. (Ramil, Part 7, Exhibit 1, pages 66-73)

We reject the above proposed finding of fact because Witness Ramil did not make the above statement anywhere in the Need Study, particularly the pages referenced.

D. LEAST COST/MOST COST-EFFECTIVE ALTERNATIVE:

37. The goal of utility resource planning is to minimize the long-run costs of providing adequate and reliable energy services to customers, and cost minimization requires that utilities choose the resources with the lowest costs first, adding progressively more expensive options until demand is satisfied. (Chernick, TR 297-298)

We reject the above proposed finding of fact because it is a general statement of policy, not a fact.

38. Least cost utility planning requires utilities to pursue the most cost-effective resource plan. Such a plan would include all cost-effective DSM that is available for less than the cost of the supply it would avoid. Not pursuing all cost-effective DSM would obligate a utility to purchase more costly supply to make up for energy savings foregone. (Chernick, TR 299)

We reject the above proposed finding of fact because it is a statement of opinion or conclusion drawn by FRG.

39. TECO did not compare the total system costs and rate impacts of the DSM measures that passed the TRC but failed the RIM with the rate impacts and revenue requirements of the final group of supply options evaluated by the company. Nor did TECO determine whether the DSM Measures rejected for failing the RIM would have cost less or had lower revenue requirements

than the proposed new facility. (Kordecki, TR 550)

We reject the above proposed finding of fact because it is a conclusion drawn by FRG. Witness Kordecki stated that the programs that were rejected would increase rates. Therefore, FRG has derived an improper conclusion from Witness Kordecki's other statements.

40. Since TECO did not examine whether measures failing the RIM would pass the TRC, the utility has no estimate of the amount of savings attainable through rejected measures and programs that would be cost-effective under the TRC -- measures which, by definition, would lower revenue requirements and reduce system costs. (Kordecki, TR 552-554)

We reject the above proposed finding of fact because although TECO did not evaluate in detail measures that failed the RIM test, FRG draws the conclusion that TECO has no estimates of the savings attainable from such programs.

ISSUE 26 -- Factual Basis for Granting TECO's Petition

E. RESULTS OF TECO'S USE OF THE "RIM" TO SCREEN DSM:

41. TECO's resource planning and DSM evaluation goal is "to cost effectively reduce revenue requirements, utility cost and lower future potential rates." (Kordecki, TR 239)

We accept the above proposed finding of fact.

42. Average customer costs and utility revenue requirements that result from DSM programs, as compared with new generation, can be lower even when customer rates to pay for the DSM are much higher, but such DSM programs would be rejected by TECO for failure to pass the RIM test. (Kordecki, TR 528-533)

We reject the above proposed finding of fact because even though the above hypothetical situation was proposed by FRG in its cross-examination of witness Kordecki, an actual program of this sort was never mentioned in the record.

43. DSM programs that fail the RIM are excluded by TECO without regard to the number of likely nonparticipants or the reasons

for non-participation. (Kordecki, TR 535)

We accept the above proposed finding of fact.

44. Contrary to the "WIN-WIN" characterization of TECO, rejection of DSM programs for failing the RIM test (i.e., for increasing the rates of nonparticipants) and building new generation instead can result in making only the customers that would not participate in DSM programs "winners" (by increasing their costs less than under a DSM resource approach) but making the customers who would participate "big losers" (by denying them the cost savings from the DSM programs and increasing their costs to pay for the new generation. (Kordecki, TR 535-536)

We reject the above proposed finding of fact because, although Witness Kordecki may have discussed the above subject, FRG incorrectly drew opinions or conclusions from the statement and, therefore, it is not a finding of fact.

45. DSM programs failing the RIM may have a smaller rate impact on nonparticipant customers in the early years of implementation than a proposed new power plant, and nonparticipants who leave the system prior to the break even point would "win" both in terms of rates and costs. (Kordecki, TR 546)

We accept the above proposed finding of fact because the second statement is an opinion FRG drew based on the first statement (which was said in the record).

46. Although greater flexibility in complying with acid rain legislation was described by the company as a key virtue of the proposed new power plant, TECO did not evaluate or model a portfolio of DSM measures to determine whether they would give the company more or less flexibility to meet clean air standards than Polk Unit One. (Ramil. TR 72-75)

We reject the above proposed finding of fact. On the pages cited above, Witness Ramil testified only that he did not perform the analysis described above. He noted only that Witness Kordecki might have.

47. Although company witnesses expressed concern about meeting clean air standards, TECO made no environmental impact comparisons between rejected DSM programs and the final group of supply options evaluated. (Ramil, TR 75-76)

We accept the above proposed finding of fact.

48. The RIM test has no role in the economic screening of DSM programs because it leads to the rejection of cost-effective conservation measures -- measures whose total benefits exceed their total costs. (Chernick, TR 300)

We reject the above proposed finding of fact because it is a conclusion drawn by FRG, not a fact.

F. CONSERVATION MEASURES TAKEN BY & AVAILABLE TO TECO:

49. Although Polk Unit One, if built, will be a baseload unit, TECO has focused its DSM efforts on programs that reduce peak demand and mitigate the need for peaking capacity, and the company plans to continue this focus on reducing peak demand in the years ahead. (Kordecki, TR 242-243)

We reject the above proposed finding of fact. Witness Kordecki did state that TECO has focused its DSM efforts on programs which reduce peak demand. However, the last part of the above statement is incorrect, as Witness Kordecki did not state that TECO plans to continue focusing on programs which only reduce peak demand.

50. If TECO had evaluated and developed DSM programs directed at reducing baseload capacity, which it chose not to do, those programs would have reduced its need for additional baseload capacity; and if it now were implementing energy saving DSM programs, they would assist in deferring the need for new baseload capacity. (Kordecki, TR 243-244)

We accept the above proposed finding of fact.

51. Research and utility experience shows that while homeowners finance cars and other things, they have little interest in financing energy efficiency measures. (Kordecki, TR 549)

We accept the above proposed finding of fact.

52. It would be possible for TECO to design a cost-effective residential new construction program that promotes efficiency installations which exceed code, and there is cost-effective potential in some construction market segments that would not

suggest code change. (Kordecki, TR 560-561)

We accept the above proposed finding of fact.

53. Because residential sales constitute about 41% of TECO retail sales and C&I about 52%, with both projected to grow over 2% a year during the next decade, there is likely to be as much potential for energy savings in the C&I sector as in the residential sector. (Kordecki, TR 567-568)

We accept the above proposed finding of fact.

54. TECO analyses show that DSM programs in the C&I sector have significant potential for energy savings but not for peak demand reductions. (Kordecki, TR 568)

We accept the above proposed finding of fact.

55. Most of the savings projected from the collaborative efforts cited by Mr. Chernick come from the C&I sector. (Kordecki, TR 568)

We accept the above proposed finding of fact.

56. There is nothing peculiar about the commercial sector in Florida, as compared with the commercial sector in other states, that would prevent TECO from getting greater energy savings. (Kordecki, TR 569)

We accept the above proposed finding of fact.

57. Although familiar with the federal government's list of some 200 energy conservation measures published under the Clean Air Act amendments, TECO has not investigated and analyzed most of the measure in a specific fashion. (Kordecki, TR 575)

We reject the above proposed finding of fact because it is misleading. Witness Kordecki testified that TECO investigated the measures in a general fashion, but that TECO probably had not analyzed every one of them in specific detail.

58. Although TECO's out-of-state witnesses demonstrated that there are many reasons why the estimated savings from FRG comparison utility programs may be overstated, neither testified that the savings estimates of FRG witness Chernick were too high by any

specific range of amounts (Perl, TR 638 & Kahn, TR 422-425); thus, on the basis of comparison utility projections and Mr. Chernick's conservative analysis of their implications for TECO, it is clear that TECO could have implemented better designed and more comprehensive efficiency programs that would capture significantly greater levels of energy savings during the 1990's. (Chernick, TR 367-376)

We reject the above proposed finding of fact because the second part of the statement is an opinion or conclusion drawn by FRG, not a fact.

59. On the basis of these facts and those listed in Parts A & B above, the Commission finds that TECO has neither adequately examined (investigated, analyzed and compared) nor reasonably implemented (i.e., undertaken well designed programs that are comprehensive in their coverage of customer market segments and electric end-uses) many cost-effective energy conservation measures that are available to mitigate the need for the proposed new power plant. (Chernick, Kordecki & Perl)

We reject the above proposed finding of fact.

G. MOST COST-EFFECTIVE ALTERNATIVE:

60. On the basis of the company's testimony, and specifically the facts listed above in parts C & D, the Commission finds that TECO's approach to evaluating demand - and supply-side resource options is inconsistent and inequitable, and that it unfairly discriminates against energy efficiency options in favor of supply options that may be more costly and less equitable to its customers. (Kordecki & Ramil)

We reject the above proposed finding of fact.

61. On the basis of TECO's testimony and the facts highlighted above, the Commission finds that TECO's integrated planning process -- with its inconsistent evaluation of DSM and supply options -- is not capable of demonstrating that the proposed new plant is the most cost-effective alternative available; and the Commission further finds that the company has not shown by a preponderance of the evidence on this record that Polk Unit One is the most cost-effective option. (Chernick, Kordecki & Ramil)

We reject the above proposed finding of fact.

PROPOSED CONCLUSIONS OF LAW

ISSUE 27 -- Does "Most Cost-Effective" Mean "Least Cost"?

1. Reading and interpreting the plain language of Section 403.519 of the Florida Electrical Power Plant Siting Act as a whole, as well as considering it in the context of FEECA's direction to construe this section liberally to help control the growth rates of electric use and demand, and noting that the company analyzes and chooses its supply-side options on the basis of lowest cost, the Commission concludes as follows:
 - a. that adequate electricity at "reasonable cost" means electricity that meets basic system requirements at the lowest possible cost, since it would be "unreasonable" to pay more than necessary for such electricity;
 - b. that "cost-effective" alternative means that a resource option's benefits equal or exceed its costs; and
 - c. that "most cost-effective" alternative means "lowest cost" or "least cost" resource option available to meet system needs.
2. The Commission also concludes that use of a practical standard such as "least cost" for evaluating the "most cost-effective alternative" is necessary in order to carry out its statutory obligation, and that "least cost" is the most logical standard in light of the specific provisions of Sec. 403.519.

We reject proposed conclusions of law 1 and 2 because the terms "most cost-effective alternative available" and "least cost option" are not synonymous. If the Legislature intended that the Commission use the more restrictive analysis contemplated by the term "least cost option" in its determination of the need for a proposed power plant, the Legislature would have adopted that specific term.

ISSUE 28 -- TECO's Obligation to Demonstrate DSM Measures Taken or

Reasonably Available to Mitigate the Need for the Polk Unit

3. The Commission concludes that Section 403.519 of the Siting Act requires that utilities seeking a determination of need for new power plants demonstrate the following:
 - a. that they have fully examined (i.e., investigated, analyzed, and compared) the energy efficiency and other DSM alternatives reasonably available to them, based on their own research and experience, the studies and experience of other Florida utilities, and the research and DSM programs of utilities nationwide; and
 - b. that they have reasonably implemented (i.e., have undertaken well designed programs that are comprehensive in their coverage of customer market segments and electric end-uses) the cost-effective DSM measures available to mitigate the need for proposed plants.
4. The Commission concludes that TECO has not met its statutory obligations under Section 403.519, F.S., having failed to demonstrate by a preponderance of the evidence either that it has fully examined or reasonably implemented the DSM measures reasonably available to mitigate the need for Polk Unit One.

We reject proposed conclusions of law 3 and 4 because they expand the Commission's review and analysis of TECO's conservation efforts beyond the scope of what is required in this need determination proceeding. In this proceeding TECO has the obligation to show, and the Commission has the responsibility to consider, the conservation measures TECO has taken to mitigate the need for the proposed unit. The conservation measures to be considered by the Commission here are those measures that might mitigate the need for this proposed plant. While the record in this proceeding shows that TECO can improve its conservation efforts, the record in this proceeding does not show that additional conservation can be implemented quickly enough to avoid construction of this particular power plant, and thus additional conservation cannot "mitigate the need" for the IGCC plant.

APPENDIX 11.15

**POWER PLANT SITE SELECTION ASSESSMENT
SITING TASK FORCE MEMBERS**

APPENDIX 11.15

MEMBERS OF POWER PLANT SITING TASK FORCE*

Bruce A. Samson; Chairman of Siting Task Force

Mr. Samson is a former investment banker and has served as chairman of the Southwest Florida Water Management District (SWFWMD) board. A Harvard MBA, he is now president of the University of Tampa.

James (Jim) W. Apthorp

Mr. Apthorp is a member of the board of 1,000 Friends of Florida, executive vice president of Gulfstream Holding Company, vice president of the Greater Tampa Chamber of Commerce, a director of University Community Hospital, and serves on the Florida Judicial Council.

Dr. Sanford V. Berg

Dr. Berg is a professor of Economics at the University of Florida (UF). He is also executive director of Public Utility Research Center at UF, and has served as a consultant to various private and public organizations, including the Florida PSC, the Governor's Energy Office, the National Bureau of Standards, and the Office of Technology Assessment. He is widely published on business and economic topics.

Robert T. Bramson, M.D.

Dr. Bramson has been a radiologist in Tampa since 1974.

Henry Carley

Professionally, Mr. Carley has been an educator at the college level for the last 17 years, primarily at Hillsborough Community College (HCC). He is presently the coordinator of minority student outreach programs at HCC, which focuses on recruitment and retention. He is president of the Tampa branch of the NAACP and affiliated with a number of Tampa area charities and organizations such as the March of Dimes and American Legion.

Dr. David Denslow

Dr. Denslow is interim director of the Bureau of Economic and Business Research and a professor in the Department of Economics at UF. He is chairman of the Governor's Council of Economic Advisors for Florida, and was selected as the University Alumni Professor for 1989-1991--an award given by the National Alumni Assn. The award recognized Denslow's influence on students and alumni as a classroom teacher and included a cash award and research assistance.

Ethel Hammer

Ms. Hammer has been director of planning for Taub & Williams law firm in Tampa since 1985 where she is responsible for coordination of all land use-related activities including zoning petitions, site plans, and developments of regional impact. She was

with the Hillsborough County Department of Development Coordination between 1980 and 1985, much of the time as principal planner. Between 1978 and 1980, she was environmental planner for the Hillsborough County Planning Commission. Ms. Hammer has a masters degree in environmental planning.

Clayton Lyons

Mr. Lyons has been president of Master Containers in Lakeland since 1969. He came to that post from eight years with Florida Tile Industries. He has his bachelors from Florida Southern College, and has studied business at the graduate level at University of South Florida (USF). He has a lengthy list of awards and civic activities in the Lakeland area, and is currently an officer with the Polk Museum of Art in Lakeland and on the executive committee of the Boy Scouts of America council in Tampa. He was recently appointed by the governor to the Central Florida Regional Planning Council.

Richard T. Paul

Having earned a masters in wildlife ecology, Mr. Paul joined the National Audubon in 1972, first as a research biologist, and since 1980 as manager of Tampa Bay Sanctuaries. Under his protection are large colonies of as many as 25 species of birds. He is currently serving on the Agency on Bay Management and has served on other local environmental advisory committees. His field and research experience is extensive and worldwide, including Antarctica and Thailand.

Jill E. Pettigrew

Ms. Pettigrew is a member of the Florida Bar. She is staff attorney to the Second District Court of Appeal of Florida in Lakeland. She reviews trial records, researches issues under appeal, drafts case summaries and analyses, and makes recommendations to the presiding judge.

Walter L. Preston

Mr. Preston is owner and president of Manatee Fruit Company in Palmetto, a company founded by his grandfather in 1892. He is a member of the Manatee County Agricultural Advisory Council and is active in a number of professional associations. Gov. Graham appointed him to the Future of Agriculture in Florida task force, and in 1986 he was named Outstanding Florida Agriculturist by the Florida Association of County Agricultural Agents. He is a director of the Manatee County Blood Bank and of First Florida Bank.

Nathaniel P. Reed

Mr. Reed is president of the Hobe Sound Company, a real estate and holding company. He is currently president of 1,000 Friends of Florida and is a former member of the National Audubon Board and served on the board of the Nature Conservancy. He is currently on the board of the Natural Resources Defense Council and the National Geographic Society. Mr. Reed was Assistant Secretary of the Interior from 1971-1977 and chairman of the Florida Department of Air and Water Pollution Control from 1968-1971. He is currently chairman of the Commission on the Future of Florida's Environment.

Dr. Mark Stewart

Dr. Stewart is a professor in and chairman of the USF Geology Department. At USF since 1976, he is certified as a professional hydrogeologist by the American Institute of Hydrology, and is a registered professional geologist in Florida. He is currently a director of the Association of Ground Water Scientists and Engineers, and is on the editorial board of the Journal of Ground Water. He is extensively published in his field.

Sally Thompson

Ms. Thompson is president of the Hillsborough Environmental Coalition, on the board of the Tampa Audubon Society, and a member of Sierra Club and other local environmental groups. Professionally, she is chief of personnel for the Tampa Public Works Department and has been with the City of Tampa for 15 years.

Victoria Tschinkel

Ms. Tschinkel is a consultant specializing in environmental matters with the law firm of Landers & Parsons. She was secretary of the Florida Department of Environmental Regulation from 1981 to 1987. She was a board member of 1,000 Friends of Florida and a member of the National Academy of Public Administration. Ms. Tschinkel currently serves on the U.S. Department of Energy's Advisory Committee on Nuclear Facility Safety, on the Advisory Council of the Electric Power Research Institute, as a member of the Tallahassee/Leon County Local Planning Agency, on the board of Florida Defenders of the Environment, and on the board of Environmental and Energy Study Institute. Ms. Tschinkel received the Tropical Audubon Society's Conservation Award and Environmental Protection Agency's Service Award in 1984.

William J. Webber, AIA

Mr. Webber is retired from Reynolds, Smith & Hills (RSH), an architectural and engineering firm, where he was a senior vice president in the Tampa office. An architect by profession, Webber was one of the original partners in RSH before it became a corporation.

Dr. Bernard Yokel

Dr. Yokel has his doctorate in marine science with a specialization in estuarine ecology, and is currently the president of the Florida Audubon Society. He came to the Florida Audubon in 1984 from a position as director of research and environmental protection in Naples for The Conservancy. In 1974 he came to the Conservancy from a four-year position as director of the Rookery Bay Marine Research Station at Naples. The Rookery Bay project was a demonstration experiment to determine if an essentially unaltered natural system could be conserved in the presence of an expanding population and aggressive development. He has a lengthy list of community services and special appointments and has been extensively published.

Walker Roberts, Communications Consultant to Task Force

Roberts & Hice (R&H) provides communications services to the task force. R&H is a full-service firm with clients in several industries; it specializes in hospi-

tal/medical public relations and in Florida issues management. Mr. Roberts edited Florida Trend magazine for about a decade, and, in his career as a business journalist, has started, owned, or worked on numerous other publications, including the Miami Herald. He serves clients with Florida issues management needs for R&H, as well as offering media consulting.

Mary Kumpe, Senior Consultant to Task Force

Ms. Kumpe served as senior consultant to the task force. She is a former vice-chairman of the federal Gulf of Mexico Fishery Management Council. She has completed the Harvard University program in Environmental Policy and Management. She is a former governing board member of the SWFWMD, a board member of 1,000 Friends of Florida, and has served as a regional planning commissioner on the Southwest Florida Regional Planning Council. Ms. Kumpe chaired the Sarasota County Chamber of Commerce' committee which formulated the Chamber's contribution to the county comprehensive plan and she served on the 1987 State Comprehensive Plan Committee.

**Summaries reflect biographical status at the time of the Power Plant Site Selection Assessment.*

APPENDIX 11.16

SUPPORTING INFORMATION FOR CONCEPTUAL RECLAMATION PLAN APPLICATION: MAPS

- 11.16.1 LAND ACQUISITION LOCATION MAP**
- 11.16.2 MINED, DISTURBED, AND PERMIT AREAS**
- 11.16.3 PRE-MINING TOPOGRAPHY AND DRAINAGE**
- 11.16.4 PRE-MINING VEGETATION AND LAND USE**
- 11.16.5 EXISTING VEGETATION AND LAND USE**
- 11.16.6 POST-RECLAMATION TOPOGRAPHY AND DRAINAGE**
- 11.16.7 POST-RECLAMATION VEGETATION AND LAND USE**
- 11.16.8 AERIAL PHOTOGRAPH OF POLK POWER STATION SITE**

APPENDIX 11.17
LIST OF PREPARERS

APPENDIX 11.17
LIST OF PREPARERS

The following provides a listing of the persons who served in key management, technical, technical support roles in preparation of the Site Certification Application (SCA) for Tampa Electric Company's proposed Polk Power Station project. Environmental Consulting & Technology, Inc. (ECT) served as the overall environmental consultant to Tampa Electric Company for the preparation of the SCA. Engineering inputs on the various facility systems and processes in support of the SCA were provided by United Engineers & Constructors (UE&C); Texaco, Inc.; and General Electric Company (GE). Although not listed below, numerous individuals from various departments of Tampa Electric Company and TECO Power Services also participated in providing key inputs and the preparation of this SCA.

LIST OF PREPARERS

Environmental Consulting & Technology, Inc.

Jack D. Doolittle	Project Director	Project Management
Vilma S. Brueggemeyer	Project Manager	Project Management
Jeffrey L. Meling	Manager, Air Resources	Air Resources
Thomas W. Davis	Air Resources Engineer	Air Resources/BACT
Ivan B. Chou	Manager, Surface Water	Hydrology
Michael S. Tomlinson	Project Hydrologist	Water Quality
Gregory M. Harper	Project Hydrologist	Hydrology
Gary P. Uebelhoer	Manager, Reclamation	Reclamation
Robert S. Hearon	Project Reclamation	Reclamation
Bradley S. Pekas	Manager, Geohydrology	Geohydrology
Juan C. Villa	Project Geologist	Geology
Anthony N. Arcuri	Manager, Ecology	Ecology
Phillip W. Simpson	Project Ecologist	Ecology
Phyllis A. Guthrie	Project Ecologist	Aquatic Ecology
Douglas A. Dean	Environmental Engineer	Water/Wastewater
Nancy D. Bartoletta	Environmental Engineer	Water/Wastewater
Theresa A. Barnard-Hazlett	Meteorologist	Noise
Brian R. Kiraly	Project Planner	Land Use/Socioeconomics
Debra L. Mansell	Project Coordinator	SCA Production
Terri S. Warrington	Document Coordinator	SCA Production
Frank X. Ramirez	Manager, Graphics	SCA Production
Peter S. Sullivan	CADD Operator	SCA Production

United Engineers and Constructors, Inc.

Raymond A. Rizzi	Project Manager	Project Management
William A. Schwegler	Project Engineering Manager	Overall Mechanical
Dennis J. Mohan	Manager, Geotechnical Services	Geological/Geotechnical
Kim A. Lukens	Supervising Process Engineer	Water Treatment
Dennis E. Ahern	Project Licensing Manager	Overall Licensing
David R. Wegner	Process Engineer	Water Treatment

Texaco, Inc.

W.E. Preston	Project Manager	Overall Project Management
A.E. Chang	Environmental Specialist	Environmental Coordinator
R.B. Heiman	Engineering Manager	Coordinator
P.S. Wallace	Lead Processing Engineer	Gasification
E.R. Anderson	Lead Project Engineer	Coordinator
R.F. Heyl	Lead Mechanical Engineer	Wastewater Treatment
R.L. Zerda	Lead Electrical Engineer	CC and Gasification I&C
M.K. Anderson	Processing Engineer	BACT/Gasification
R.F. Tyree	Processing Engineer	BACT/Gasification
Al denBlecker	Mechanical Engineer	Wastewater Treatment
A.J. Pertuit	Electrical Engineer	CC and Gasification I&C

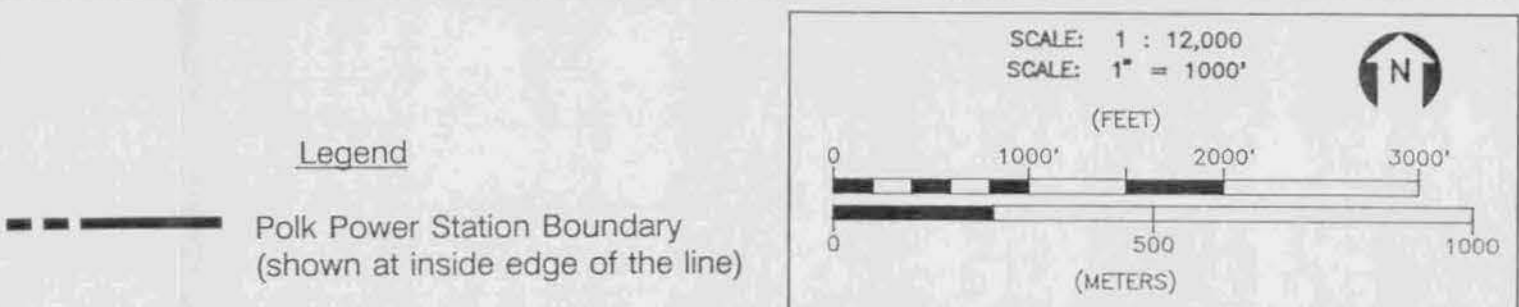
General Electric Company

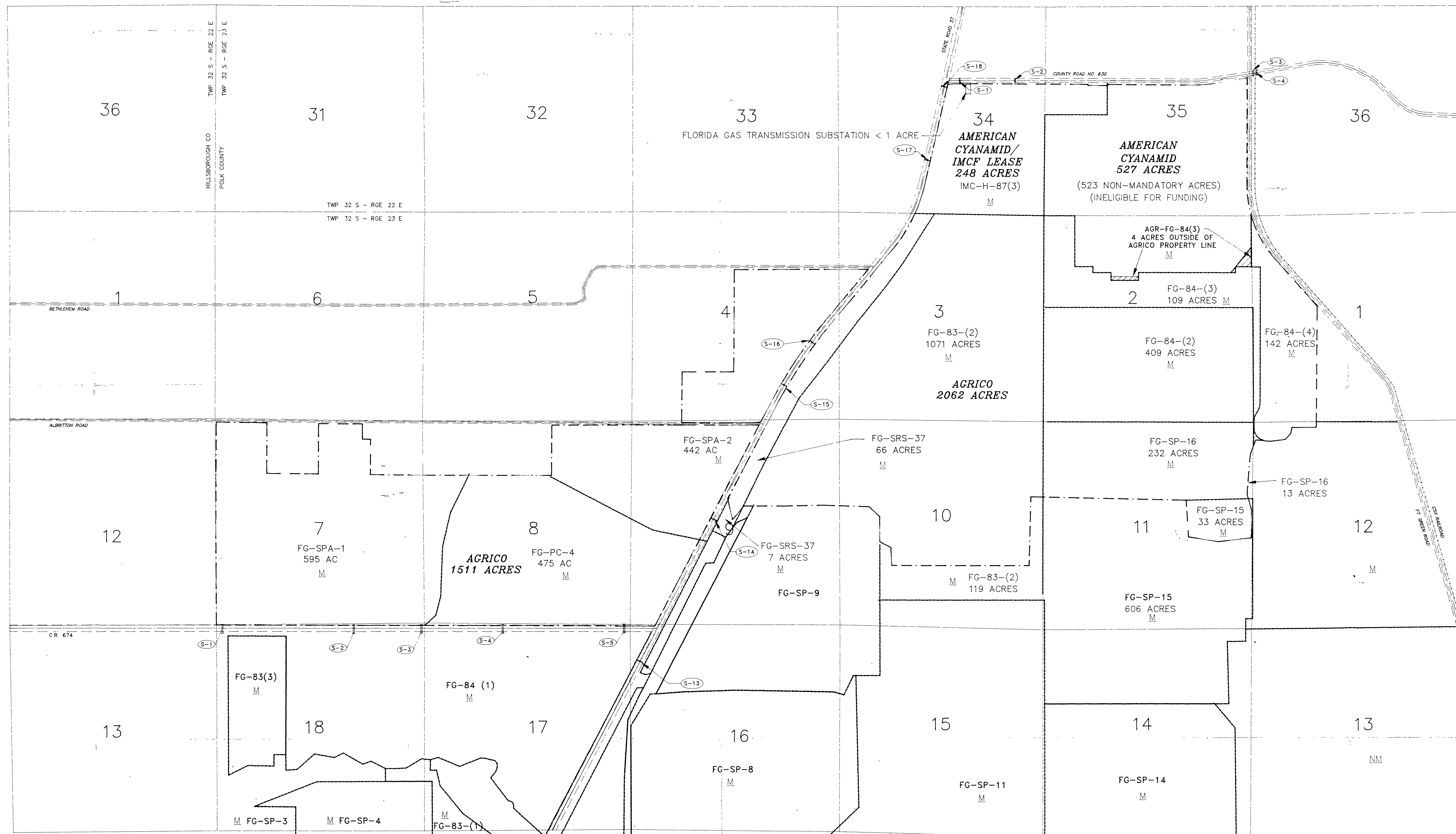
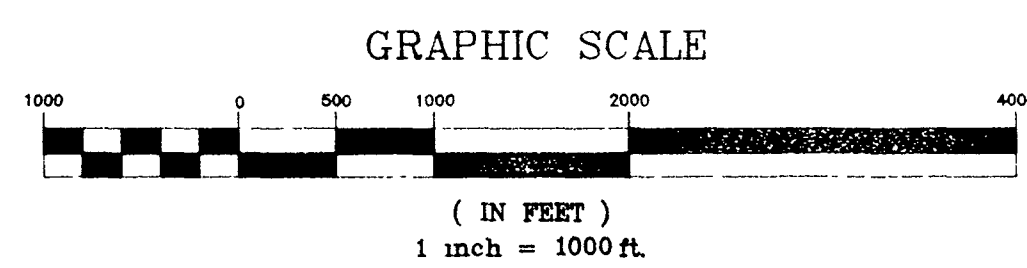
Eugene H. Broadway	Systems Engineer	Combined Cycle Performance
Raymond F. Racine	Project Engineer	Combined Cycle Performance
William M. Starr	Environmental Engineer	Combustion Turbine Emissions
Terry C. Lynch	Project Engineer	Combined Cycle Performance
Charles S. Cook	Manager, IGCC Technology	Hot Gas Cleanup
Alan Feitelberg	Consulting Engineer	Hot Gas Cleanup



1067277

2





LEGEND

	PROPOSED TAMPA ELECTRIC PROPERTY BOUNDARY
	MAJOR HIGHWAY
	EXISTING LAND OWNER AND PARCEL SIZE
	FDNR LRU RECLAMATION PROGRAM ID AND SIZE
	FDNR LRU RECLAMATION PROGRAM BOUNDARY
	MANDATORY ACREAGE
	NON-MANDATORY ACREAGE

LAND ACQUISITION SUMMARY

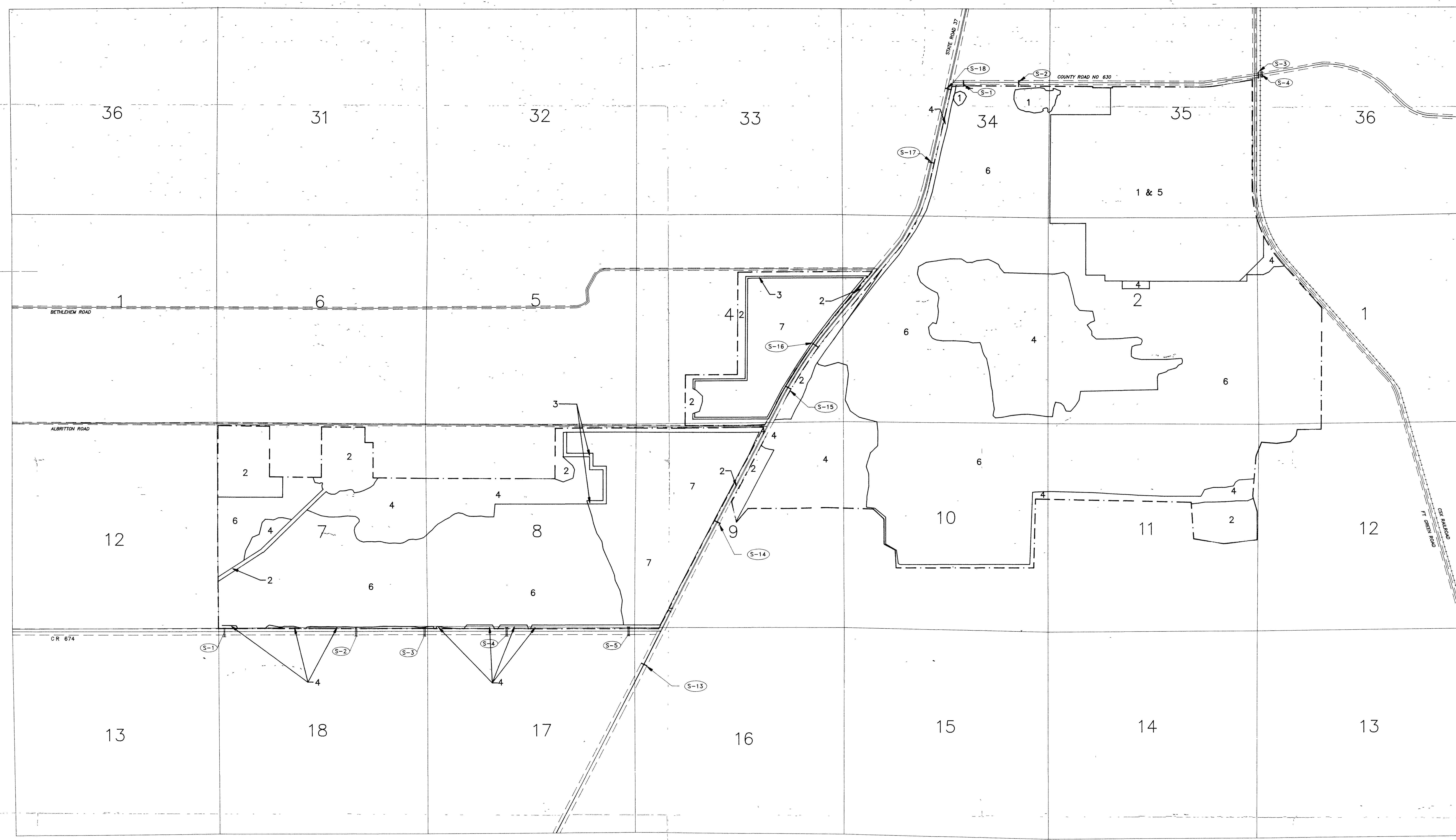
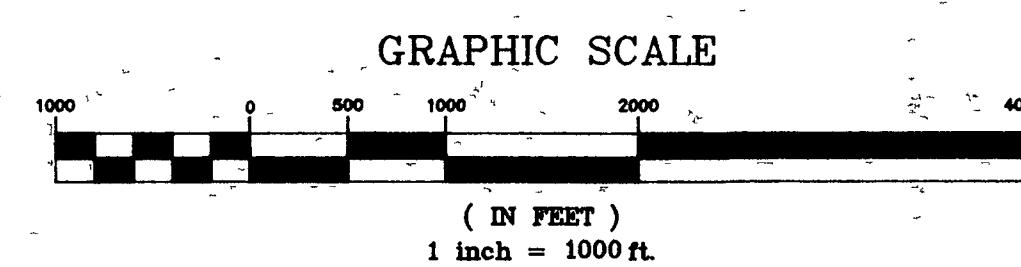
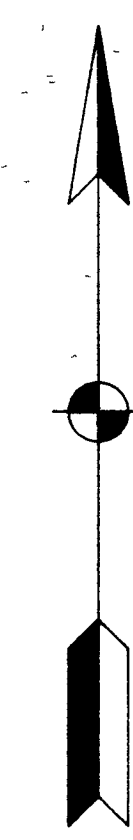
TO BE PURCHASED FROM AGRICO 3,573 ACRES
TO BE PURCHASED FROM AMERICAN CYANAMID 775 ACRES
TOTAL PROPOSED SITE 4348 ACRES

NOTE: SUM OF LRU PROGRAMS TO BE ACQUIRED DOES NOT
EQUAL ACREAGE TOTALS PRESENTED DUE TO ROUNDING

FIGURE: 1	TITLE: LAND ACQUISITION LOCATION		TAMPA ELECTRIC COMPANY POLK POWER STATION PROJECT A TECO ENERGY COMPANY
SOURCE: ECT/TEC	MAP		
DATE: 6/29/92	SCALE: 1 in = 1000 ft		
FILE: LANDACQ3	PROJECT: 90263-0407		

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& Constructors
A Hochtief Company



LEGEND

- MAJOR ROADWAYS
- PROPERTY BOUNDARY (LESS ROW)
- RECLAMATION STATUS BOUNDARY

RECLAMATION LIABILITY BY PARCEL

CURRENT OWNER	MAN.	NON MAN.	SUBTOTAL
AGRIC	3573	0	3573
AmCy/IMCF	248	0	248
AmCy (AGR FG84(3))	4	0	4
AmCy OTHER	0	523	523
SUBTOTAL	3825	523	4348

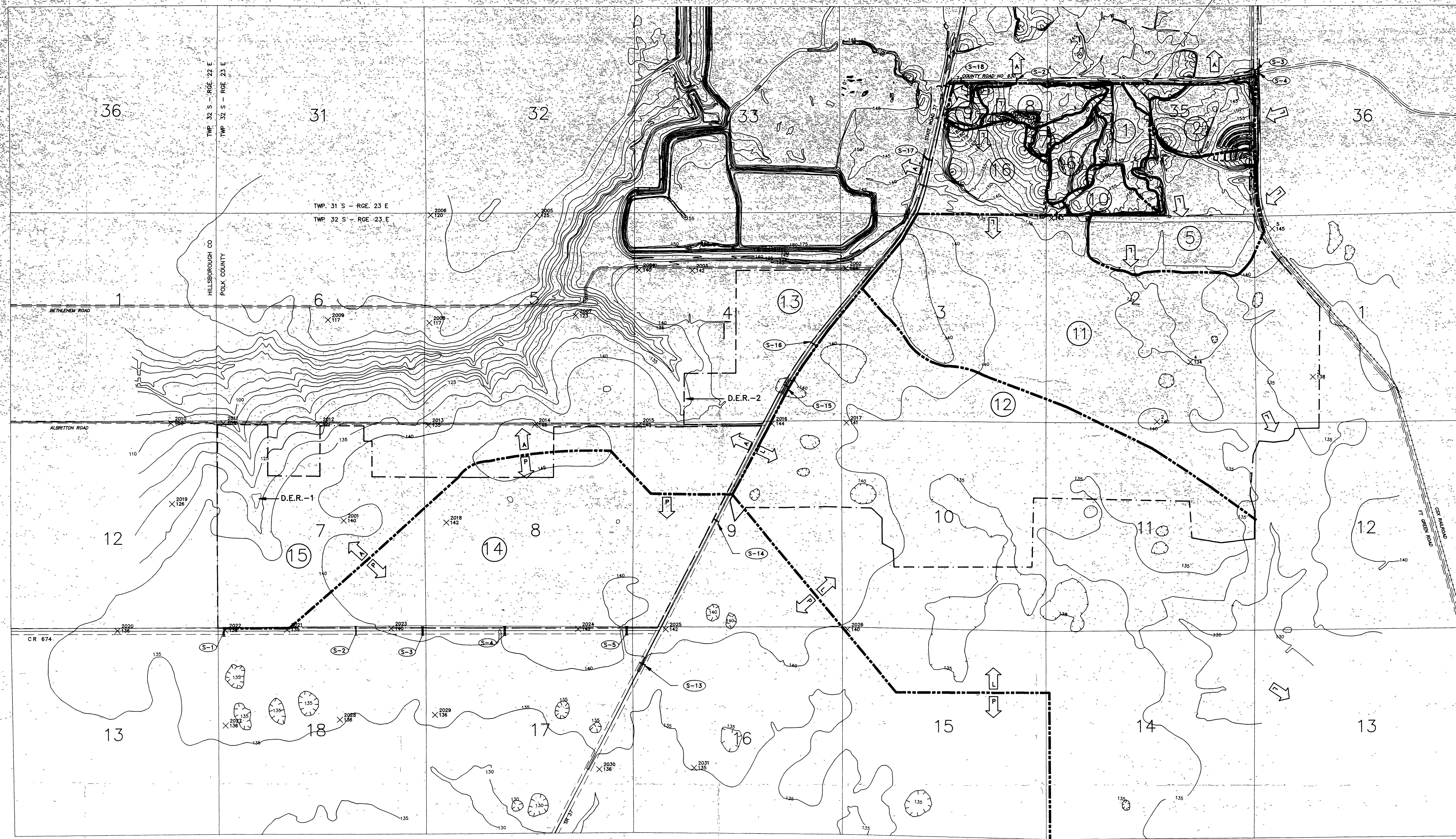
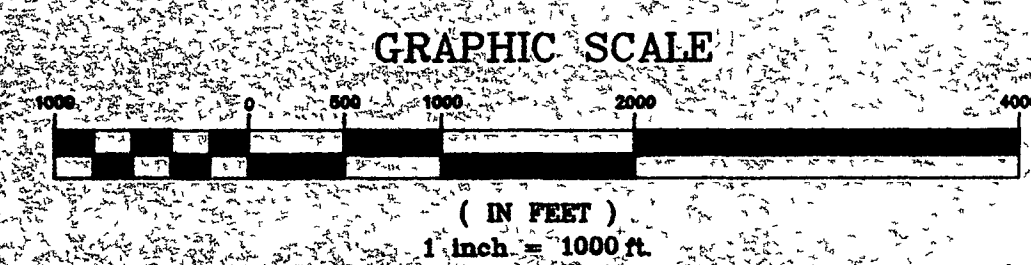
RECLAMATION STATUS LEGEND (6-13-91)

1 & 5 MINED/DISTURBED PRIOR TO 7/1/75	- 523 ACRES
2 TO REMAIN UNDISTURBED BY MINE OPERATOR	- 233 ACRES
3 TO BE DISTURBED BY MINE OPERATOR	- 21 ACRES
4 DISTURBED AFTER 6/30/75	- 906 ACRES
6 MINED AFTER 7/1/75	- 2173 ACRES
7 TO BE MINED	- 492 ACRES
TOTAL	- 4348 ACRES

FIGURE: 2	TITLE: MINING OPERATIONS STATUS MAP	 TAMPA ELECTRIC COMPANY POLK POWER STATION PROJECT A TECO ENERGY COMPANY
SOURCE: ECT		
DATE: 6/16/92	SCALE: 1 in = 1000 ft	
FILE: STATMP3	PROJECT: 90263-0404	

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TOPOGRAPHY SOURCES: 1 F. ROOKS - 6/13/91 (SECTIONS 3, 4, 8 & 9)
 U.S.G.S/AGRIC - 1972 (SECTIONS 1, 2, 3, 7, 9, 10, 11 & 12)
 SWFWMD - 1975 (SECTIONS 33, 34, 35 & 36)

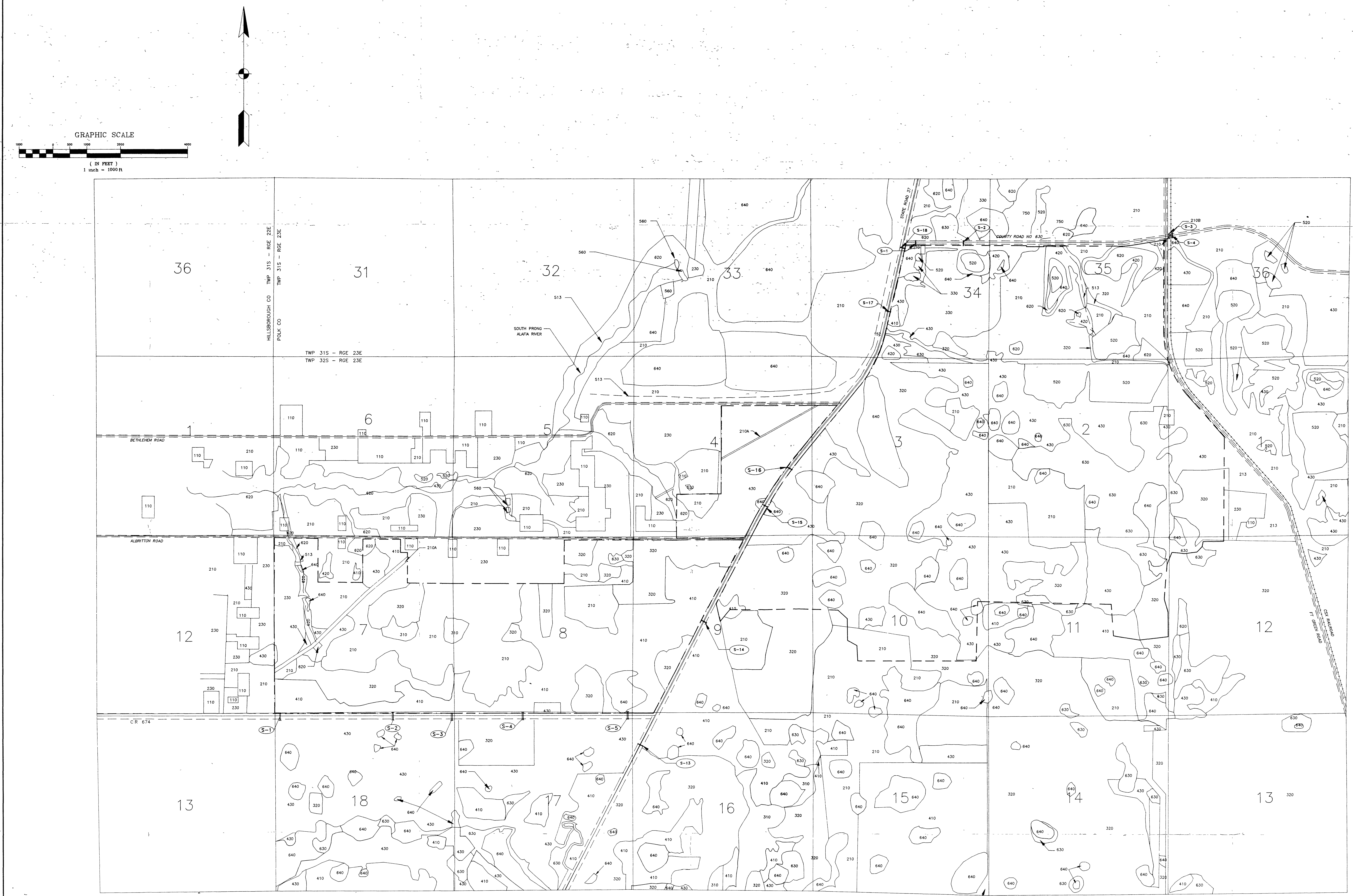
LEGEND	
	PROJECT BOUNDARY
	ELEVATION CONTOUR
	CULVERTS BENEATH HIGHWAYS
	DRAINAGE BASIN NO
	WATERSHED DIVIDE
	WATERSHED BASINS
A	ALAFIA RIVER BASIN
L	LITTLE PAYNE CREEK BASIN
P	PAYNE CREEK BASIN

DRAINAGE PATTERNS BY PARCEL				
PARCEL	ALAFIA BASIN	LITTLE PAYNE BASIN	PAYNE BASIN	SUB TOTAL
AGRIC	795 AC	2046 AC	716 AC	3557 AC
AmCo/AMC	21 AC	227 AC	0 AC	248 AC
AmCo NON-MAN	0 AC	523 AC	0 AC	523 AC
AmCo (AGR MAN)	0 AC	4 AC	0 AC	4 AC
TOTAL	816 AC	2816 AC	716 AC	4348 AC

WATERSHED BASIN SUMMARY
 LITTLE PAYNE CREEK (1-8,10,11,12 & 16) = 2816 ACRES
 PAYNE CREEK (14) = 716 ACRES
 ALAFIA RIVER (9,13 & 15) = 816 ACRES
 TOTAL AREA OF SITE BASINS = 4348 ACRES

BASIN	ACRES	BASIN	ACRES
1	62	10	41
2	100	11	951
5	262	12	1095
6	43	13	381
7	25	14	716
8	58	15	414
9	21	16	178

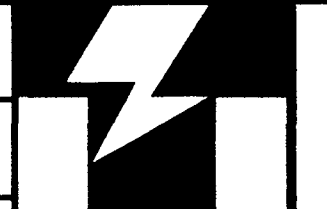
FIGURE: 3	TITLE: PREMINING TOPOGRAPHY AND DRAINAGE MAP	TAMPA ELECTRIC COMPANY POLK POWER STATION PROJECT A TECO ENERGY COMPANY ECT Environmental Consulting & Technology, Inc. United Engineers & Constructors A TECO Energy Company
SOURCE: ECT/AGRIC	SCALE: 1 in = 1000 ft	
DATE: 6/29/92	PROJECT: 90263-0407	
FILE: PRETOP7		

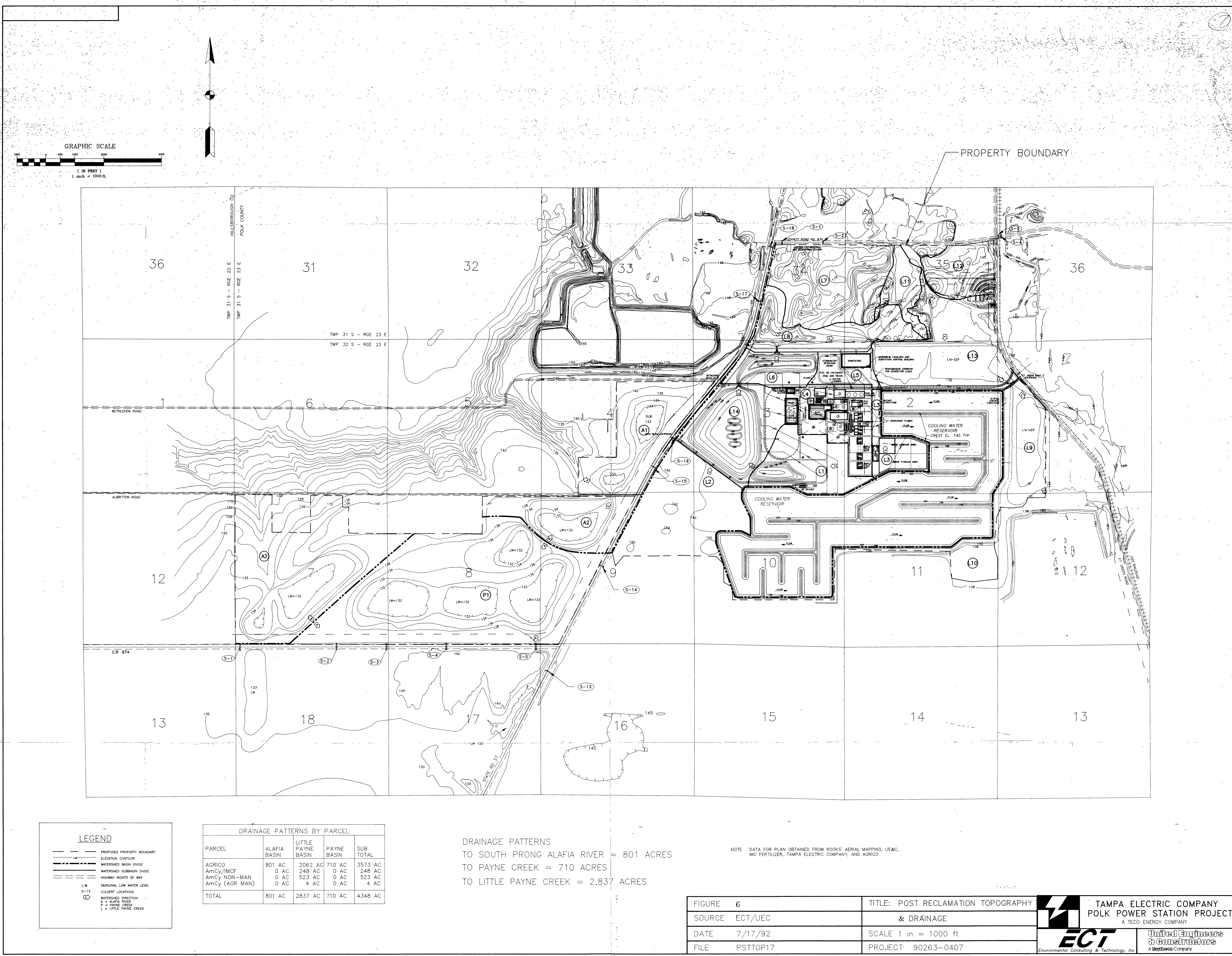


PREMINING VEGETATION WITHIN PROJECT BOUNDARY				PREMINING VEGETATION LEGEND BY OWNERSHIP				
	NON-MANDATORY ACRES	MANDATORY ACRES	TOTAL ACRES	AmCy NON-MANDATORY ACRES	AmCy MANDATORY ACRES	AGRIC MANDATORY ACRES		TOTAL ACRES
210A PASTURE OVER GAS TRANSMISSION LINE	0	13	13	210A PASTURE OVER GAS TRANSMISSION LINE	0	0	13	13
210 PASTURE	226	660	886	210 PASTURE	226	24	636	886
230 CITRUS	0	59	59	230 CITRUS	0	0	59	59
310 GRASSLAND	0	20	20	310 GRASSLAND	0	0	20	20
320 SHRUBLAND	0	995	995	320 SHRUBLAND	0	8	987	995
330 MIXED RANGELAND	12	147	159	330 MIXED RANGELAND	12	147	0	159
410 CONIFEROUS FOREST	0	439	439	410 CONIFEROUS FOREST	0	3	436	439
420 UPLAND HARDWOOD FOREST	42	11	53	420 UPLAND HARDWOOD FOREST	42	11	0	53
430 UPLAND MIXED FOREST	34	931	965	430 UPLAND MIXED FOREST	34	29	902	965
520 LAKES	140	7	147	520 LAKES	140	0	147	147
620 WETLAND HARDWOOD FOREST	52	16	68	620 WETLAND HARDWOOD FOREST	52	1	15	68
630 WETLAND MIXED FOREST	0	267	267	630 WETLAND MIXED FOREST	0	10	257	267
640 HERBACEOUS WETLAND	17	260	277	640 HERBACEOUS WETLAND	17	12	248	277
			TOTAL 4348	TOTAL 523	TOTAL 252	TOTAL 3573		TOTAL 4348

VEGETATION LEGEND OUTSIDE PROJECT BOUNDARY	
110	RESIDENTIAL
213	IMPROVED PASTURE
513	CANALS/DITCHES
560	PONDS

NOTE
BASIS FOR THIS MAP CONSISTS OF
1. MINE OPERATOR'S SUBMITTAL OF PRE-MINING LAND USE FOR LANDS
MINED AFTER 7-1-75, OR
2. AERIAL PHOTOGRAPH DATED 6-13-91 BY IF ROOKS & ASSOCIATES
AND MODIFIED BY GROUND TRUTHING ON 12-19-91 BY ECT FOR
LANDS NOT SUBJECT TO MANDATORY LAND RECLAMATION RULES
SEE FIGURE 2 FOR REFERENCE

FIGURE 4	TITLE. PREMINING VEGETATION AND	 TAMPA ELECTRIC COMPANY POLK POWER STATION PROJECT A TECO ENERGY COMPANY
SOURCE AGRICO/ECT/SWFMD/SEMINOLE	LAND USE MAP	
DATE 6/29/92	SCALE 1 in = 1000 ft	
FILE PREVEG5	PROJECT 90263-0407	
		 ECT Environmental Consulting & Technology, Inc.
		 United Engineers & Constructors A Bechtel Company



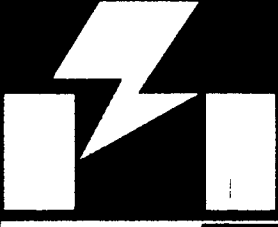
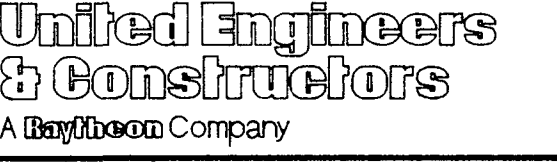
LEGEND

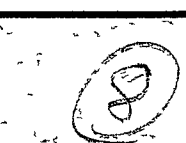
- PROPOSED PROPERTY BOUNDARY
- ELEVATION CONTOUR
- WATERSHED BASIN DIVIDE
- WATERSHED SUBBASIN DIVIDE
- HIGHWAY RIGHTS OF WAY
- SEASONAL LOW WATER LEVEL
- CULVERT LOCATIONS
- WATERSHED DIRECTION
 - A = ALAFIA RIVER
 - P = PAYNE CREEK
 - L = LITTLE PAYNE CREEK

DRAINAGE PATTERNS BY PARCEL				
PARCEL	ALAFIA BASIN	LITTLE PAYNE BASIN	PAYNE BASIN	SUB TOTAL
AGRIC	801 AC	2062 AC	710 AC	3573 AC
AmCy/IMCF	0 AC	248 AC	0 AC	248 AC
AmCy NON-MAN	0 AC	523 AC	0 AC	523 AC
AmCy (AGR MAN)	0 AC	4 AC	0 AC	4 AC
TOTAL	801 AC	2837 AC	710 AC	4348 AC

DRAINAGE PATTERNS
TO SOUTH PRONG ALAFIA RIVER = 801 ACRES
TO PAYNE CREEK = 710 ACRES
TO LITTLE PAYNE CREEK = 2,837 ACRES

NOTE: DATA FOR PLAN OBTAINED FROM ROOKS' AERIAL MAPPING, U&EC, IMC FERTILIZER, TAMPA ELECTRIC COMPANY, AND AGRICO

FIGURE 6	TITLE: POST RECLAMATION TOPOGRAPHY & DRAINAGE	 TAMPA ELECTRIC COMPANY POLK POWER STATION PROJECT A TECO ENERGY COMPANY
SOURCE ECT/UEC	SCALE 1 in = 1000 ft	
DATE 7/17/92	PROJECT: 90263-0407	
FILE PSTTOP17		
		 ECT Environmental Consulting & Technology, Inc.
		 United Engineers & Constructors A Day & Zimmermann Company

BUILDING KEY

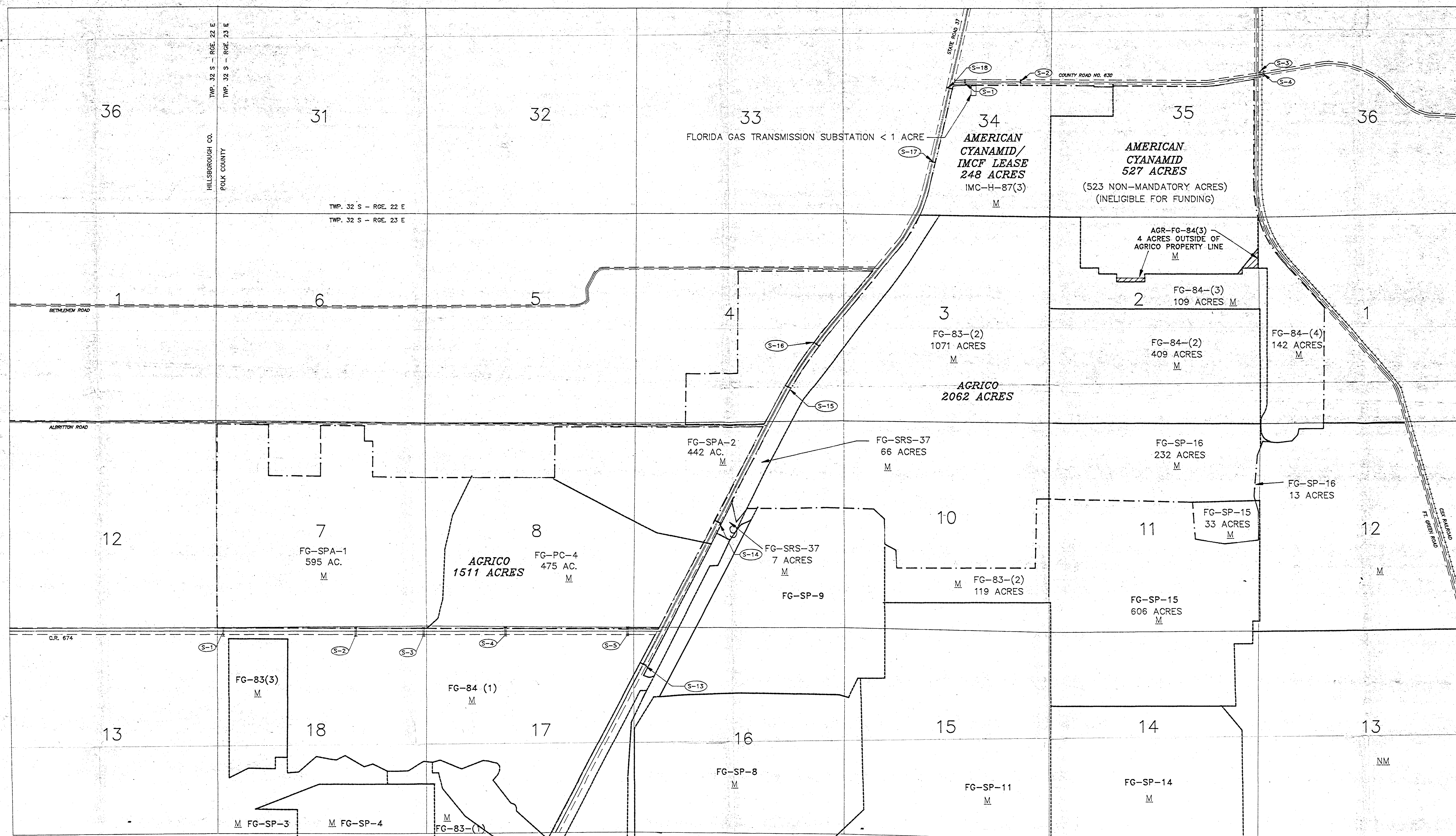
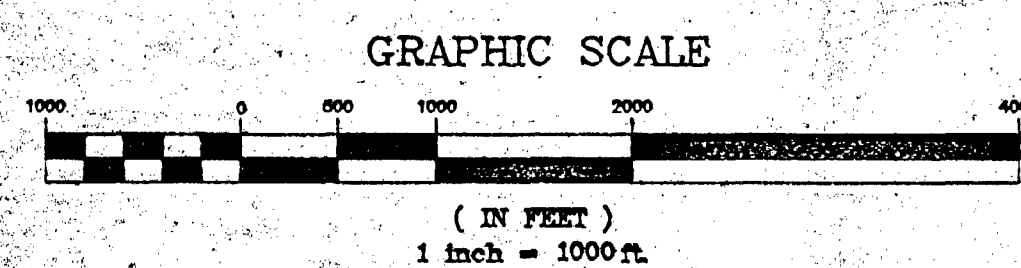
- ## NOTES

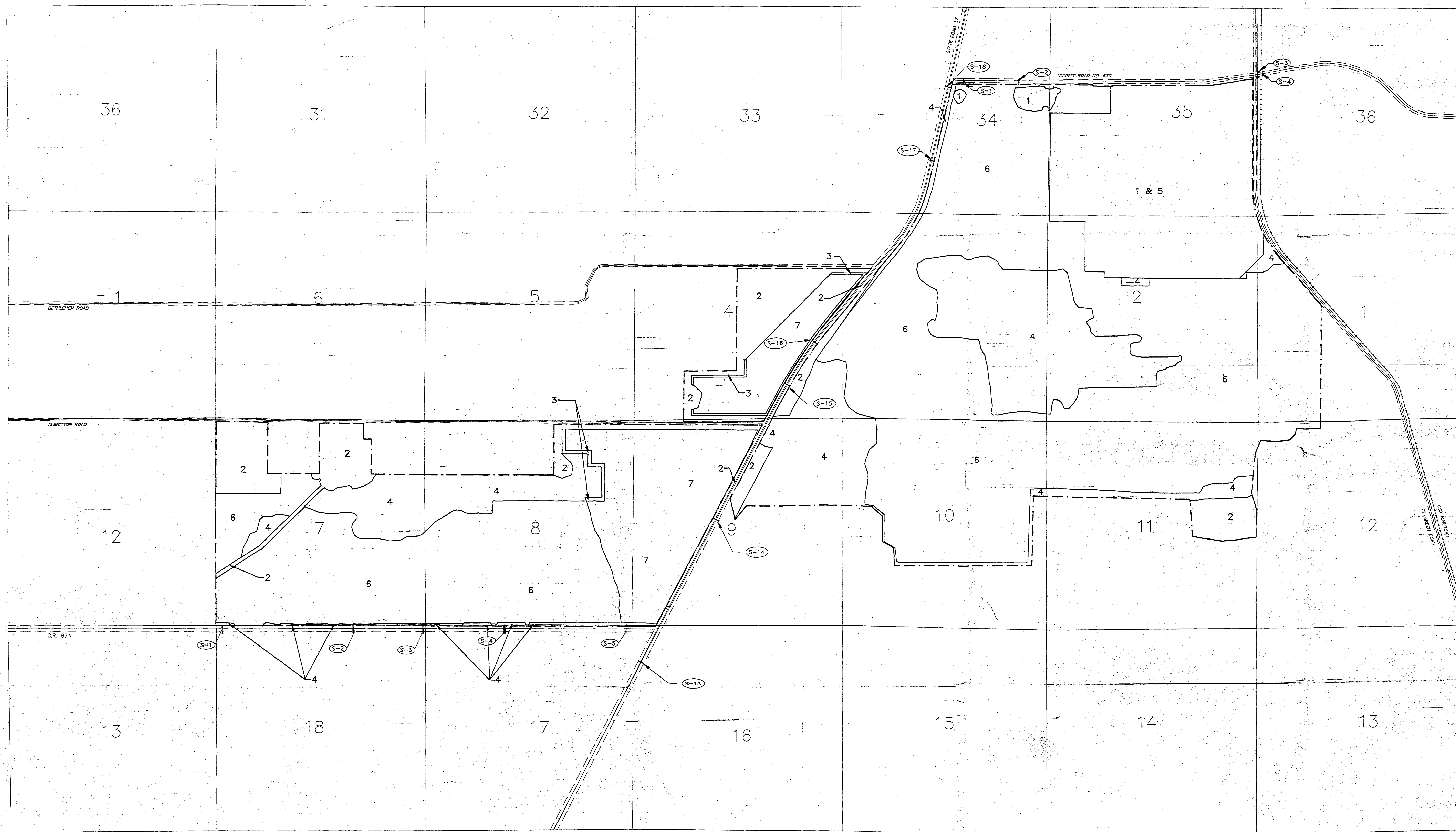
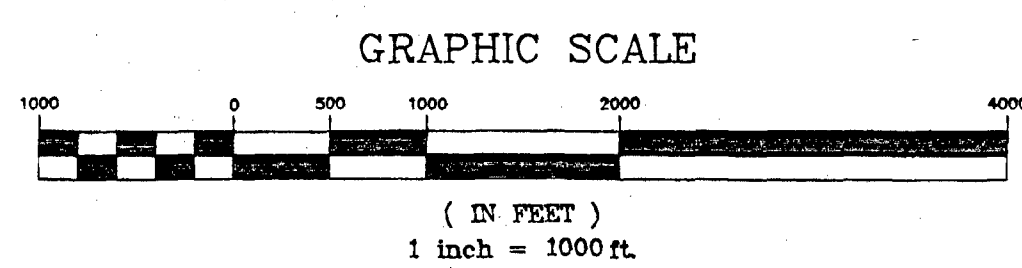
- | |
|----------------------------|
| TITLE: CONCEPTUAL SITE AND |
| POSTRECLAMATION PLAN |
| SCALE: 1 in = 1000 ft |
| PROJECT: 90263-0407 |



CO ENERGY COMPANY

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& Constructors**
A Balfour Beatty Company





LEGEND

- MAJOR ROADWAYS
- PROPERTY BOUNDARY (LESS ROW)
- RECLAMATION STATUS BOUNDARY

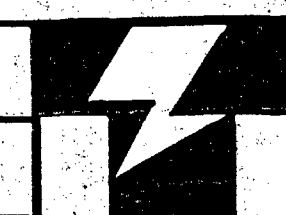
RECLAMATION LIABILITY BY PARCEL

CURRENT OWNER	MAN.	NON MAN.	SUBTOTAL
AGRICO	3573	0	3573
AmCy/IMCF	248	0	248
AmCy (AGR FG84(3))	4	0	4
AmCy OTHER	0	523	523
SUBTOTAL	3825	523	4348

RECLAMATION STATUS LEGEND (6-13-91)

1 & 5 MINED/DISTURBED PRIOR TO 7/1/75	- 523 ACRES
2 TO REMAIN UNDISTURBED BY MINE OPERATOR	- 279 ACRES
3 TO BE DISTURBED BY MINE OPERATOR	- 16 ACRES
4 DISTURBED AFTER 6/30/75	- 906 ACRES
6 MINED AFTER 7/1/75	- 2173 ACRES
7 TO BE MINED	- 451 ACRES
TOTAL	- 4348 ACRES

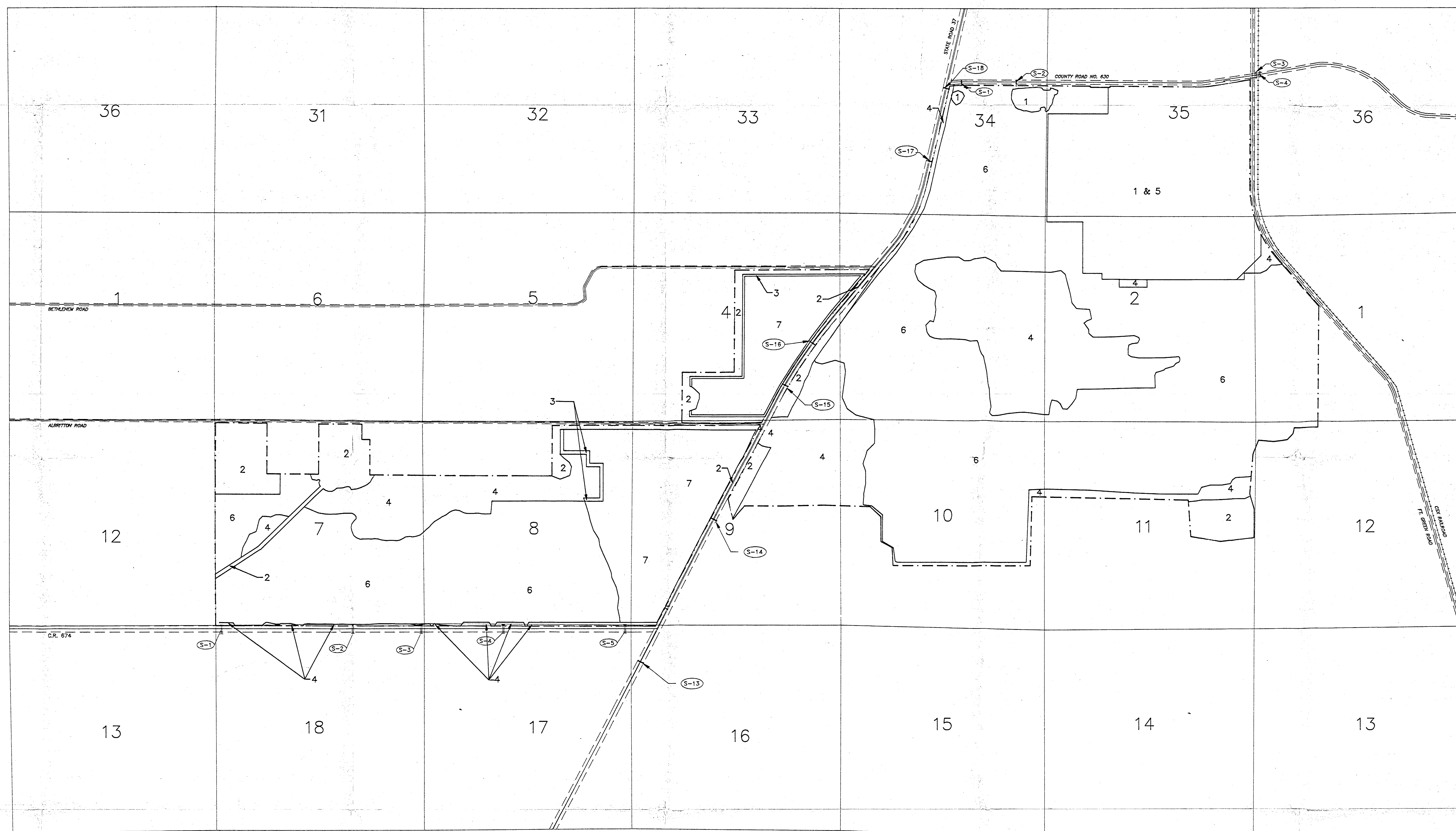
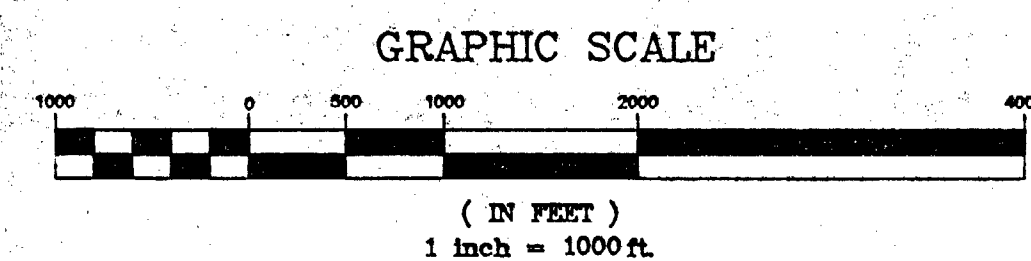
FIGURE: 2	TITLE: MINING OPERATIONS STATUS MAP
SOURCE: ECT	
DATE: 6/16/93	SCALE: 1 in = 1000 ft.
FILE: STATMP4	PROJECT: 90263-0404



TAMPA ELECTRIC COMPANY
POLK POWER STATION PROJECT
A TECO ENERGY COMPANY

ECT
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A Bechtel Company



LEGEND

- MAJOR ROADWAYS
- PROPERTY BOUNDARY (LESS ROW)
- RECLAMATION STATUS BOUNDARY

RECLAMATION LIABILITY BY PARCEL

CURRENT OWNER	MAN.	NON MAN.	SUBTOTAL
AGRICO	3573	0	3573
AmCy/IMCF	248	0	248
AmCy (AGR FG84(3))	4	0	4
AmCy OTHER	0	523	523
SUBTOTAL	3825	523	4348

RECLAMATION STATUS LEGEND (6-13-91)

1 & 5 MINED/DISTURBED PRIOR TO 7/1/75	523 ACRES
2 TO REMAIN UNDISTURBED BY MINE OPERATOR	233 ACRES
3 TO BE DISTURBED BY MINE OPERATOR	21 ACRES
4 DISTURBED AFTER 6/30/75	906 ACRES
6 MINED AFTER 7/1/75	2173 ACRES
7 TO BE MINED	492 ACRES
TOTAL	4348 ACRES

FIGURE: 2

SOURCE: ECT

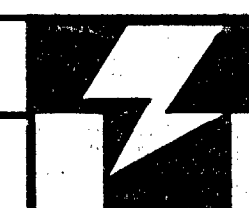
DATE: 6/16/92

FILE: STATMP3

TITLE: MINING OPERATIONS STATUS MAP

SCALE: 1 in = 1000 ft

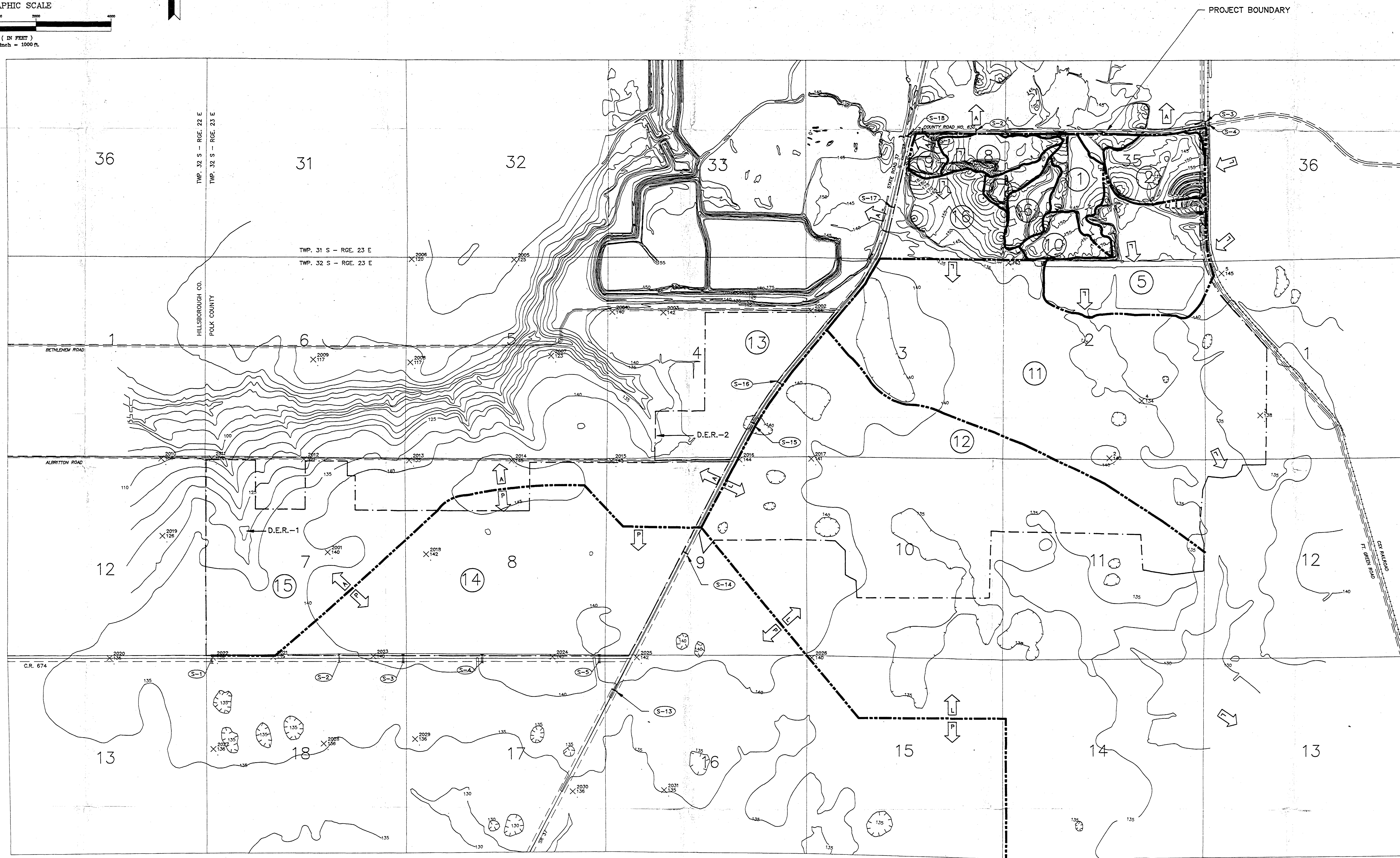
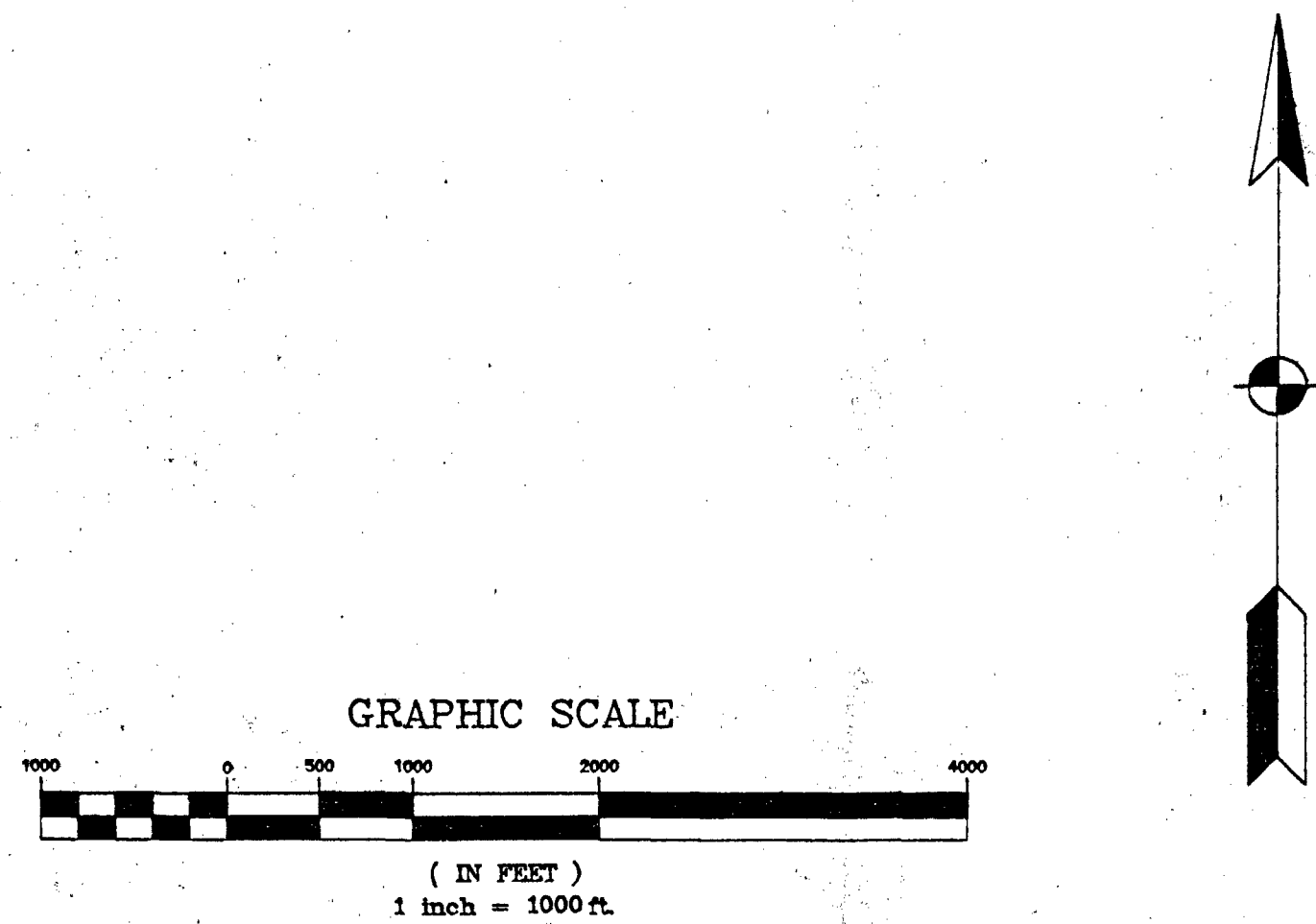
PROJECT: 90263-0404



TAMPA ELECTRIC COMPANY
POLK POWER STATION PROJECT
A TECO ENERGY COMPANY

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United Engineers & Constructors
A Bechtel Company



TOPOGRAPHY SOURCES: I.F. ROOKS - 6/13/91 (SECTIONS 3, 4, 8 & 9)
U.S.G.S./AGRIC - 1972 (SECTIONS 1, 2, 3, 7, 9, 10, 11 & 12)
SWFWM - 1975 (SECTIONS 33, 34, 35 & 36)

WATERSHED BASIN SUMMARY

LITTLE PAYNE CREEK (1-8,10,11,12 & 16) = 2816 ACRES
PAYNE CREEK (14) = 716 ACRES
ALAFIA RIVER (9,13 & 15) = 816 ACRES
TOTAL AREA OF SITE BASINS = 4348 ACRES

BASIN	ACRES	BASIN	ACRES
1	62	10	41
2	100	11	951
5	262	12	1095
6	43	13	381
7	26	14	716
8	58	15	414
9	21	16	178

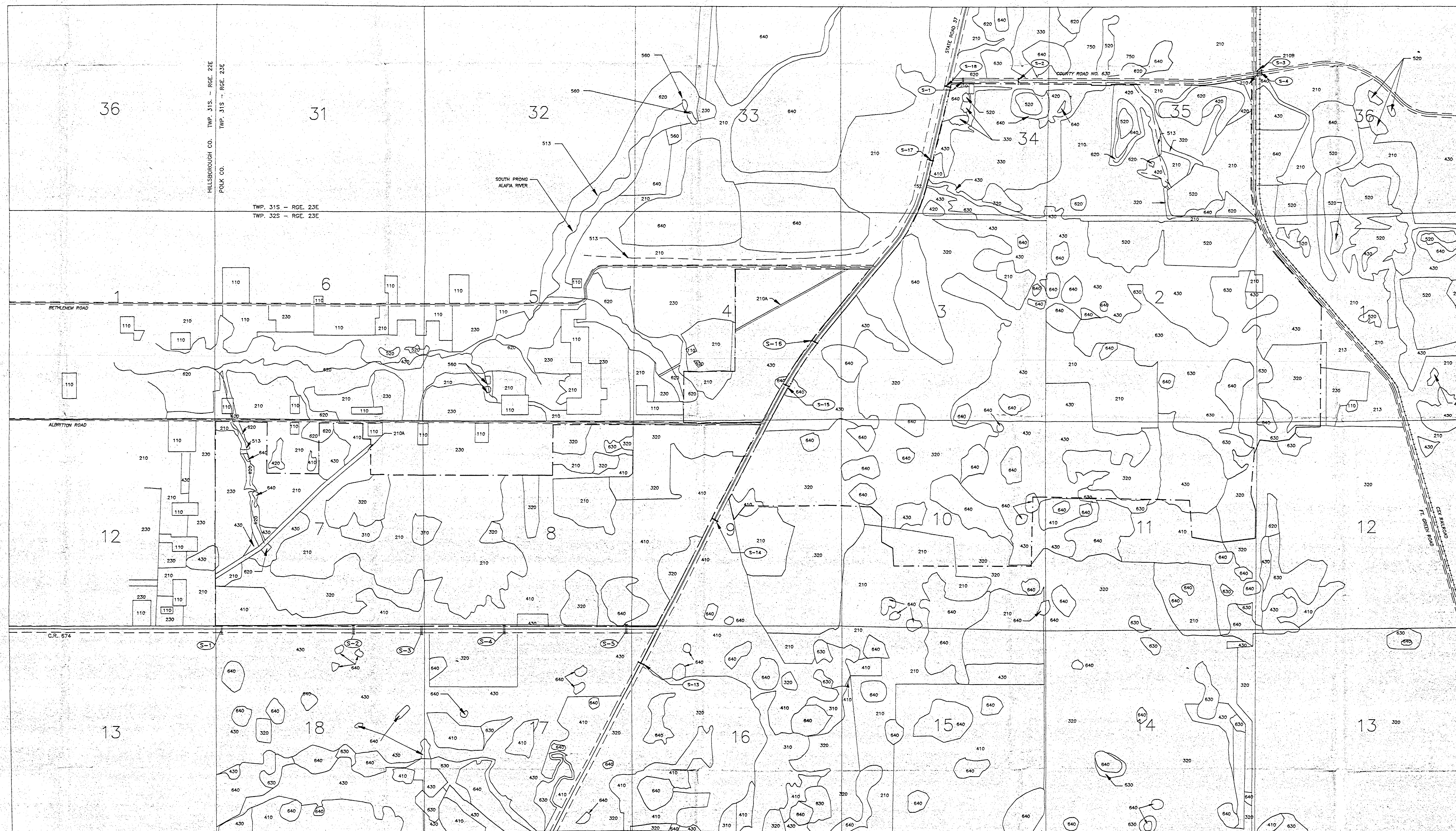
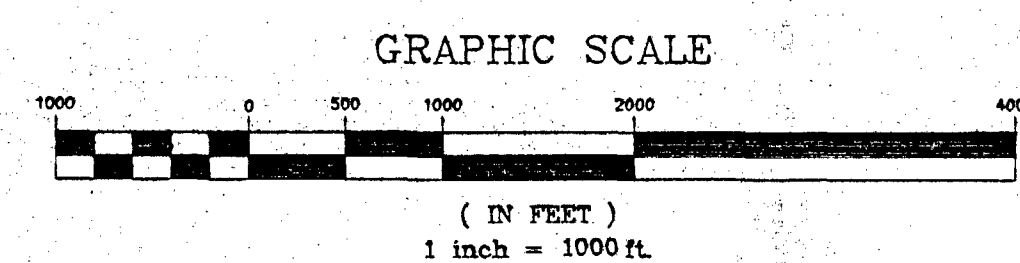
PARCEL	ALAFIA BASIN	LITTLE PAYNE BASIN	PAYNE BASIN	SUB TOTAL
AGRIC	795 AC	2046 AC	716 AC	3557 AC
AmDy/MGF	21 AC	227 AC	0 AC	248 AC
AmDy NON-MAN	0 AC	523 AC	0 AC	523 AC
AmDy (AGR MAN)	0 AC	4 AC	0 AC	4 AC
TOTAL	816 AC	2816 AC	716 AC	4348 AC

FIGURE: 3	TITLE: PREMINING TOPOGRAPHY AND DRAINAGE MAP
SOURCE: ECT/AGRIC	
DATE: 6/29/92	SCALE: 1 in = 1000 ft
FILE: PRETOP7	PROJECT: 90263-0407

TAMPA ELECTRIC COMPANY
POLK POWER STATION PROJECT
A TECO ENERGY COMPANY

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A Bechtel Company



PREMINING VEGETATION WITHIN PROJECT BOUNDARY

	NON-MANDATORY ACRES	MANDATORY ACRES	TOTAL ACRES
210A PASTURE OVER GAS TRANSMISSION LINE	0	13	13
210 PASTURE	226	660	886
230 CITRUS	0	59	59
310 GRASSLAND	0	20	20
320 SHRUBLAND	0	995	995
330 MIXED RANGELAND	12	147	159
410 CONIFEROUS FOREST	0	439	439
420 UPLAND HARDWOOD FOREST	42	53	95
430 UPLAND MIXED FOREST	34	965	1000
520 LAKES	140	7	147
620 WETLAND HARDWOOD FOREST	52	16	68
630 WETLAND MIXED FOREST	0	267	267
640 HERBACEOUS WETLAND	17	260	277
TOTAL	4348		

PREMINING VEGETATION LEGEND BY OWNERSHIP

	AmCy NON-MANDATORY ACRES	AmCy MANDATORY ACRES	AGRICULTURAL MANDATORY ACRES	TOTAL ACRES
210A PASTURE OVER GAS TRANSMISSION LINE	0	0	13	13
210 PASTURE	226	24	636	886
230 CITRUS	0	0	59	59
310 GRASSLAND	0	0	20	20
320 SHRUBLAND	0	8	987	995
330 MIXED RANGELAND	12	147	0	159
410 CONIFEROUS FOREST	0	3	436	439
420 UPLAND HARDWOOD FOREST	42	11	52	105
430 UPLAND MIXED FOREST	34	29	937	1000
520 LAKES	140	7	0	147
620 WETLAND HARDWOOD FOREST	52	1	15	68
630 WETLAND MIXED FOREST	0	10	257	267
640 HERBACEOUS WETLAND	17	12	248	277
TOTAL	523	252	3573	4348

VEGETATION LEGEND OUTSIDE PROJECT BOUNDARY

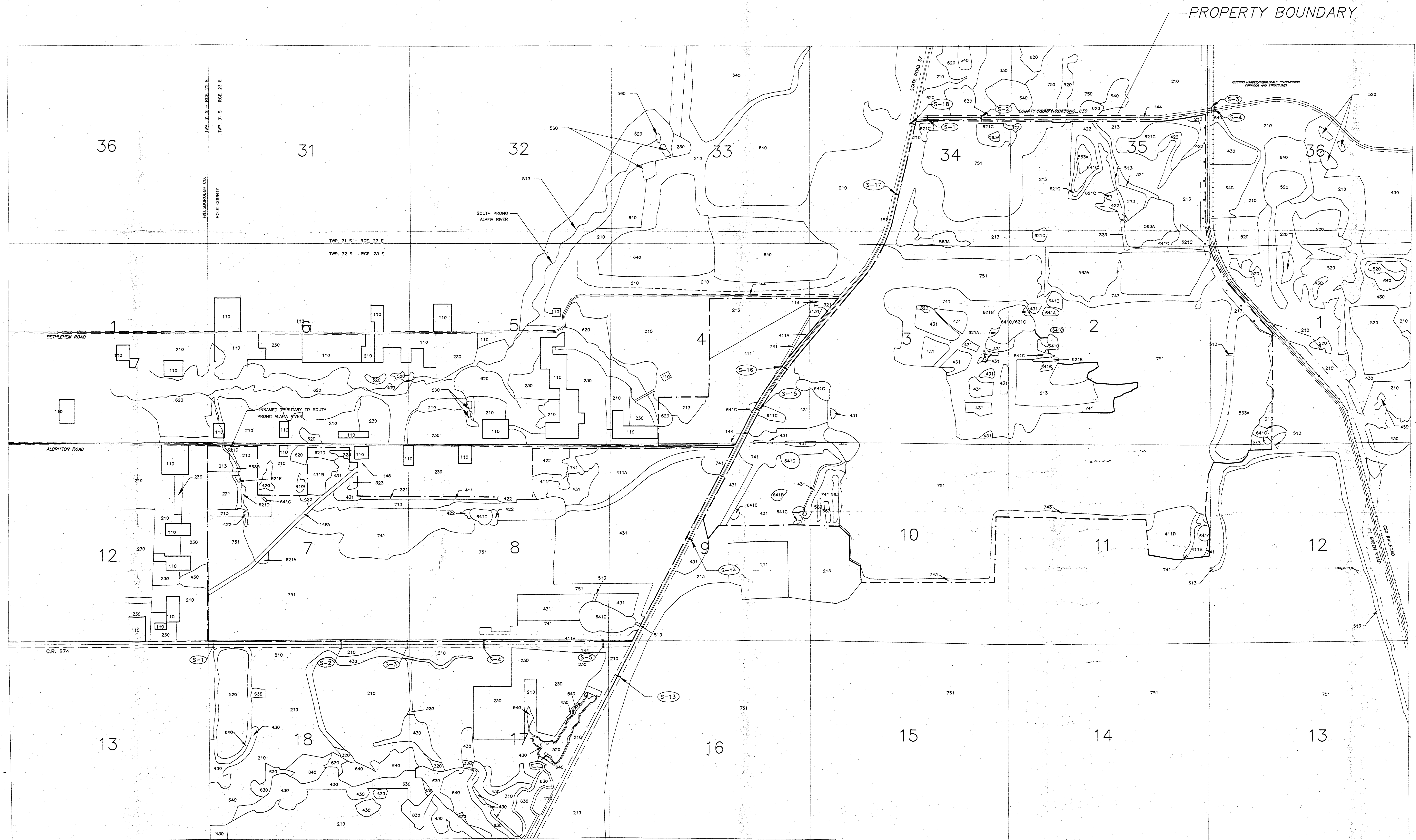
110 RESIDENTIAL
213 IMPROVED PASTURE
513 CANALS/DITCHES
560 PONDS

NOTE:
BASIS FOR THIS MAP CONSISTS OF:
1. MINE OPERATOR'S SUBMITTAL OF PRE-MINING LAND USE FOR LANDS MINED AFTER 7-1-75; OR
2. AERIAL PHOTOGRAPH DATED 6-13-91 BY I.F. ROOKS & ASSOCIATES AND MODIFIED BY GROUND TRUTHING ON 12-19-91 BY ECT FOR LANDS NOT SUBJECT TO MANDATORY LAND RECLAMATION RULES. SEE FIGURE 2 FOR REFERENCE.

FIGURE: 4	TITLE: PREMINING VEGETATION AND LAND USE MAP	
SOURCE: AGRICO/ECT/SWFMD/SEMINOLE	SCALE: 1 in = 1000 ft	
DATE: 6/29/92	PROJECT: 90263-0407	
FILE: PREVEG5		

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LEGEND (FLUCCS, 1976)

110	RESIDENTIAL	430	MIXED UPLAND FOREST
114	MOBILE HOME	431	MIXED OAK/PINE FOREST
131	LIGHT INDUSTRIAL	520	LAKES
144	ROADS AND HIGHWAYS	513	CANAL/DITCH
148A	FGT GAS PIPELINE	563	PONDS
148B	TAMPA ELECTRIC COMPANY 230-KV TRANSMISSION LINE (HARDEE-PEBBLEDALE)	560	OTHER WATER AREAS
152	OVERHEAD TRANSMISSION LINES	A	MINE PONDS
210	CROP AND PASTURELAND	B	OTHER WATER AREAS
211	ROWCROPS	620	WETLAND - HARDWOOD FOREST
213	IMPROVED PASTURE	621	WETLAND FORESTED
230	CITRUS GROVE	A	BAY HEAD SWAMP
231	ORANGE GROVE	B	RED MAPLE SWAMP
310	GRASSLAND	C	WILLOW - ELDERBERRY SWAMP
320	SHRUB AND BRUSHLAND	D	MIXED HARDWOOD SWAMP
321	PALMETTO PRAIRIE	E	PRIMROSE WILLOW SWAMP
323	SHRUB AND BRUSHLAND	630	WETLAND - MIXED FOREST
330	MIXED RANGELAND	640	WETLAND - VEGETATED NON-FORESTED
410	CONIFEROUS FOREST	641	NON-FORESTED WETLAND
411A	SLASH/PINE FLATWOODS	A	MAIDENCANE MARSH
411B	LONGLEAF PINE FLATWOODS	B	MAIDENCANE - BOTTONBUSH
420	HARDWOOD FOREST	C	DISTURBED MIXED MARSH
422	OAK HAMMOCK	741	SCRAPED AREAS/OLD FIELDS
		751	PHOSPHATE MINED LANDS
		743	VEGETATED SPOIL BANK

NOTE:
INFORMATION TAKEN FROM AERIAL PHOTOGRAPH DATED 6-13-91
BY J.F. ROOKS & ASSOCIATES, INC.
106 NORTHWEST DRANE STREET
PLANT CITY, FLORIDA 33566
AND MODIFIED USING INFORMATION COLLECTED
DURING GROUND TRUTHING ON 12-19-91

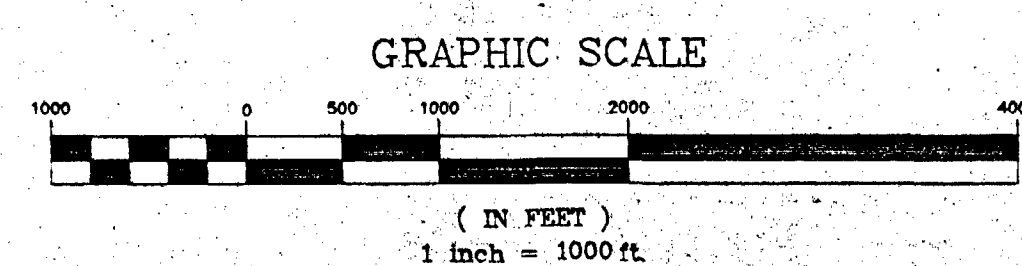
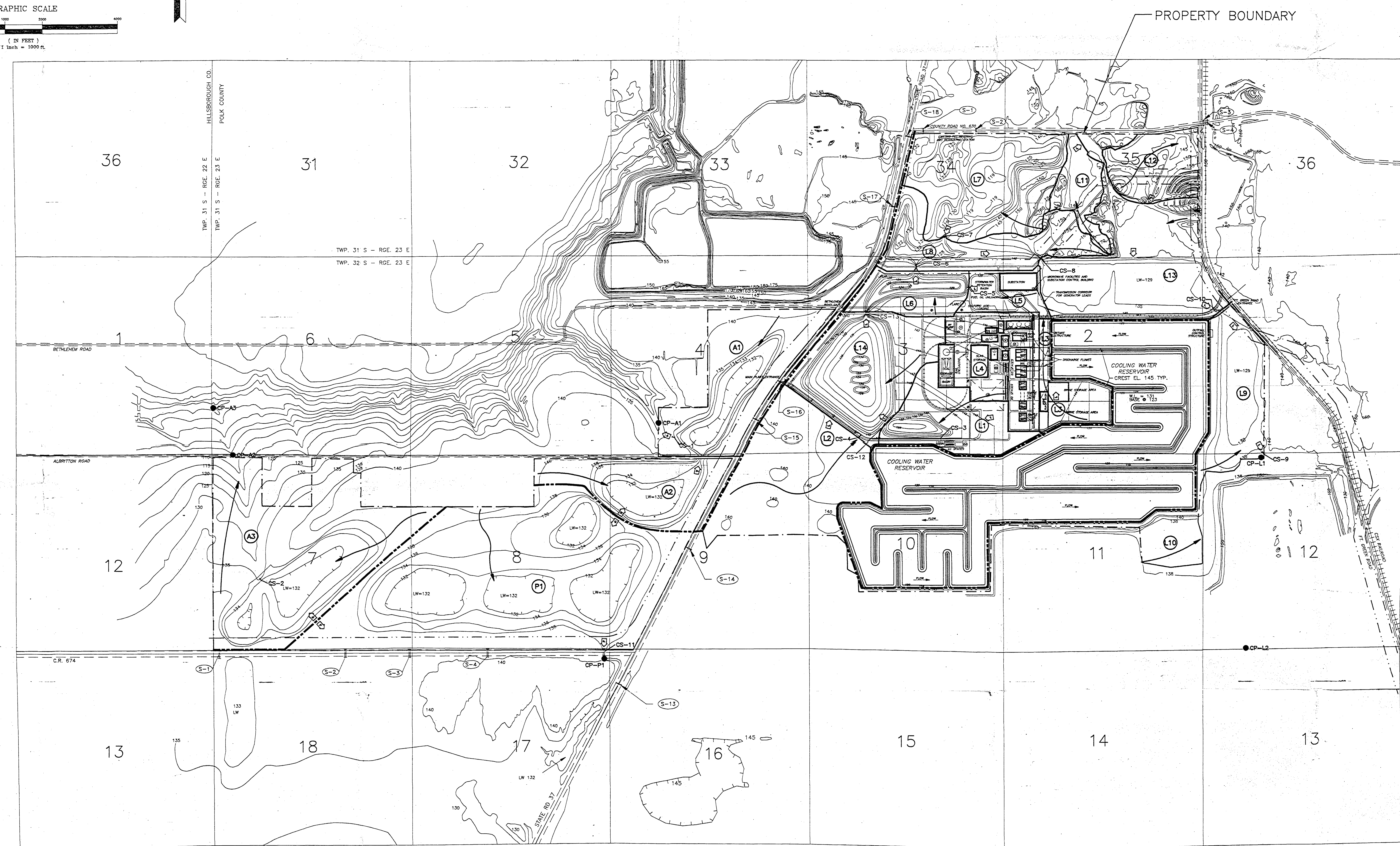
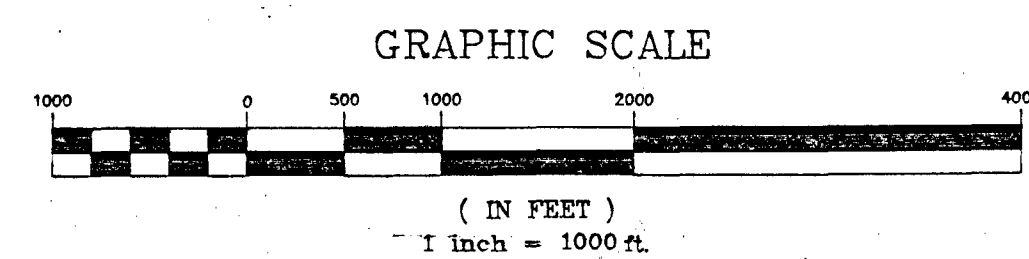


FIGURE: 5	TITLE: EXISTING LAND USE/ LAND COVER MAP	 TAMPA ELECTRIC COMPANY POLK POWER STATION PROJECT A TECO ENERGY COMPANY
SOURCE: ECT/UEC/AGRIC/SWFWM/SEMINOLE	SCALE: 1 in = 1000 ft	
DATE: 6/29/92	PROJECT: 90263-0404	
FILE: EXVEG5		


ECT
 Environmental Consulting & Technology, Inc.


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 A Bechtel Company



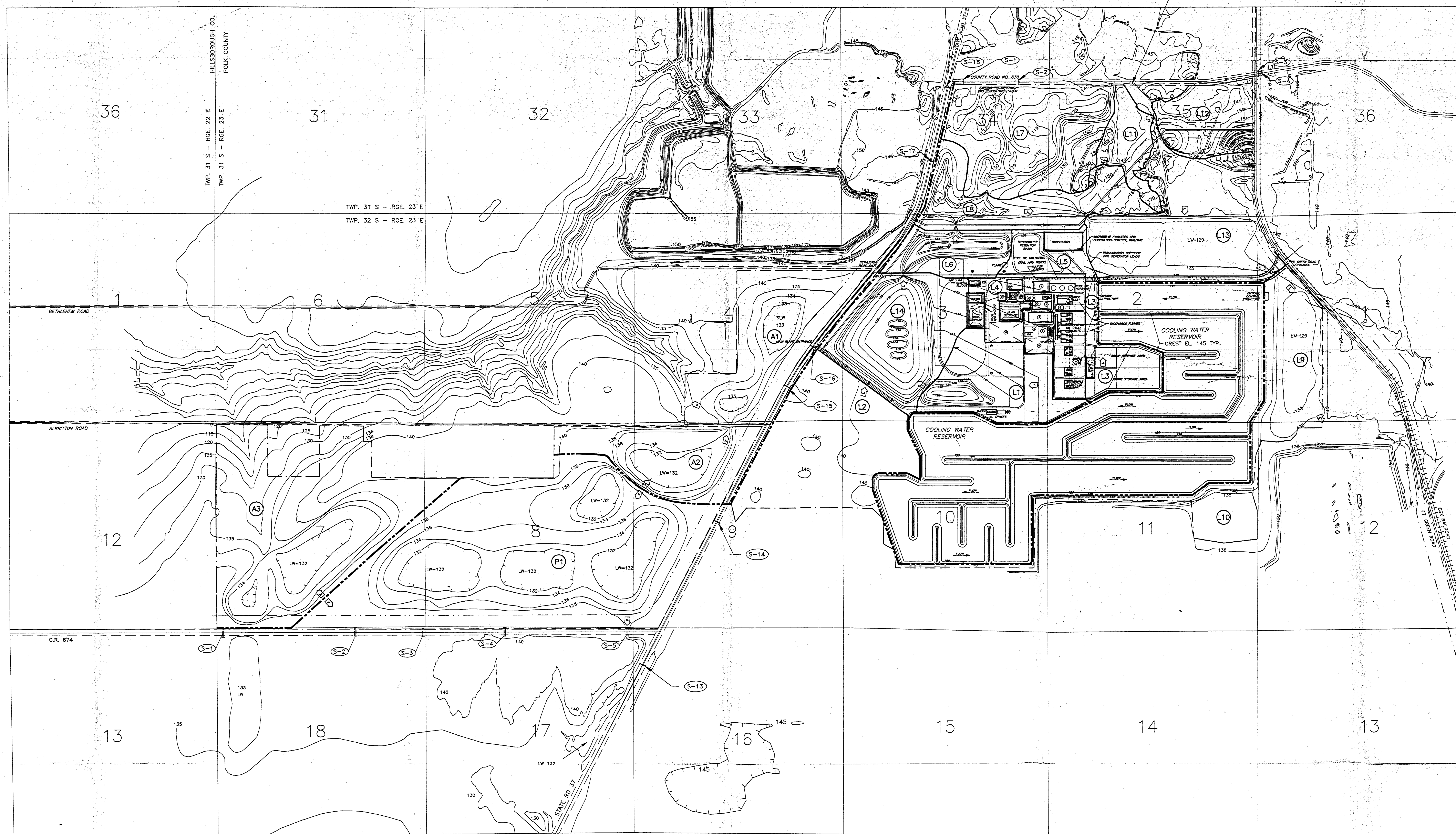
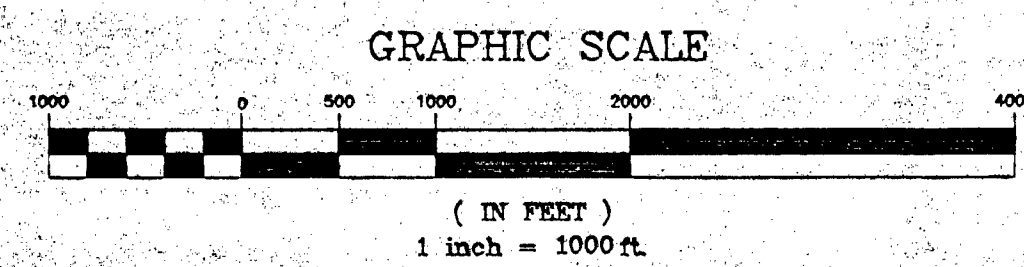
DRAINAGE PATTERNS BY PARCEL				
PARCEL	ALAFIA BASIN	LITTLE PAYNE BASIN	PAYNE BASIN	SUB TOTAL
AGRICO	801 AC	2062 AC	710 AC	3573 AC
AmCy/IMC	0 AC	248 AC	0 AC	248 AC
AmCy NON-MAN	0 AC	523 AC	0 AC	523 AC
AmCy (AGR MAN)	0 AC	4 AC	0 AC	4 AC
TOTAL	801 AC	2837 AC	710 AC	4348 AC

SUMMARY OF PROPOSED POSTRECLAMATION FLOW CONTROL STRUCTURES			
CONTROL STRUCTURE	TYPE	INVERT ELEVATION (FT.-NGVD)	
		INLET	OUTLET
SOUTH PRONG ALAFIA RIVER			
CS-1	120" V-NOTCH	135.00	
CS-2	50 FT WEIR	135.12	
	120" V-NOTCH	134.00	
	20 FT WEIR	134.50	
LITTLE PAYNE CREEK			
CS-3	1.0 INCH ORIFICE	135.25	
	0.5 FT WEIR	136.50	
CS-4	TWO 24 INCH CULVERTS	139.00	138.7
CS-5	90" V-NOTCH	135.00	
	10 FT WEIR	135.75	
CS-6	THREE 36 INCH CULVERTS	134.50	134.30
CS-7	100 FT SWALE	135.00	
CS-8	THREE 48 INCH CULVERTS	134.00	133.80
CS-9	20 FT OPEN CHANNEL	132.00	
CS-10	12 FT BOX CULVERT	133.00	
CS-11	300 FT SERV	135.00	
CS-12	THREE 42 INCH CULVERTS	133.00	132.80
PAYNE CREEK			
CS-13	TWO 36 INCH CULVERTS	136.40	136.20
	120" V-NOTCH	136.60	
	20 FT WEIR	136.80	

DRAINAGE PATTERNS
TO SOUTH PRONG ALAFIA RIVER = 801 ACRES
TO PAYNE CREEK = 710 ACRES
TO LITTLE PAYNE CREEK = 2,837 ACRES

NOTE: DATA FOR PLAN OBTAINED FROM ROCKS' AERIAL MAPPING, UE&C, IMC FERTILIZER, TAMPA ELECTRIC COMPANY, AND AGRICO

FIGURE: 6	TITLE: POST RECLAMATION TOPOGRAPHY & DRAINAGE	TAMPA ELECTRIC COMPANY POLK POWER STATION PROJECT A TECO ENERGY COMPANY United Engineers & Constructors A Bechtel Company
SOURCE: ECT/UEC	SCALE: 1" = 1000 ft	
DATE: 06/15/93	PROJECT: 90263-0407	
FILE: PSTTOP20		



PROPERTY BOUNDARY

LEGEND

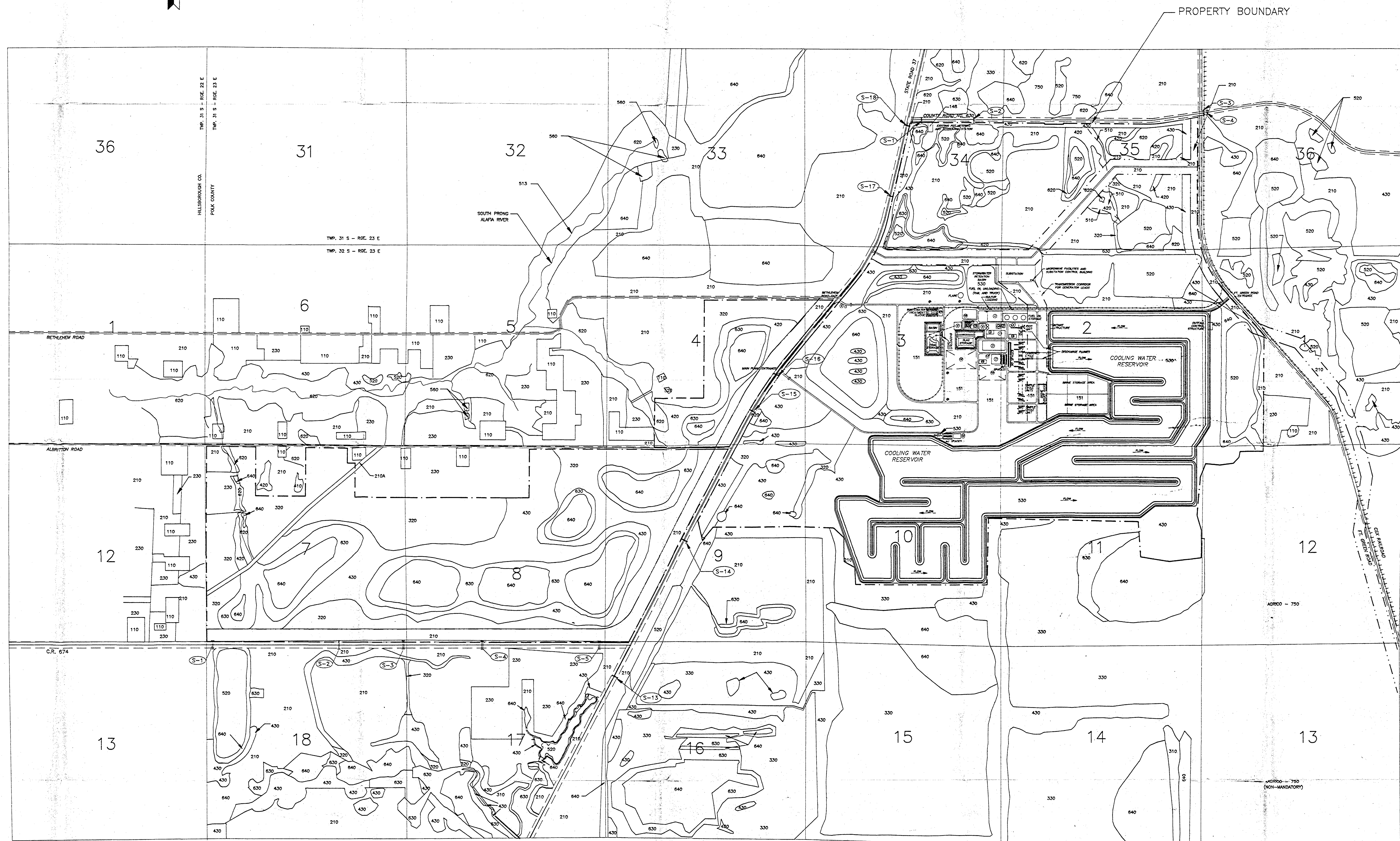
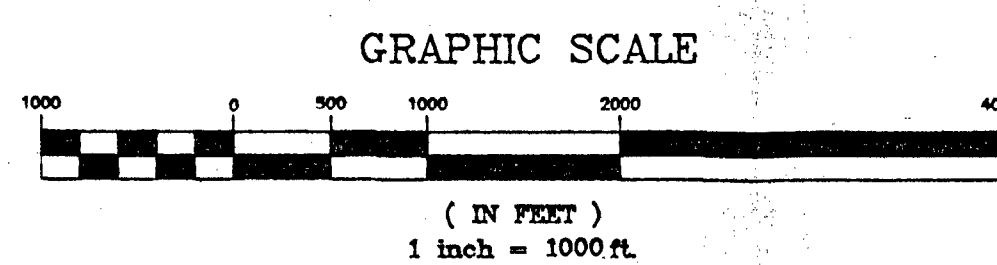
- PROPOSED PROPERTY BOUNDARY
- ELEVATION CONTOUR
- WATERSHED BASIN DIVIDE
- WATERSHED SUBBASIN DIVIDE
- HIGHWAY RIGHTS OF WAY
- LW SEASONAL LOW WATER LEVEL
- S-13 CULVERT LOCATIONS
- WATERSHED DIRECTION
- A = ALAFIA RIVER
- P = PAYNE CREEK
- L = LITTLE PAYNE CREEK

DRAINAGE PATTERNS BY PARCEL				
PARCEL	ALAFIA BASIN	LITTLE PAYNE BASIN	PAYNE BASIN	SUB TOTAL
AGRIC	801 AC	2062 AC	710 AC	3573 AC
AmCy/IMCF	0 AC	248 AC	0 AC	248 AC
AmCy NON-MAN	0 AC	523 AC	0 AC	523 AC
AmCy (AGR MAN)	0 AC	4 AC	0 AC	4 AC
TOTAL	801 AC	2837 AC	710 AC	4348 AC

DRAINAGE PATTERNS
TO SOUTH PRONG ALAFIA RIVER = 801 ACRES
TO PAYNE CREEK = 710 ACRES
TO LITTLE PAYNE CREEK = 2,837 ACRES

NOTE: DATA FOR PLAN OBTAINED FROM ROCKS' AERIAL MAPPING, U&AC, IMC FERTILIZER, TAMPA ELECTRIC COMPANY, AND AGRICO

FIGURE: 6	TITLE: POST RECLAMATION TOPOGRAPHY & DRAINAGE	
SOURCE: ECT/UEC		
DATE: 7/17/92	SCALE: 1 in = 1000 ft	
FILE: PSTTOP17	PROJECT: 90263-0407	



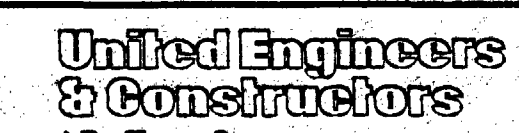
POST RECLAMATION VEGETATION WITHIN PROJECT BOUNDARY				
	NON-MANDATORY ACRES	MANDATORY ACRES	TOTAL ACRES	
00	TRANSPORTATION	0	3	3
00	GAS TRANSMISSION SUBSTATION	0	1	1
01	ELECTRICAL POWER FACILITY	0	337	337
0A	PASTURE OVER GAS TRANSMISSION LINE	0	13	13
0	PASTURE	211	430	641
0	CITRUS	0	18	18
0	SHRUBLAND	4	577	581
0	MIXED RANGELAND	6	0	6
0	UPLAND HARDWOOD FOREST	29	72	101
0	UPLAND MIXED FOREST	34	722	756
0	LAKES	165	87	252
0	RESEVOIRS	0	840	840
0	WETLAND HARDWOOD FOREST	40	21	61
0	WETLAND MIXED FOREST	11	299	310
0	HERBACEOUS WETLAND	23	405	428
	TOTAL	523	TOTAL 3825	TOTAL 4348

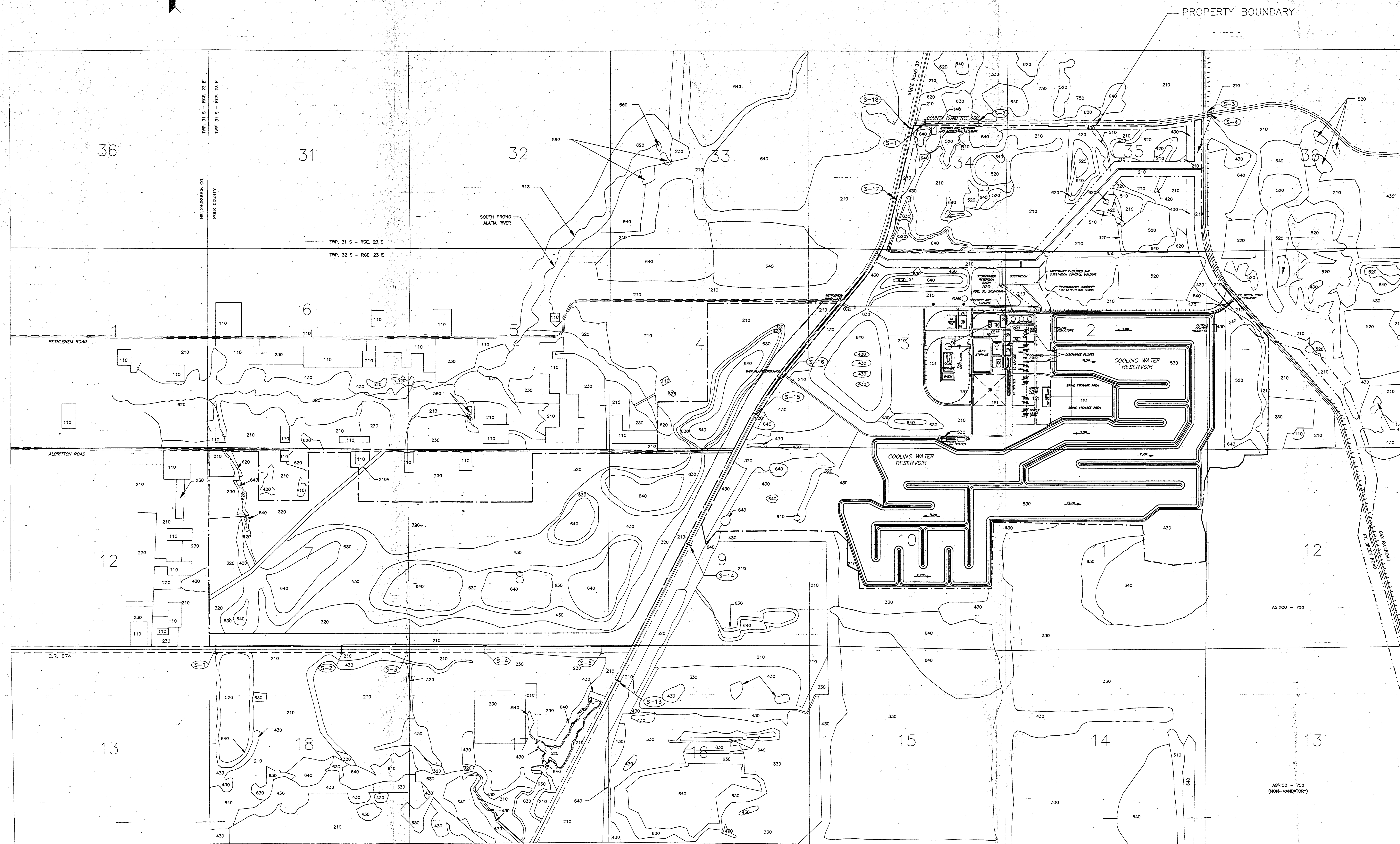
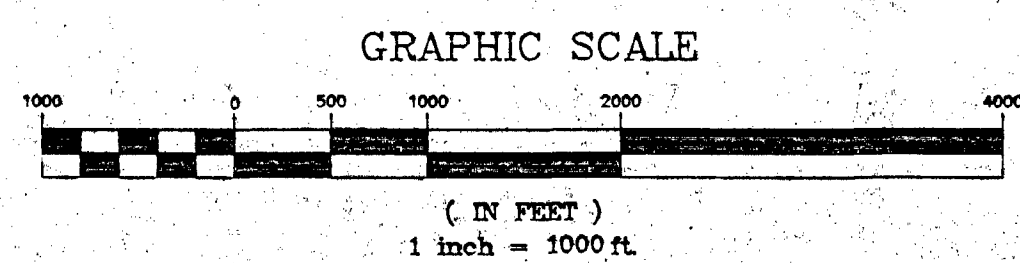
BUILDING KEY

- 1 GASIFICATION & GAS COOLING
- 2 ACID GAS REMOVAL
- 3 OXYGEN PLANT
- 4 SULFUR RECOVERY & TAIL GAS TREATING
- 5 HOT GAS CLEANUP
- 6 MAKE-UP WATER TREATING
- 7 CONTROL AND GENERAL SERVICES BUILDING
- 8 COAL GRINDING
- 9 CONSTRUCTION POWER FACILITIES
- 10 ADMINISTRATION BUILDING & VISITORS CENTER
- 11 INDUSTRIAL WASTE TREATMENT FACILITY & HOLDING BASIN
- 12 SANITARY WASTE TREATMENT
- 13 48 V BATTERY, PEX, & RTU
- 14 CONSTRUCTION WAREHOUSE
- 15 MAINTENANCE SHOP
- 16 CONSTRUCTION LAYDOWN & TEMPORARY CONSTRUCTION PERSONNEL PARKING
- 17 MOBILE EQUIPMENT MAINTENANCE SHOP
- 18 OFF-GAS TREATMENT
- 19 IGCC WASTEWATER TREATMENT

NOTES:

1. COOLING WATER RESERVOIR MAKEUP TO BE SUPPLIED BY GROUNDWATER
2. POST RECLAMATION VEGETATION IN SECTION 34, TOWNSHIP 31 SOUTH, RANGE 23 EAST, WAS SUPPLIED BY IMCF AND MAY REFLECT EXPORTATION OF OVERBURDEN AND MAY NOT BE CONSISTENT WITH APPROVED PROGRAM.

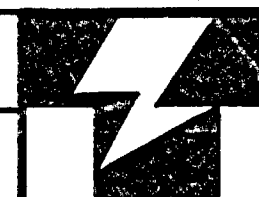
FIGURE: 7	TITLE: CONCEPTUAL SITE AND POSTRECLAMATION PLAN	 TAMPA ELECTRIC COMPANY POLK POWER STATION PROJECT A TECO ENERGY COMPANY
SOURCE: ECT/UEC/AGRIC/OSEMINOLE/IMCF	SCALE: 1 in = 1000 ft	
DATE: 7/17/92	PROJECT: 90263-0407	
FILE: POSTVG17		 ECT Environmental Consulting & Technology, Inc.
		 United Engineers & Constructors A Bechtel Company



POST RECLAMATION VEGETATION WITHIN PROJECT BOUNDARY			
	NON-MANDATORY ACRES	MANDATORY ACRES	TOTAL ACRES
140	TRANSPORTATION	0	3
148	GAS TRANSMISSION SUBSTATION	0	1
151	ELECTRICAL POWER FACILITY	0	306
210A	PASTURE OVER GAS TRANSMISSION LINE	0	13
210	PASTURE	211	735
230	CITRUS	0	18
320	SHRUBLAND	0	552
330	MIXED RANGELAND	6	6
420	UPLAND HARDWOOD FOREST	29	56
430	UPLAND MIXED FOREST	34	767
520	LAKES	165	252
530	RESEVOIRS	0	840
620	WETLAND HARDWOOD FOREST	40	61
630	WETLAND MIXED FOREST	11	310
640	HERBACEOUS WETLAND	23	428
TOTAL		523	4348

BUILDING KEY	
1	GASIFICATION & GAS COOLING
2	ACID GAS REMOVAL
3	AIR SEPARATION UNIT
4	SULFURIC ACID PLANT
5	HOT GAS CLEANUP
6	MAKE-UP WATER TREATING
7	CONTROL AND GENERAL SERVICES BUILDING
8	COAL GRINDING
9	CONSTRUCTION POWER FACILITIES
10	ADMINISTRATION BUILDING & VISITORS CENTER
11	INDUSTRIAL WASTE TREATMENT FACILITY & HOLDING BASIN
12	SANITARY WASTE TREATMENT
13	48 V BATTERY, PBX, & RTU
14	CONSTRUCTION WAREHOUSE
15	MAINTENANCE SHOP
16	CONSTRUCTION LAYDOWN & TEMPORARY CONSTRUCTION PERSONNEL PARKING
17	MOBILE EQUIPMENT MAINTENANCE SHOP
18	ICCC WASTEWATER TREATMENT

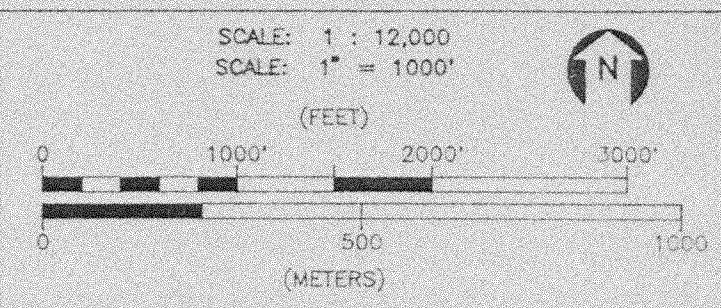
- NOTES:
1. COOLING WATER RESERVOIR MAKEUP TO BE SUPPLIED BY GROUND.
 2. POST RECLAMATION VEGETATION IN SECTION 34, TOWNSHIP 31 SOUTH, RANGE 23 EAST, WAS SUPPLIED BY IMCF AND MAY REFLECT EXPORTATION OF OVERBURDEN AND MAY NOT BE CONSISTENT WITH APPROVED PROGRAM.

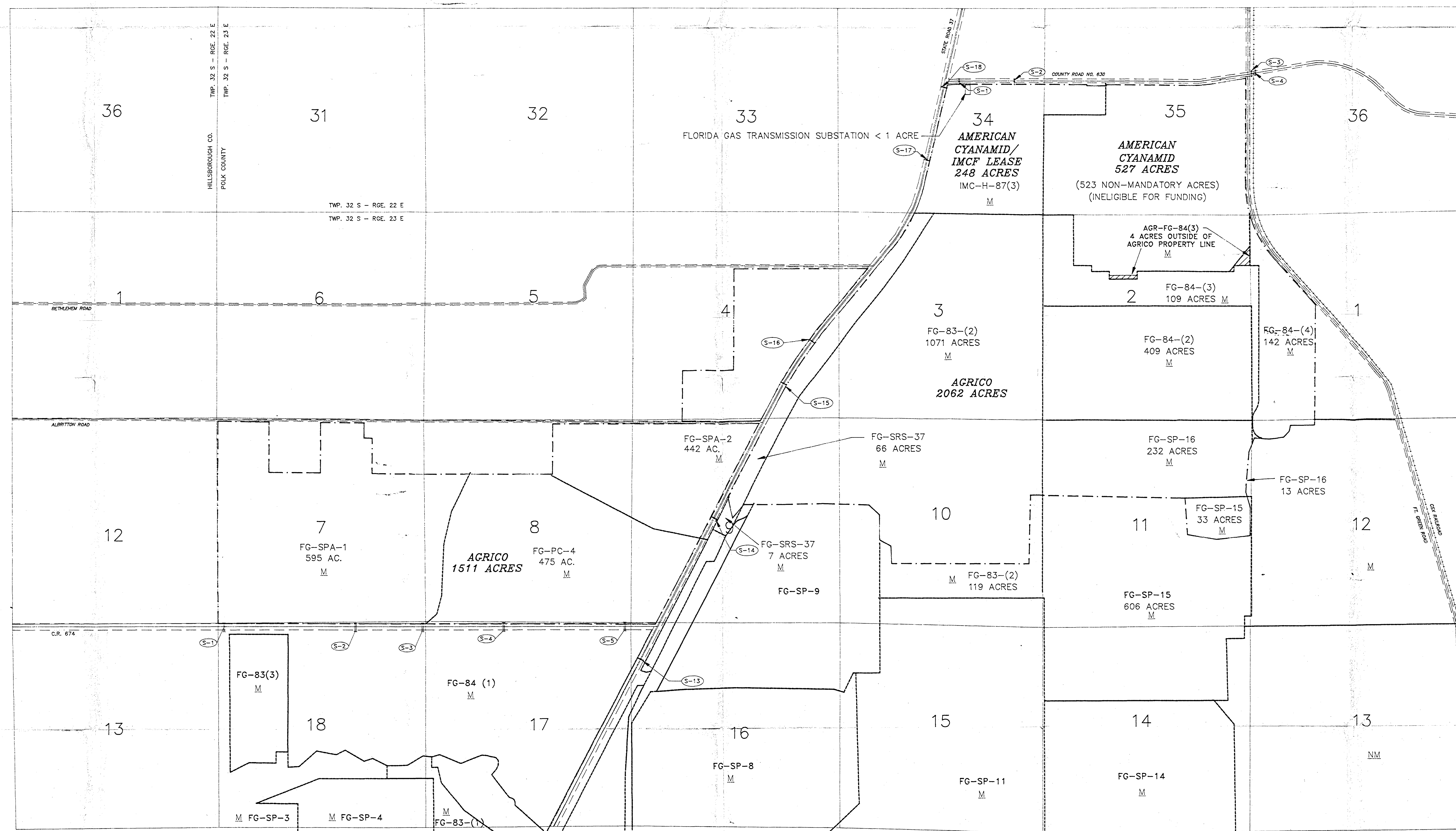
FIGURE: 7	TITLE: CONCEPTUAL SITE AND POSTRECLAMATION PLAN	 TAMPA ELECTRIC COMPANY POLK POWER STATION PROJECT A TECO ENERGY COMPANY
SOURCE: ECT/UEC/AGRICO/SEMINOLE/IMCF	SCALE: 1 in = 1000 ft	
DATE: 06/15/93	PROJECT: 90263-0407	
FILE: POSTVG20		 ECT Environmental Consulting & Technology, Inc.

United Engineers & Constructors
A Bechtel Company



Legend
----- Polk Power Station Boundary
(shown at inside edge of the line)





=====	PROPOSED TAMPA ELECTRIC PROPERTY BOUNDARY
=====	MAJOR HIGHWAY
<i>AGRIC</i>	EXISTING LAND OWNER AND PARCEL SIZE
FG-SPA-1	FDNR LRU RECLAMATION PROGRAM ID AND SIZE
=====	FDNR LRU RECLAMATION PROGRAM BOUNDARY
<u>M</u>	MANDATORY ACREAGE
<u>NM</u>	NON-MANDATORY ACREAGE

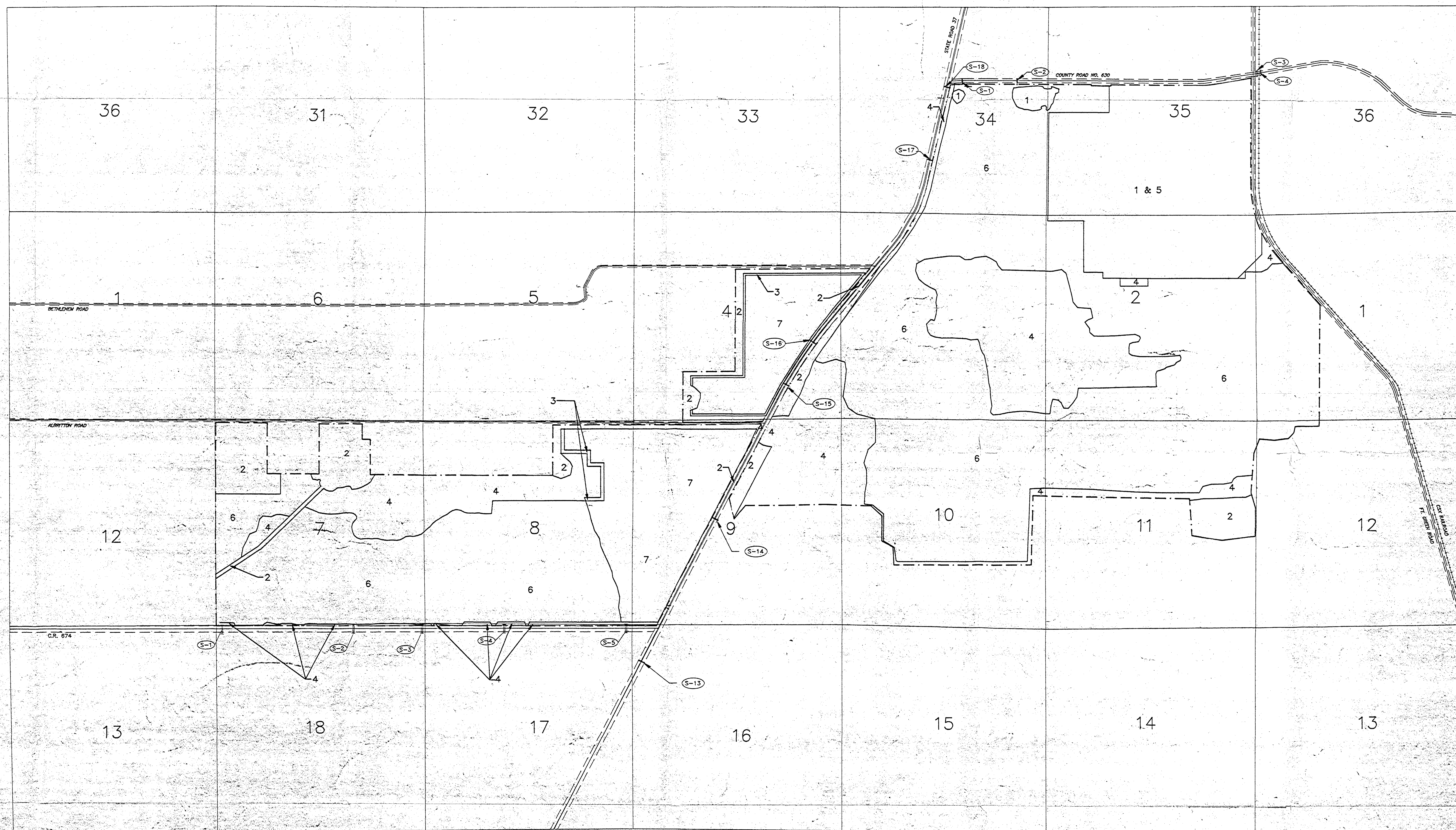
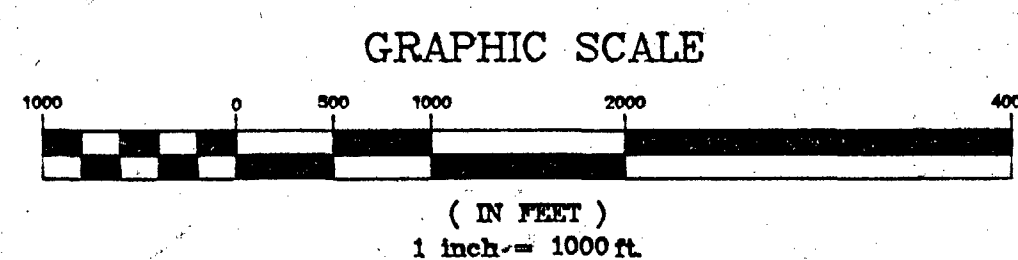
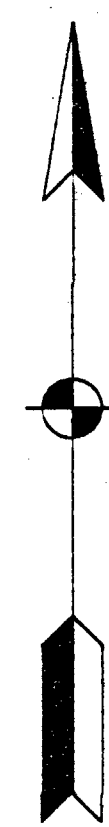
TO BE PURCHASED FROM AGRICO 3,573 ACRES
TO BE PURCHASED FROM AMERICAN CYANAMID 775 ACRES
TOTAL PROPOSED SITE 4348 ACRES

FIGURE: 1	TITLE: LAND ACQUISITION LOCATION
SOURCE: ECT/TEC	MAP
DATE: 6/29/92	SCALE: 1 in = 1000 ft
FILE: LANDACQ3	PROJECT: 90263-0407

TITLE: LAND ACQUISITION LOCATION
MAP
SCALE: 1 in = 1000 ft
PROJECT: 90263-0407



**United Engineers
& Constructors**
A Bechtel Company



LEGEND

- MAJOR ROADWAYS
- PROPERTY BOUNDARY (LESS ROW)
- RECLAMATION STATUS BOUNDARY

RECLAMATION LIABILITY BY PARCEL

CURRENT OWNER	MAN.	NON-MAN.	SUBTOTAL
AGRIC.	3573	0	3573
AmCy/IMCF	248	0	248
AmCy (AGR FG84(3))	4	0	4
AmCy OTHER	0	523	523
SUBTOTAL	3825	523	4348

RECLAMATION STATUS LEGEND (6-13-91)

1 & 5 MINED/DISTURBED PRIOR TO 7/1/75	523 ACRES
2 TO REMAIN UNDISTURBED BY MINE OPERATOR	233 ACRES
3 TO BE DISTURBED BY MINE OPERATOR	21 ACRES
4 DISTURBED AFTER 6/30/75	906 ACRES
6 MINED AFTER 7/1/75	2173 ACRES
7 TO BE MINED	492 ACRES
TOTAL	4348 ACRES

FIGURE: 2

SOURCE: ECT

DATE: 6/16/92

FILE: STATMP3

TITLE: MINING OPERATIONS STATUS MAP

SCALE: 1 in = 1000 ft.

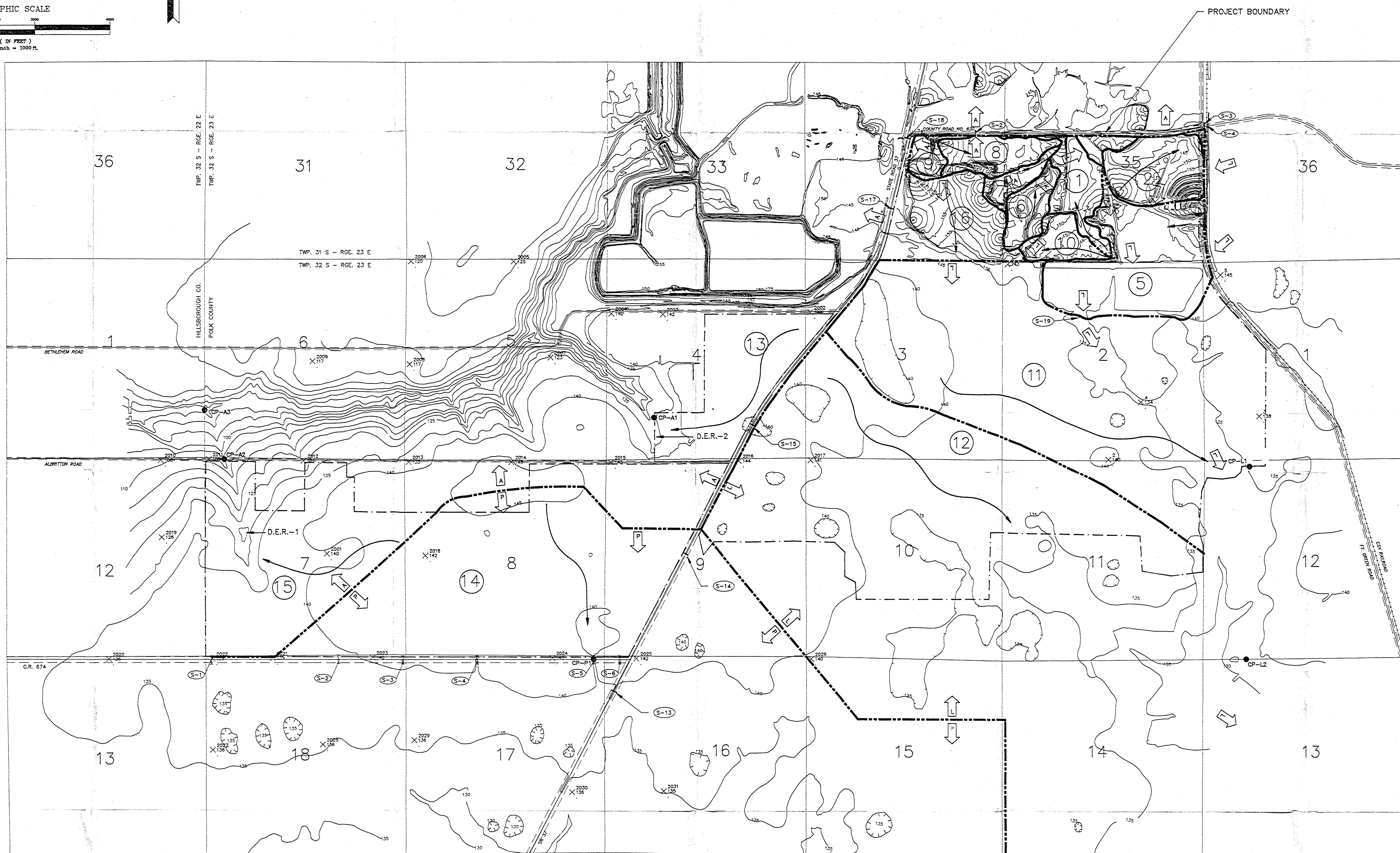
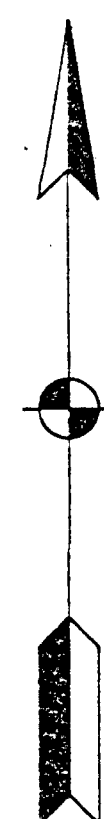
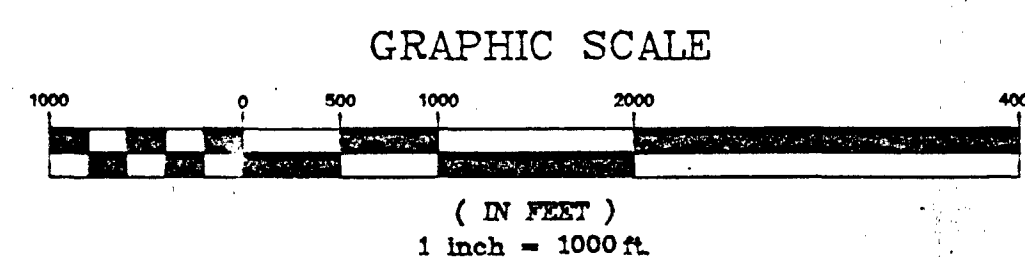
PROJECT: 90263-0404



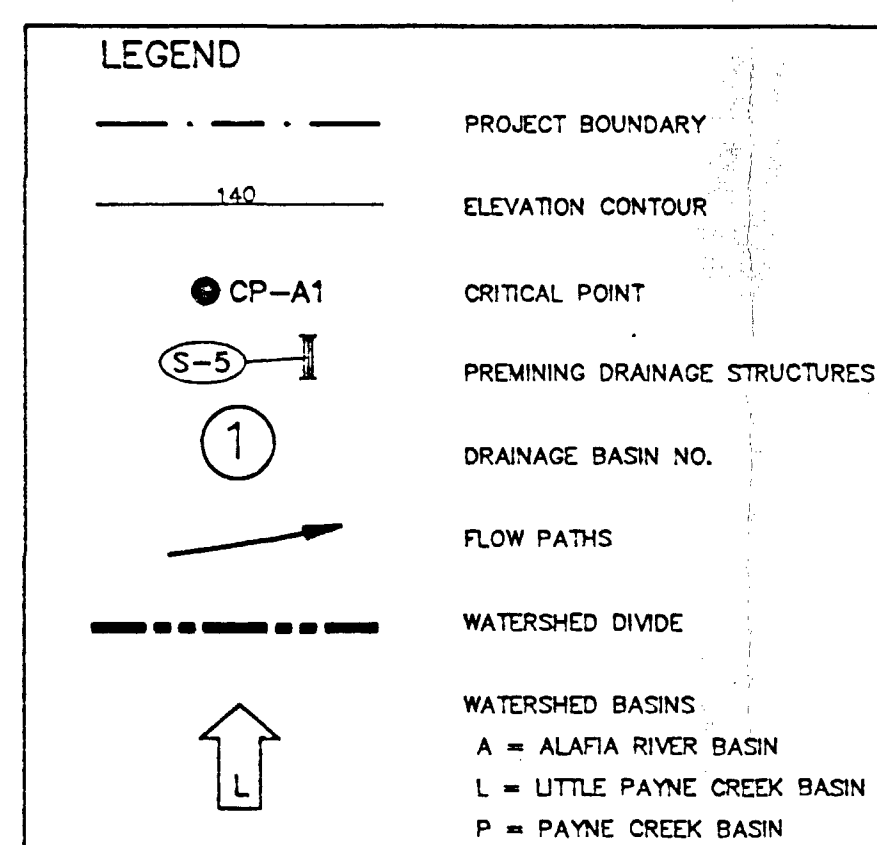
TAMPA ELECTRIC COMPANY
POLK POWER STATION PROJECT
A TECO ENERGY COMPANY



United Engineers
& Constructors
A Hensley Company



TOPOGRAPHY SOURCES: I.F. ROOKS - 6/13/91 (SECTIONS 3, 4, 8 & 9)
U.S.G.S./AGRIC - 1972 (SECTIONS 1, 2, 3, 7, 9, 10, 11 & 12)
SWFWMD - 1975 (SECTIONS 33, 34, 35 & 36)

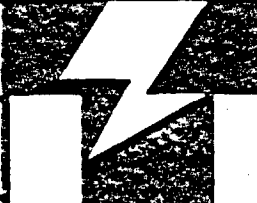


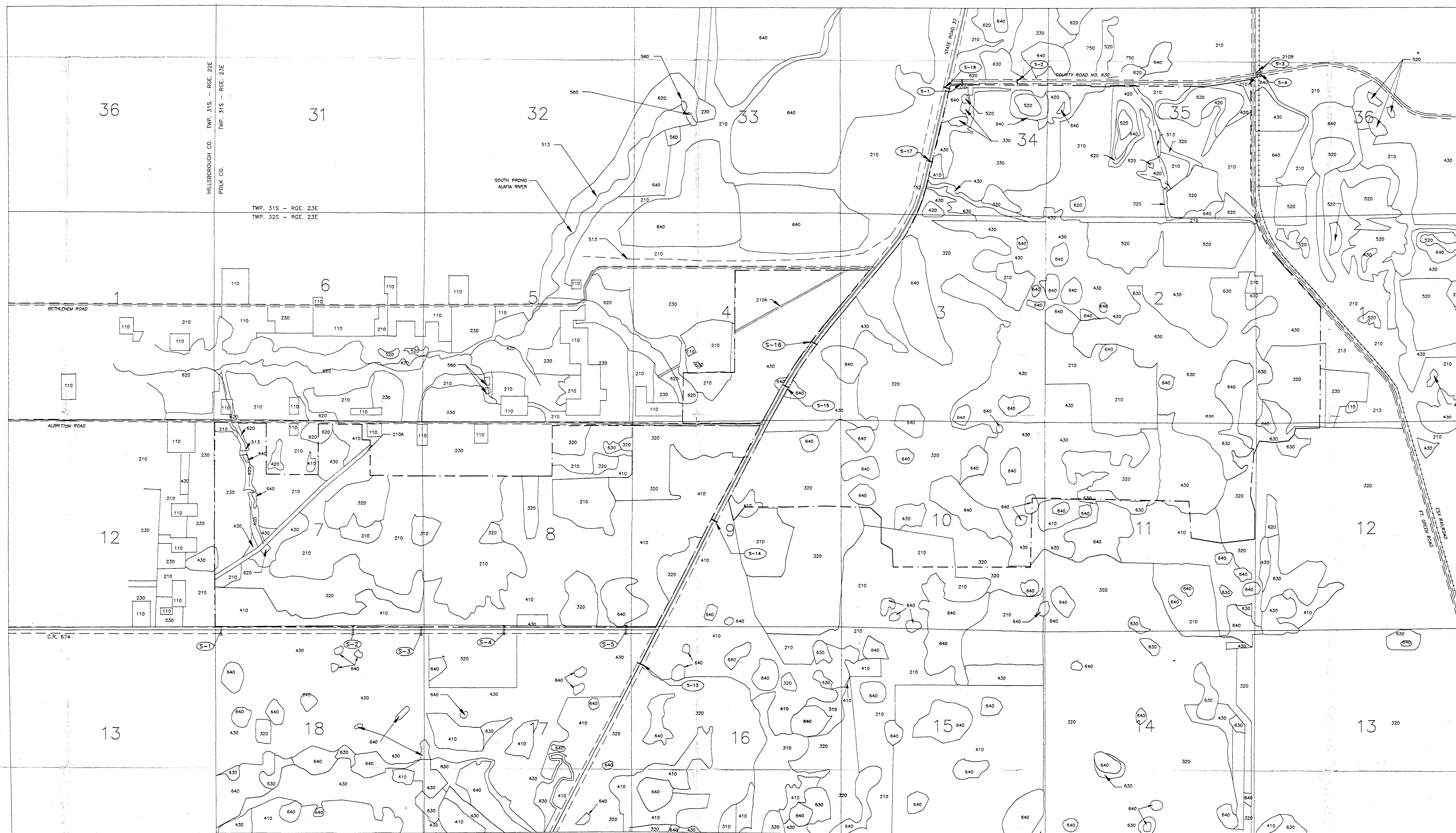
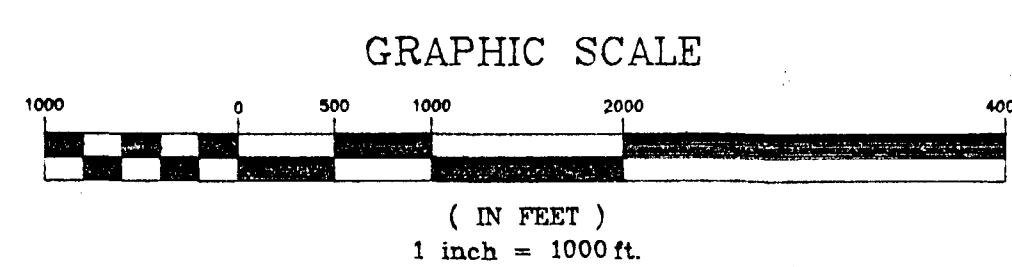
DRAINAGE PATTERNS BY PARCEL				
PARCEL	ALAFIA BASIN	LITTLE PAYNE BASIN	PAYNE BASIN	SUB TOTAL
AGRIC	534 AC	2323 AC	716 AC	3573 AC
AmCy/MGP	246 AC	2 AC	0 AC	248 AC
AmCy NON-MAN	36 AC	487 AC	0 AC	523 AC
AmCy (AGR MAN)	0 AC	4 AC	0 AC	4 AC
TOTAL	816 AC	2816 AC	716 AC	4348 AC

WATERSHED BASIN SUMMARY
LITTLE PAYNE CREEK (1-8,10,11,12 & 16) = 2816 ACRES
PAYNE CREEK (14) = 716 ACRES
ALAFIA RIVER (9,13 & 15) = 816 ACRES
TOTAL AREA OF SITE BASINS = 4348 ACRES

BASIN	ACRES	BASIN	ACRES
1	62	10	41
2	100	11	951
5	262	12	1095
6	43	13	381
7	26	14	716
8	58	15	414
9	21	16	178

SUMMARY OF FLOW CONTROL STRUCTURES				
CONTROL STRUCTURE	CONTROL	INLET (E12)	OUTLET (E12)	INITIAL STAGE (E12)
SOUTH PRONG ALAFIA RIVER				
S-18	48 INCH CULVERT	132.99	132.31	140.00
LITTLE PAYNE CREEK				
S-19	5 FT FLASHBOARD RISER	134.46		134.46
PAYNE CREEK				
S-5	24 INCH CULVERT	137.29	136.96	137.27
S-6	TWO 24 INCH CULVERTS	137.27	137.00	

FIGURE: 3	TITLE: PREMINING TOPOGRAPHY AND DRAINAGE MAP	 TAMPA ELECTRIC COMPANY POLK POWER STATION PROJECT A TECO ENERGY COMPANY
SOURCE: ECT/AGRIC	SCALE: 1 in = 1000 ft	
DATE: 8/31/92	PROJECT: 90263-0407	
FILE: PRETOP8		
		 Environmental Consulting & Technology, Inc.
		 Unified Engineers & Constructors A Raytheon Company



PREMINING VEGETATION WITHIN PROJECT BOUNDARY

	NON-MANDATORY ACRES	MANDATORY ACRES	TOTAL ACRES
210A PASTURE OVER GAS TRANSMISSION LINE	0	13	13
210 PASTURE	226	660	886
230 CITRUS	0	59	59
310 GRASSLAND	0	20	20
320 SHRUBLAND	0	995	995
330 MIXED RANGELAND	12	147	159
410 CONIFEROUS FOREST	0	439	439
420 UPLAND HARDWOOD FOREST	42	11	53
430 UPLAND MIXED FOREST	34	931	965
520 LAKES	140	7	147
620 WETLAND HARDWOOD FOREST	52	16	68
630 WETLAND MIXED FOREST	0	267	267
640 HERBACEOUS WETLAND	17	260	277
TOTAL			4348

PREMINING VEGETATION LEGEND BY OWNERSHIP

	AmCy NON-MANDATORY ACRES	AmCy MANDATORY ACRES	ACRICO MANDATORY ACRES	TOTAL ACRES
210A PASTURE OVER GAS TRANSMISSION LINE	0	0	13	13
210 PASTURE	226	24	636	886
230 CITRUS	0	0	59	59
310 GRASSLAND	0	0	20	20
320 SHRUBLAND	0	8	987	995
330 MIXED RANGELAND	12	147	0	159
410 CONIFEROUS FOREST	0	3	436	439
420 UPLAND HARDWOOD FOREST	42	11	0	53
430 UPLAND MIXED FOREST	34	29	902	965
520 LAKES	140	7	0	147
620 WETLAND HARDWOOD FOREST	52	1	15	68
630 WETLAND MIXED FOREST	0	10	257	267
640 HERBACEOUS WETLAND	17	12	248	277
TOTAL	523	252	3573	4348

VEGETATION LEGEND OUTSIDE PROJECT BOUNDARY

110 RESIDENTIAL
213 IMPROVED PASTURE
513 CANALS/DITCHES
560 PONDS

NOTE:
BASIS FOR THIS MAP CONSISTS OF:
1. MINE OPERATOR'S SUBMITTAL OF PRE-MINING LAND USE FOR LANDS MINED AFTER 7-1-75; OR
2. AERIAL PHOTOGRAPH DATED 6-13-91 BY I.F. ROOKS & ASSOCIATES AND MODIFIED BY GROUND TRUTHING ON 12-19-91 BY ECT FOR LANDS NOT SUBJECT TO MANDATORY LAND RECLAMATION RULES. SEE FIGURE 2 FOR REFERENCE

FIGURE: 4

SOURCE: AGRICO/ECT/SWFWD/SEMINOLE

DATE: 6/29/92

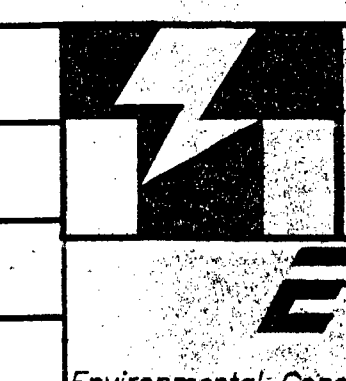
FILE: PREVEG5

TITLE: PREMINING VEGETATION AND

LAND USE MAP

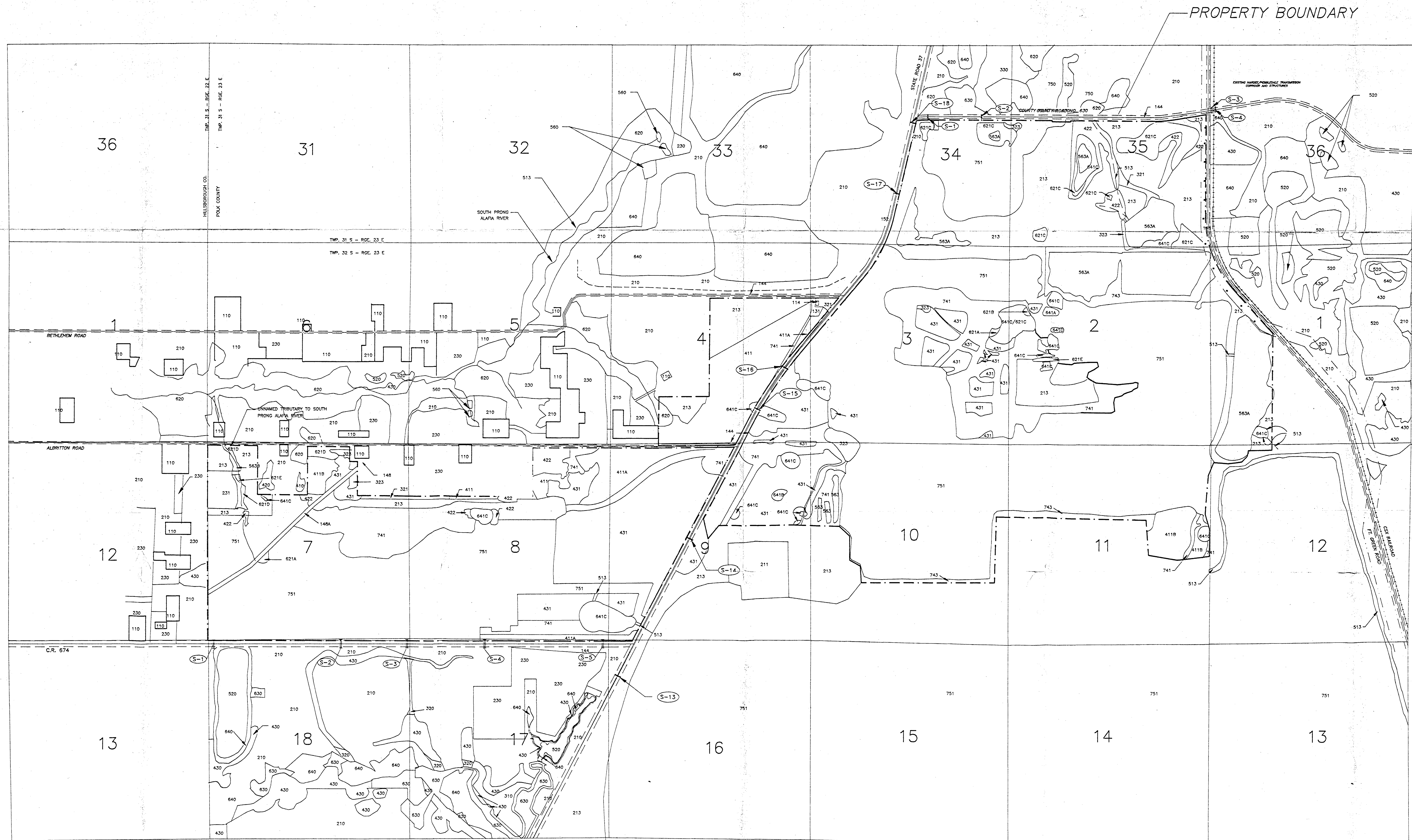
SCALE: 1 in = 1000 ft

PROJECT: 90263-0407



TAMPA ELECTRIC COMPANY
POLK POWER STATION PROJECT
A TECO ENERGY COMPANY

United Engineers
& Constructors
A TECO COMPANY



LEGEND (FLUCCS, 1976)

110	RESIDENTIAL	430	MIXED UPLAND FOREST
114	MOBILE HOME	431	MIXED OAK/PINE FOREST
131	LIGHT INDUSTRIAL	520	LAKES
144	ROADS AND HIGHWAYS	513	CANAL/DITCH
148A	FGT GAS PIPELINE	563	PONDS
148B	TAMPA ELECTRIC COMPANY 230-KV TRANSMISSION LINE (HARDEE-PEBBLEDAL)	560	OTHER WATER AREAS
152	OVERHEAD TRANSMISSION LINES	A	MINE PONDS
210	CROP AND PASTURELAND	B	OTHER WATER AREAS
211	ROWCROPS	620	WETLAND - HARDWOOD FOREST
213	IMPROVED PASTURE	621	WETLAND FORESTED
230	CITRUS GROVE	A	BAY HEAD SWAMP
231	ORANGE GROVE	B	RED MAPLE SWAMP
310	GRASSLAND	C	WILLOW - ELDERBERRY SWAMP
320	SHRUB AND BRUSHLAND	D	MIXED HARDWOOD SWAMP
321	PALMETTO PRAIRIE	E	PRIMROSE WILLOW SWAMP
323	SHRUB AND BRUSHLAND	630	WETLAND - MIXED FOREST
330	MIXED RANGELAND	640	WETLAND - VEGETATED NON-FORESTED
410	CONIFEROUS FOREST	641	NON-FORESTED WETLAND
411A	SLASH PINE FLATWOODS	A	MAIDENCANE MARSH
411B	LONGLEAF PINE FLATWOODS	B	MAIDENCANE - BOTTONBUSH
420	HARDWOOD FOREST	C	DISTURBED MIXED MARSH
422	OAK HAMMOCK	741	SCRAPED AREAS/OLD FIELDS
		751	PHOSPHATE MINED LANDS
		743	VEGETATED SPOIL BANK

NOTE:
INFORMATION TAKEN FROM AERIAL PHOTOGRAPH DATED 6-13-91
BY I.F. ROOKS & ASSOCIATES, INC.
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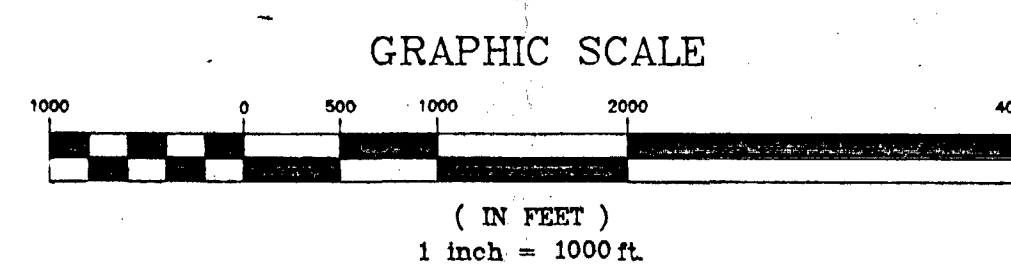
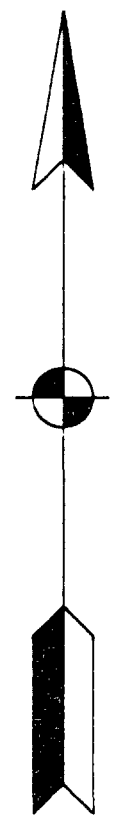
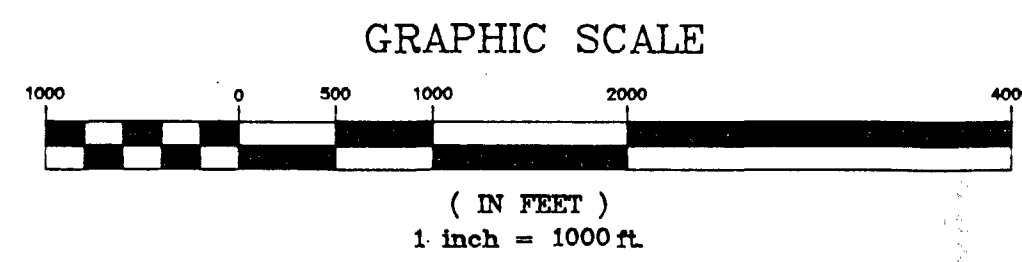
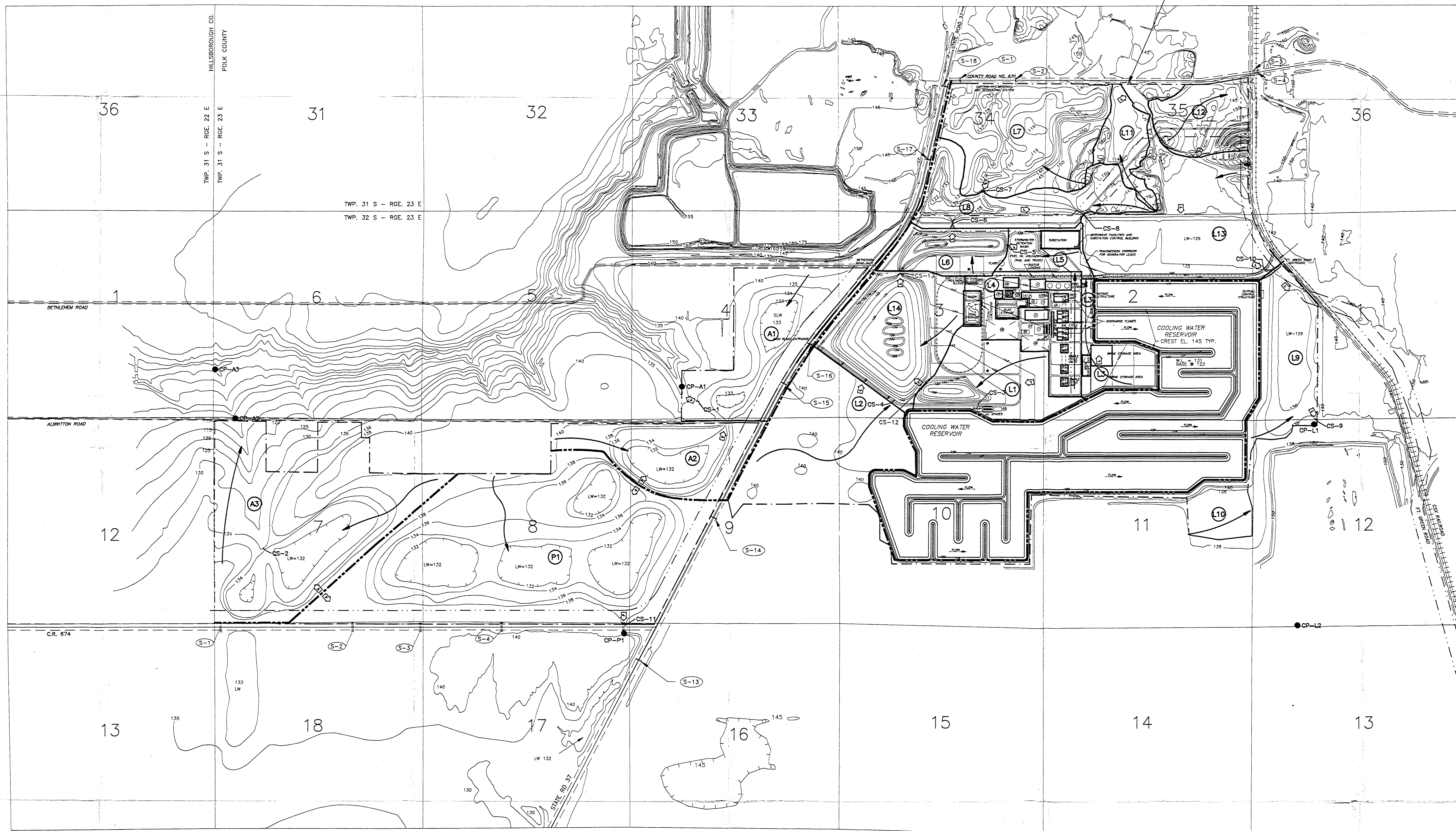


FIGURE: 5	TITLE: EXISTING LAND USE/		TAMPA ELECTRIC COMPANY POLK POWER STATION PROJECT A TECO ENERGY COMPANY
SOURCE: ECT/UEC/AGRICO/SWFWM/SEMINOLE	LAND COVER MAP		
DATE: 6/29/92	SCALE: 1 in = 1000 ft		United Engineers & Constructors A Tregrean Company
FILE: EXVEG5	PROJECT: 90263-0404		



PROPERTY BOUNDARY



LEGEND

- PROJECT BOUNDARY
- ELEVATION CONTOUR
- CRITICAL POINT
- EXISTING DRAINAGE STRUCTURES
- PROPOSED POSTRECLAMATION DRAINAGE STRUCTURES
- DRAINAGE BASIN NO.
- FLOW PATHS
- WATERSHED DIVIDE
- WATERSHED BASINS
A = ALAFIA RIVER BASIN
L = LITTLE PAYNE CREEK BASIN
P = PAYNE CREEK BASIN

DRAINAGE PATTERNS BY PARCEL

PARCEL	ALAFIA BASIN	LITTLE PAYNE BASIN	PAYNE BASIN	SUB TOTAL
AGRIC	801 AC	2062 AC	710 AC	3573 AC
AmCy/MCF	0 AC	248 AC	0 AC	248 AC
AmCy NON-MAN	0 AC	523 AC	0 AC	523 AC
AmCy (AGR MAN)	0 AC	4 AC	0 AC	4 AC
TOTAL	801 AC	2837 AC	710 AC	4348 AC

SUMMARY OF PROPOSED POSTRECLAMATION FLOW CONTROL STRUCTURES

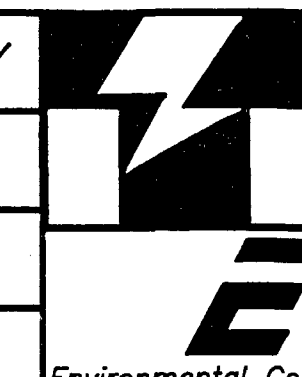
CONTROL STRUCTURE	TYPE	INLET INVERT ELEVATION (FT.-NGVD)	OUTLET INVERT ELEVATION (FT.-NGVD)
SOUTH PRONG ALAFIA RIVER			
CS-1	120" V-NOTCH	135.00	
CS-2	50 FT WEIR	135.30	
	120" V-NOTCH	134.00	
	20 FT WEIR	134.00	
LITTLE PAYNE CREEK			
CS-3	1.5 INCH ORIFICE	135.25	
	0.5 FT WEIR	136.50	
CS-4	TWO 24 INCH CULVERTS	139.00	138.7
CS-5	90" V-NOTCH	135.00	
	10 FT WEIR	135.75	
CS-6	THREE 36 INCH CULVERTS	134.50	134.30
CS-7	100 FT SWALE	135.00	
CS-8	THREE 48 INCH CULVERTS	134.00	133.80
CS-9	20 FT OPEN CHANNEL	132.00	
CS-10	12 FT BOX CULVERT	133.00	
CS-11	300 FT BERM	135.00	
CS-12	THREE 42 INCH CULVERTS	133.00	132.80
PAYNE CREEK			
CS-13	TWO 36 INCH CULVERTS	136.70	136.50
	120" V-NOTCH	136.90	
	20 FT WEIR	137.10	

DRAINAGE PATTERNS

TO SOUTH PRONG ALAFIA RIVER = 801 ACRES
TO PAYNE CREEK = 710 ACRES
TO LITTLE PAYNE CREEK = 2,837 ACRES

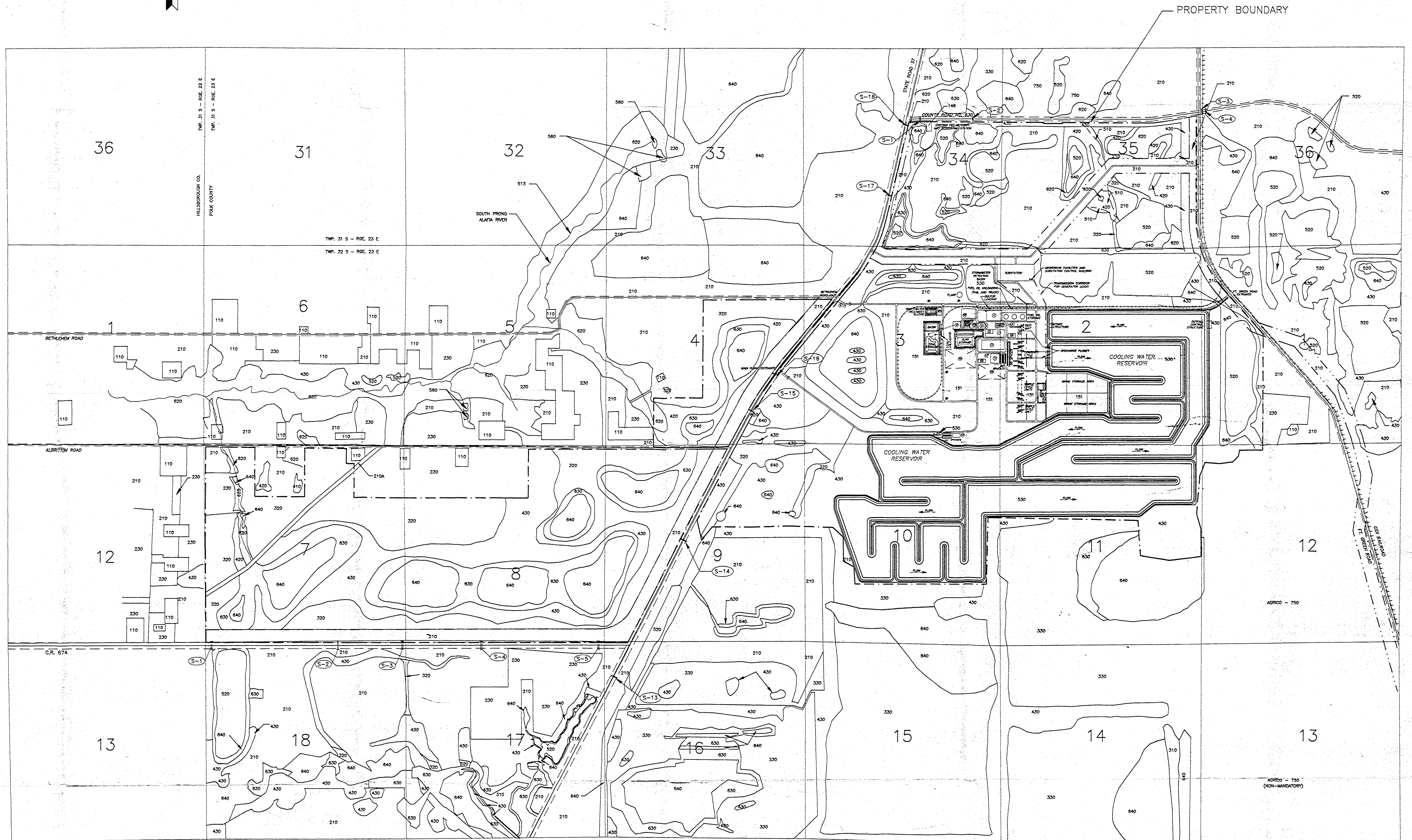
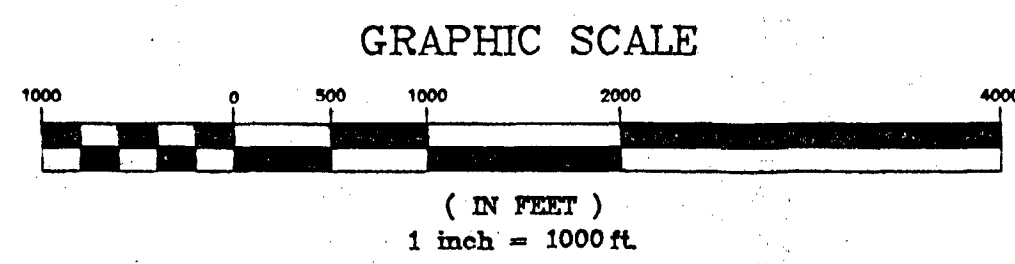
NOTE: DATA FOR PLAN OBTAINED FROM ROCKS' AERIAL MAPPING, U&C, IMC FERTILIZER, TAMPA ELECTRIC COMPANY, AND AGRICO

FIGURE: 6	TITLE: POST RECLAMATION TOPOGRAPHY & DRAINAGE
SOURCE: ECT/UEC	
DATE: 8/31/92	SCALE: 1 in = 1000 ft
FILE: PSTTOP18	PROJECT: 90263-0407



TAMPA ELECTRIC COMPANY
POLK POWER STATION PROJECT
A TECO ENERGY COMPANY

United Engineers
& Constructors
A Bergstrom Company



POST RECLAMATION VEGETATION WITHIN PROJECT BOUNDARY

	NON-MANDATORY ACRES	MANDATORY ACRES	TOTAL ACRES
140	TRANSPORTATION	0	3
148	GAS TRANSMISSION SUBSTATION	0	1
151	ELECTRICAL POWER FACILITY	0	337
210A	PASTURE OVER GAS TRANSMISSION LINE	0	13
210	PASTURE	211	641
230	CITRUS	0	18
320	SHRUBLAND	4	58
330	MIXED RANGELAND	6	0
420	UPLAND HARDWOOD FOREST	29	72
430	UPLAND MIXED FOREST	34	722
520	LAKES	165	87
530	RESEVOIRS	0	840
620	WETLAND HARDWOOD FOREST	40	21
630	WETLAND MIXED FOREST	11	299
640	HERBACEOUS WETLAND	23	405
	TOTAL	523	3825
			TOTAL 4348

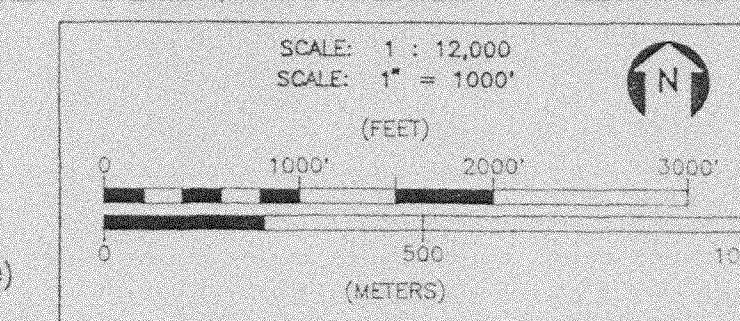
BUILDING KEY

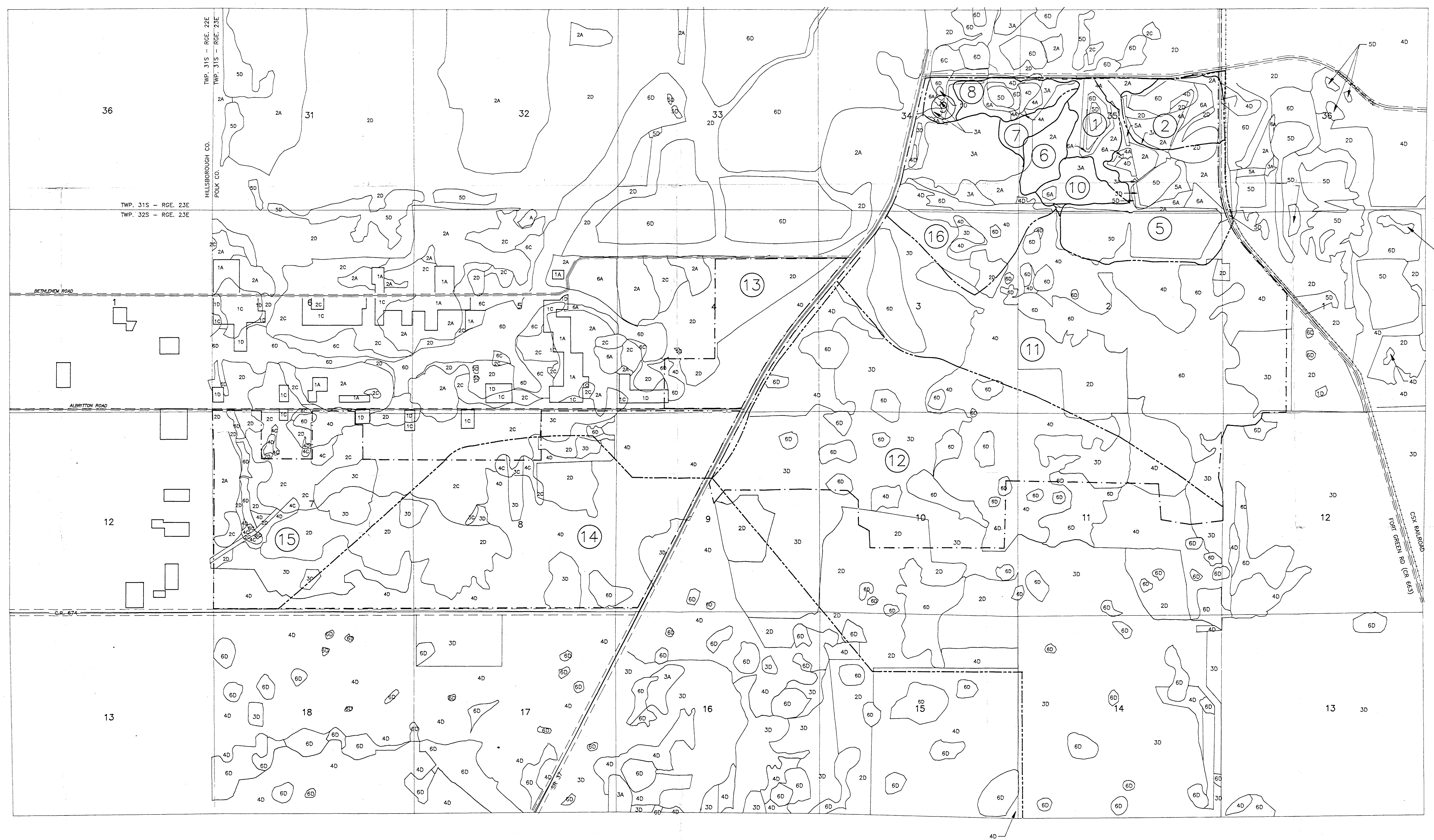
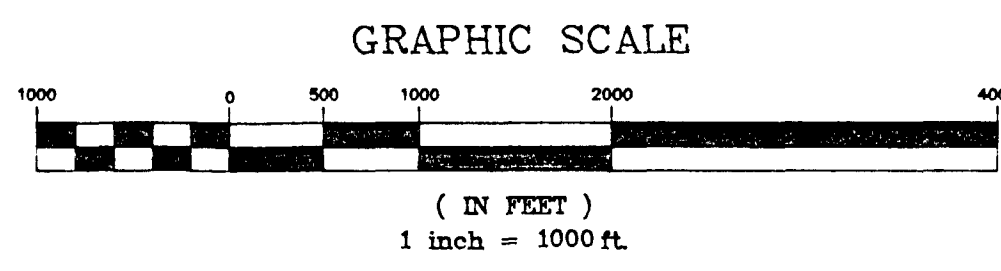
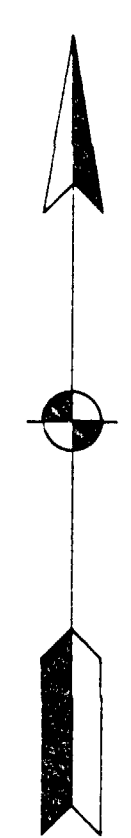
- 1 GASIFICATION & GAS COOLING
- 2 ACID GAS REMOVAL
- 3 OXYGEN PLANT
- 4 SULFUR RECOVERY & TAIL GAS TREATING
- 5 HOT GAS CLEANUP
- 6 MAKE-UP WATER TREATING
- 7 CONTROL AND GENERAL SERVICES BUILDING
- 8 COAL GRINDING
- 9 CONSTRUCTION POWER FACILITIES
- 10 ADMINISTRATION BUILDING & VISITORS CENTER
- 11 INDUSTRIAL WASTE TREATMENT FACILITY & HOLDING BASIN
- 12 SANITARY WASTE TREATMENT
- 13 48 V BATTERY, PEK, & RTU
- 14 CONSTRUCTION WAREHOUSE
- 15 MAINTENANCE SHOP
- 16 CONSTRUCTION LAYDOWN & TEMPORARY CONSTRUCTION PERSONNEL PARKING
- 17 MOBILE EQUIPMENT MAINTENANCE SHOP
- 18 OFF-GAS TREATMENT
- 19 ICCG WASTEWATER TREATMENT

NOTES:

1. COOLING WATER RESERVOIR MAKEUP TO BE SUPPLIED BY GROUNDWATER
2. POST RECLAMATION VEGETATION IN SECTION 34, TOWNSHIP 31 SOUTH, RANGE 23 EAST, WAS SUPPLIED BY IMCF AND MAY REFLECT EXPORTATION OF OVERBURDEN AND MAY NOT BE CONSISTENT WITH APPROVED PROGRAM.

FIGURE: 7	TITLE: CONCEPTUAL SITE AND		TAMPA ELECTRIC COMPANY	
SOURCE: ECT/UEC/AGRICO/SEMINOLE/IMCF	POSTRECLAMATION PLAN		POLK POWER STATION PROJECT	
DATE: 7/17/92	SCALE: 1 in = 1000 ft	A TECO ENERGY COMPANY		
FILE: POSTVG17	PROJECT: 90263-0407	 Environmental Consulting & Technology, Inc.	 A Bechtel Company	

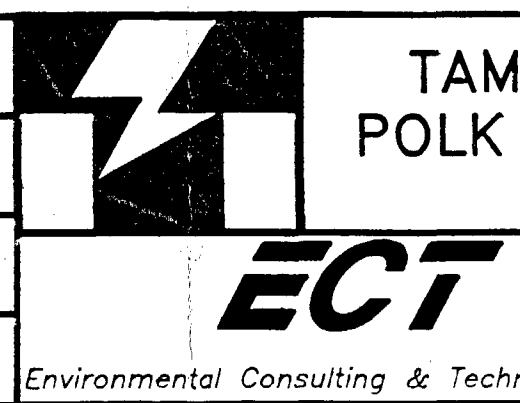
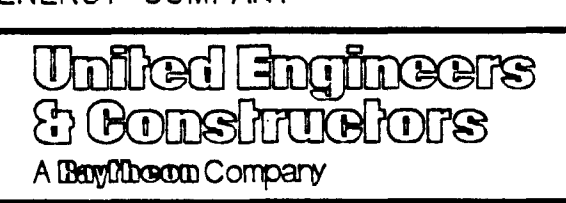




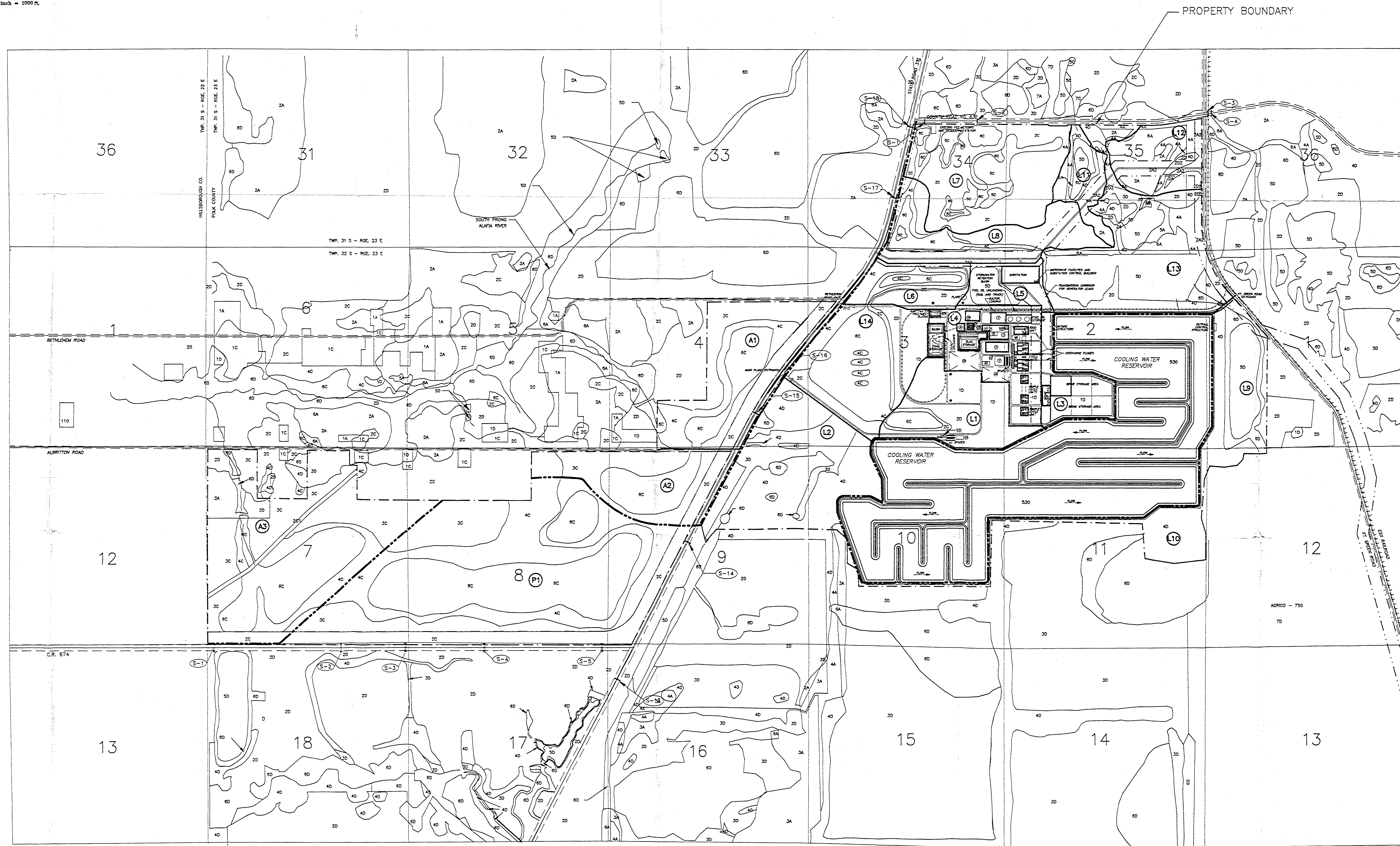
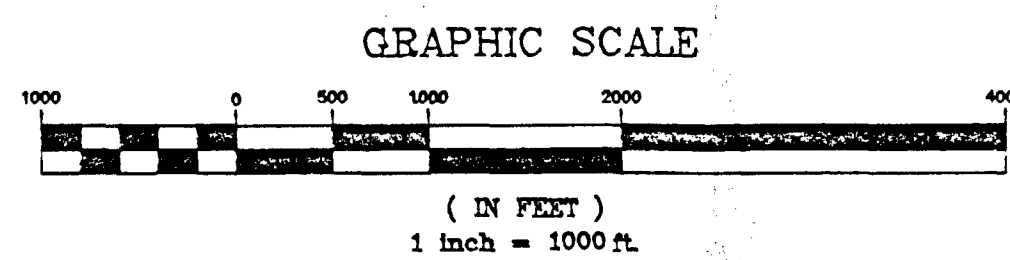
		DRAINAGE BASINS																
		1	2	5	6	7	8	9	10	11	12	13	14	15	16			
HYDROLOGIC CLASSES	2A	35	48	49	39	12	4	-	-	-	-	-	-	38	17			
	2B	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	2C	-	-	-	-	-	-	-	-	-	-	-	56	100	-			
	2D	-	15	8	-	-	-	-	-	128	38	93	179	99	-			
	3A	-	3	2	4	14	24	8	37	-	-	-	-	-	125			
	3B	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	3C	-	-	-	-	-	-	-	-	-	-	20	8	26	-			
	3D	-	-	4	-	-	-	-	-	200	504	-	129	66	-			
	4A	12	7	3	-	-	5	5	-	-	-	-	-	-	11			
4B	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
4C	-	-	-	-	-	-	-	-	-	-	-	-	10	11	-			
4D	-	10	46	-	-	10	-	1	321	356	260	318	61	10	-			

		DRAINAGE BASINS																TOTAL
		1	2	5	6	7	8	9	10	11	12	13	14	15	16			
HYDROLOGIC CLASSES	5A	-	-	10	-	-	-	-	-	-	-	-	-	-	-	10		
	5B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	5C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	5D	4	-	125	-	-	7	1	-	-	-	-	-	-	-	137		
	6A	2	-	15	-	-	4	4	-	-	-	-	-	-	1	26		
	6B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	6C	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1		
	6D	9	17	-	-	-	4	3	3	302	197	8	16	12	14	542		

AREA CALCULATIONS BY DRAINAGE BASIN
IN ACRES

FIGURE: 9	TITLE: PREMINING HYDROLOGIC SOIL		TAMPA ELECTRIC COMPANY POLK POWER STATION PROJECT A TECO ENERGY COMPANY
SOURCE: ECT/TEC	GROUP MAP		
DATE: 6/29/92	SCALE: 1 in = 1000 ft		
FILE: PREHYD3	PROJECT: 90263-0407		

Environmental Consulting & Technology, Inc. A Bechtel Company



DRAINAGE BASINS

	A1	A2	A3	P1	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14
1A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1D	-	-	-	-	89	-	59	152	28	-	-	-	-	-	-	-	-	32
2A2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	23	18	-
2C1	-	-	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2D1	-	-	-	-	-	-	-	-	-	-	3	47	-	-	-	-	-	-
2D2	-	-	-	-	-	-	-	-	-	-	-	6	-	-	5	2	-	-
2A	-	-	22	-	-	-	-	-	-	-	-	-	-	-	8	13	11	-
2B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2C	38	17	15	96	7	-	-	-	-	3	133	62	-	-	-	-	-	24
2D	-	-	8	-	27	6	-	-	-	21	-	-	17	-	-	9	15	23
3A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3C	61	71	186	188	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3D	-	-	8	-	-	77	-	-	-	-	-	-	-	-	-	-	13	-

DRAINAGE BASINS

	A1	A2	A3	P1	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14
4A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20	16	28	-
4B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4C	59	13	58	184	-	-	-	-	-	43	17	5	-	-	-	-	-	25
4D	-	-	-	-	-	189	-	-	-	-	-	-	50	63	4	4	32	-
5A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-
5B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5C	-	-	-	-	-	-	-	-	-	-	40	2	-	-	-	-	-	-
5D	-	-	-	-	-	-	-	26	-	-	-	-	51	-	5	-	146	-
6A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	26	24	-
6B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6C	55	56	114	242	13	-	-	-	10	25	36	-	-	-	-	-	-	97
6D	-	-	7	-	-	9	-	-	-	-	-	-	32	-	13	-	9	-

FIGURE: 10

SOURCE: ECT/UEC/AGRIC/SEMINOLE/IMCF

DATE: 7/17/92

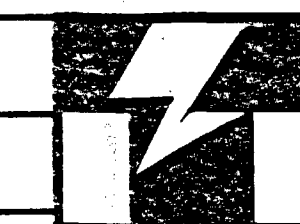
FILE: POSTHYD8

TITLE: POSTRECLAMATION HYDROLOGIC

SOILS PLAN

SCALE: 1 in = 1000 ft

PROJECT: 90263-0407



Environmental Consulting & Technology, Inc.

TAMPA ELECTRIC COMPANY
POLK POWER STATION PROJECT
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