TAMPA ELECTRIC
A TECO ENERGY COMPANY

June 18, 1993

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Division of Air Resources Management

Mr. Hamilton S. Oven, Jr., P.E., Administrator
Siting Coordination Section
Florida Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Re: Tampa Electric Company
Polk Power Station Site Certification Application (SCA)
Revision 2, June 18, 1993, Updates to SCA

Dear Mr. Oven:

Enclosed are twelve (12) copies of updates to the Tampa Electric Company Polk Power Station SCA, (PA 92-32, DOAH Case No. 92-4896 EPP, and OGC Case No. 92-1399). These updates represent Revision 2 (Rev. 2, 6/18/93) of the Polk Power Station SCA. Revision 1 (Rev. 1, 11/25/92) was previously submitted to reviewing agencies on December 2, 1992.

Since the submission of the Revision 1 updates to the SCA, Tampa Electric Company continued to respond to Sufficiency Comments from reviewing agencies. The Polk Power Station, SCA was deemed sufficient on May 10, 1993. Also since the submission of the Revision 1 updates, Tampa Electric Company has retained Bechtel Power Corporation (Bechtel) to conduct the detailed engineering and design efforts for the project. Thus, the Revision 2 updates have been identified as needed to primarily make the SCA consistent with Tampa Electric Company's Sufficiency Responses to reviewing agency comments and the current status of the ongoing detailed engineering efforts by Bechtel. Certain other minor updates to the SCA have been identified as needed to reflect changes in regulations, mining plans, and the project licensing efforts since the filing of the SCA on July 30, 1992. The attached Table 1 provides a summary of the Revision 2 updates and the reasons for these updates. It is important to note that these updates to the SCA represent only minor changes in the overall design of the project and either have not changed or have lessened the potential environmental impacts associated with the project in such areas as air quality, water use and quality, and wetland reclamation/mitigation.

A table is attached with the Revision 2 package which identifies the specific pages or sections of the SCA that have been revised, and to be removed from and inserted into the SCA. Further, to expedite your review of the revisions, the Revision 2 updates show deletions from the SCA as strikeouts (e.g., ~~sulfur~~), and additions to the SCA are highlighted by shading (e.g., sulfur).

If you have any questions regarding the Revision 2 package, please contact Greg Nelson at 813/228-4847. Thank you for your continued interest in this project.

Sincerely,

A. Spencer Autry /gnw

A. Spencer Autry
Director
Environmental

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Enclosures

cc: Mr. S.L. Palmer, P.E., FDER-Tallahassee

Table 1. Tampa Electric Company Polk Power Station Summary of Updates to Site Certification Application

SCA Update	Reason for Update
1. Revised plant site layout.	Ongoing detailed engineering by Bechtel.
2. Delete sulfur recovery unit and tail gas treating unit and expand H_2SO_4 plant to treat 100 percent of offgas.	Ongoing detailed engineering by Bechtel results in less environmental impact, higher plant efficiency, and lower costs.
3. Revised air quality modeling and impact assessments. Revise GEP analysis and significant impact analyses. Since impacts are less than previous impacts in SCA, revised PSD Class I and II and AAQS modeling was not conducted.	Revised modeling based on revised plant layout and change in sulfur removal process to H_2SO_4 plant only.
4. Revised construction dewatering drawdown modeling, which was included in Sufficiency Responses.	Decrease in required dewatering depths from 120 to 129 ft-NGVD in Subareas B and C results in reduced offsite drawdowns.
5. Add construction dewatering monitoring/mitigation plan which was included in Sufficiency Responses.	Requested by SWFWMD in Sufficiency Comments.
6. Revised design of internal berms in cooling reservoir from top elevation of 145 to 141 ft-NGVD and width of berm top from 25 to 17 ft.	Ongoing site preparation planning and materials balance estimates.
7. Add request for groundwater zone of discharge for antimony and variance for color, in addition to variance for iron. The need for these additions was included in Sufficiency Responses.	Reflect changes in primary and secondary drinking water standards since SCA submitted.
8. Revised operational groundwater monitoring plan to include antimony as indicated in Sufficiency Responses.	Reflect request for zone of discharge.
9. Revised estimates of nutrient concentrations in cooling reservoir and discharge which were included in Sufficiency Responses.	Revisions in nutrient estimates based on FDER Sufficiency Comments.
10. Change lead federal agency for EIS from DOE to EPA.	Reflect current status of federal EIS process.
11. Revised reclamation plan for portion of site to the west of SR 37 between Albritton and Bethlehem Roads.	Reflect change in Agrico's mining plan to not mine north of natural gas pipeline.

Source: ECT, 1993.

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TAMPA ELECTRIC COMPANY
POLK POWER STATION
SITE CERTIFICATION APPLICATION

REVISION 2

Revision 2, 06/18/93, of the Site Certification Application for the Tampa Electric Company Polk Power Station consists of the following revisions to the document.

	Remove	Insert from Rev. 2, 06/18/93

Volume 1

	Remove	Insert from Rev. 2, 06/18/93
	SCA Table of Contents, List of Tables, List of Figures Pages i through xliv	SCA Table of Contents, List of Tables, List of Figures Pages i through xliii
CHAPTER 1.0	Table of Contents, Pages i through ii	Table of Contents, Pages i through iii
	Pages 1.2.0-3 and 1.2.0-4	Pages 1.2.0-3 and 1.2.0-4
	Pages 1.5.3-4 and 1.5.3-5	Pages 1.5.3-4 and 1.5.3-5
	Page 1.6.0-2	Page 1.6.0-2
CHAPTER 2.0	Table of Contents, Pages i through xii	Table of Contents, Pages i through xii
	Page 2.1.0-1	Page 2.1.0-1
	Page 2.2.4-4	Page 2.2.4-4
	Pages 2.3.2-8 through 2.3.2-11	Pages 2.3.2-8 through 2.3.2-11
	Pages 2.3.2-23 and 2.3.2-24	Pages 2.3.2-23 and 2.3.2-24
	Page 2.3.2-26	Page 2.3.2-26
	Page 2.3.2-28	Page 2.3.2-28
	Pages 2.3.2-34 through 2.3.2-36	Pages 2.3.2-34 through 2.3.2-36
	Page 2.3.4-33	Page 2.3.4-33
	Page 2.3.4-38	Page 2.3.4-38
	Pages 2.3.6-19 and 2.3.6-20	Pages 2.3.6-19 and 2.3.6-20
	Page 2.3.6-29	Page 2.3.6-29
	Page 2.3.6-55	Page 2.3.6-55

Volume 2

	Remove	Insert from Rev. 2, 06/18/93
CHAPTER 3.0	Table of Contents, Pages i through ix	Table of Contents, Pages i through ix
	Pages 3.1.1-3 and 3.1.1-4	Pages 3.1.1-3 and 3.1.1-4
	Pages 3.1.1-17 through 3.1.1-27	Pages 3.1.1-17 through 3.1.1-27
	Pages 3.1.1-30 through 3.1.1-31	Page 3.1.1-30 through 3.1.1-31a
	Pages 3.1.4-1 and 3.1.4-2	Pages 3.1.4-1 and 3.1.4-2
	Pages 3.1.4-5 through 3.1.4-9	Pages 3.1.4-5 through 3.1.4-9
	Pages 3.2.0-2 through 3.2.0-6	Pages 3.2.0-2 through 3.2.0-6

	Remove	Insert from Rev. 2, 06/18/93
	Pages 3.2.0-9 and 3.2.0-10	Pages 3.2.0-9 and 3.2.0-10
	Page 3.3.0-1	Page 3.3.0-1
	Page 3.3.1-1	Page 3.3.1-1
	Page 3.4.1-1	Page 3.4.1-1
	Pages 3.4.1-3 through 3.4.1-5	Pages 3.4.1-3 through 3.4.1-5
	Page 3.4.2-2	Page 3.4.2-2
	Page 3.4.2-4	Page 3.4.2-4
	Pages 3.4.3-2 through 3.4.3-4	Pages 3.4.3-2 through 3.4.3-4
	Page 3.4.3-8	Page 3.4.3-8
	Pages 3.4.3-12 and 3.4.3-13	Pages 3.4.3-12 and 3.4.3-13
	Page 3.4.3-19	Page 3.4.3-19
	Pages 3.4.4-2 and 3.4.4-3	Pages 3.4.4-2 and 3.4.4-3
	Page 3.4.5-2	Page 3.4.5-2
	Page 3.5.1-2	Page 3.5.1-2
	Page 3.5.1-8	Page 3.5.1-8
	Pages 3.5.1-10 and 3.5.1-11	Pages 3.5.1-10 and 3.5.1-11
	Page 3.6.2-2	Page 3.6.2-2
	Page 3.6.2-4	Page 3.6.2-4
	Page 3.7.1-1	Page 3.7.1-1
	Pages 3.7.1-3 and 3.7.1-4	Pages 3.7.1-3 and 3.7.1-4
	Page 3.7.1-7	Page 3.7.1-7
	Pages 3.7.2-1 through 3.7.2-3	Pages 3.7.2-1 through 3.7.2-3
	Page 3.8.0-3	Page 3.8.0-3
	Page 3.8.0-4	Page 3.8.0-4
	Page 3.8.3-1	Page 3.8.3-1
	Page 3.9.2-1	Page 3.9.2-1
CHAPTER 4.0	Table of Contents, Pages i through iv	Table of Contents, Pages i through iv
	Page 4.1.1-1	Page 4.1.1-1
	Page 4.1.1-5	Page 4.1.1-5
	Page 4.1.4-2	Page 4.1.4-2
	Page 4.2.1-1	Page 4.2.1-1
	Page 4.2.1-7	Page 4.2.1-7
	Pages 4.3.1-1 through 4.3.1-5	Pages 4.3.1-1 through 4.3.1-5a
	Page 4.3.2-1	Pages 4.3.2-1 through 4.3.2-10
	Page 4.4.1-3	Page 4.4.1-3

	Remove	Insert from Rev. 2, 06/18/93
	Page 4.4.1-5	Page 4.4.1-5
	Pages 4.4.1-8 and 4.4.1-9	Pages 4.4.1-8 and 4.4.1-9
	Page 4.6.1-1	Page 4.6.1-1
	Page 4.9.0-6	Page 4.9.0-6
	Page 4.12.0-1	Page 4.12.0-1
CHAPTER 5.0	Table of Contents, Pages i through vi	Table of Contents, Pages i through vi
	Page 5.1.1-9	Page 5.1.1-9
	Page 5.2.1-2	Page 5.2.1-2
	Pages 5.2.1-4 and 5.2.1-5	Pages 5.2.1-4 through 5.2.1-5a
	Page 5.3.5-1	Page 5.3.5-1
	Page 5.4.1-2	Page 5.4.1-2
	Page 5.6.1-2	Page 5.6.1-2
	Pages 5.6.1-6 through 5.6.1-14	Pages 5.6.1-6 through 5.6.1-14
	Page 5.9.0-11	Page 5.9.0-11
	Page 5.9.0-14	Page 5.9.0-14
	Page 5.12.0-1	Page 5.12.0-1

Volume 3

CHAPTER 6.0	Table of Contents, Pages i through v	Table of Contents, Pages i through v
	Page 6.4.0-1	Page 6.4.0-1
CHAPTER 7.0	Table of Contents, Pages i through ii	Table of Contents, Pages i through ii
	Page 7.1.3-1	Page 7.1.3-1
CHAPTER 8.0	Table of Contents, Pages i through vi	Table of Contents, Pages i through v
	Page 8.0.0-1	Page 8.0.0-1
	Pages 8.2.3-13 and 8.2.3-14	Pages 8.2.3-13 and 8.2.3-14
	Page 8.2.3-16	Page 8.2.3-16
	Page 8.3.8-1	Page 8.3.8-1
CHAPTER 9.0	Table of Contents, Pages i through ii	Table of Contents, Pages i through iii
	Page 9.0.0-1	Page 9.0.0-1
	Page 9.1.1-7	Page 9.1.1-7
	Page 9.5.0-1	Page 9.5.0-1

Remove	Insert from Rev. 2, 06/18/93
Appendix 11.1.1--National Pollutant Discharge Elimination System Permit Applications	
Fourth page, Figure 2	Figure 2, Site Drainage Plan and Outfalls 001 and 002
First page of Form 1--Item XII	First page of Form 1--Item XII
Table 1 at end of Form 2D	Table 1, Estimated Cooling Reservoir Discharge (Outfall 001) Effluent Water Quality
Pages 2 and 3 of Best Management Practices Plan	Pages 2 and 3 of Best Management Practices Plan
Pages 2 through 4 of Preliminary Pollution Prevention Plan	Pages 2 through 4 of Preliminary Pollution Prevention Plan
Page 12 of Preliminary Pollution Prevention Plan	Page 12 of Preliminary Pollution Prevention Plan
Appendix 11.1.2--Joint Application for Works in the Waters of Florida	
Pages 9 and 10, Figure 3 (6 and 7 of 13)	Pages 9 and 10, Figure 3 (6 and 7 of 13)
Pages 22 and 23, Figure 4 (6 and 7 of 13)	Pages 22 and 23, Figure 4 (6 and 7 of 13)
Pages 35 and 36, Figure 5 (6 and 7 of 13)	Pages 35 and 36, Figure 5 (6 and 7 of 13)

Volume 4

Remove	Insert from Rev. 2, 06/18/93
Appendix 11.1.3--Prevention of Significant Deterioration Permit Application	
Pages 1-5 through 1-7	Pages 1-5 through 1-7
Pages 2-6 through 2-8	Pages 2-6 through 2-8
Pages 2-20 through 2-32	Pages 2-20 through 2-32
Page 2-34	Pages 2-34 through 2-34b
Page 2-41	Page 2-41
Pages 2-43 through 2-45	Pages 2-43 through 2-45
Page 2-58	Page 2-58
Pages 2-60 and 2-61	Pages 2-60 and 2-61

Remove	Insert from Rev. 2, 06/18/93
Page 2-64	Page 2-64
Page 2-66	Page 2-66
Page 3-16	Page 3-16
Pages 4-6 and 4-7	Pages 4-6 and 4-7
Pages 4-12 through 4-14	Pages 4-12 through 4-14
Page 4-28	Page 4-28
Page 4-36	Page 4-36
Page 4-38	Page 4-38
Pages 4-49 and 4-50	Pages 4-49 and 4-50
Pages 4-68 through 4-72	Pages 4-68 through 4-72
Page 4-74	Page 4-74
Pages 4-81 and 4-82	Pages 4-81 and 4-82
Pages 4-109 and 4-110	Pages 4-109 and 4-110
Page 4-118	Page 4-118
Pages 5-1 through 5-4	Pages 5-1 through 5-4
Pages 6-10 through 6-12	Pages 6-10 through 6-12
Pages 7-10 through 7-25	Pages 7-10 through 7-25
Page 7-33	Pages 7-33 and 7-33a
Page 8-7	Page 8-7
Page 9-4	Page 9-4
Page A-13	Page A-13
Page A-21	Page A-21
Page A-24	Page A-24

Volume 5

Appendix 11.2.1--Application to Construct/Operate Air Pollution Sources

Seventh page (Tail Gas Treating Unit Thermal Oxidizer [EP 13] Form page 4 of 12) of Application for Unit No. 1 and Future CC/CT Units	Tail Gas Treating Unit Thermal Oxidizer (EP 13)--Form page 4 of 12 marked DELETED

Remove	Insert from Rev. 2, 06/18/93
Sixth page (Sulfuric Acid Plant Thermal Oxidizer [EP 15] Form page 4 of 12) of Application for Unit No. 1 and Future CC/CT Units	Sulfuric Acid Plant Thermal Oxidizer (EP 15)--Form page 4 of 12
Twenty-first page (Tail Gas Treating Unit Thermal Oxidizer Form page 5 of 12) of Application for Unit No. 1 and Future CC/CT Units	Tail Gas Treating Unit Thermal Oxidizer--Form page 5 of 12 marked DELETED
Twenty-second page (Sulfuric Acid Plant Thermal Oxidizer Form page 5 of 12) of Application for Unit No. 1 and Future CC/CT Units	Sulfuric Acid Plant Thermal Oxidizer--Form page 5 of 12
Twenty-ninth page (Tail Gas Treating Unit Thermal Oxidizer Form page 6 of 12) of Application for Unit No. 1 and Future CC/CT Units	Tail Gas Treating Unit Thermal Oxidizer--Form page 6 of 12 marked DELETED
Thirteenth page (Sulfuric Acid Plant Thermal Oxidizer Form page 6 of 12) of Application for Unit No. 1 and Future CC/CT Units	Sulfuric Acid Plant Thermal Oxidizer--Form page 6 of 12

Appendix 11.2.2--Water Use Permit Application

Remove	Insert from Rev. 2, 06/18/93
Figures 11.2.2-2 and 11.2.2-3	Figures 11.2.2-2 and 11.2.2-3
Figure 11.2.2-5	Figure 11.2.2-5
	ADD: Attachments A and B at end of Appendix 11.2.2, Water Use Permit Application

Remove	Insert from Rev. 2, 06/18/93

Volume 6

Appendix 11.7.6--Cooling Reservoir--Surficial Aquifer Model

Pages 4 and 5	Pages 4 and 5
Pages 38 through 61	Pages 38 through 61
Page 63	Page 63

Appendix 11.7.8--Groundwater Monitoring Plan

Third pagen monitoring program description	Monitoring program
Figures 11.7.8-1 and 11.7.8-2	Figures 11.7.8-1 and 11.7.8-2

Volume 7

Appendix 11.13.1--Preliminary Spill Prevention, Control, and Countermeasure Plan

Page 3, Figure 1	Page 3, Figure 1

Appendix 11.16--Supporting Information for Conceptual Reclamation Plan Application: Maps (oversized in pockets)

Map 11.16.2, Mining Operations Status Map	Figure 2, Mining Operations Status Map
Map 11.16.6, Postreclamation Topography and Drainage Map	Figure 6, Postreclamation Topography and Drainage Map
Map 11.16.7, Conceptual Site Plan and Postreclamation Vegetation and Land Use Map	Figure 7, Conceptual Site and Post-reclamation Plan Map

CHAPTER 6.0

TRANSMISSION LINES AND OTHER LINEAR FACILITIES

Rev. 2, 06/18/93

TABLE OF CONTENTS

Section				Page
		VOLUME 3		
6.0	TRANSMISSION LINES AND OTHER LINEAR FACILITIES			6.1.1-1
	6.1	TRANSMISSION LINES		6.1.1-1
		6.1.1	PROJECT INTRODUCTION	6.1.1-1
		6.1.2	CORRIDOR LOCATION AND LAYOUT	6.1.2-1
		6.1.3	TRANSMISSION LINE AND ROAD DESIGN CHARACTERISTICS	6.1.3-1
		6.1.4	COST PROJECTIONS	6.1.4-1
		6.1.5	CORRIDOR SELECTION	6.1.5-1
		6.1.6	SOCIO-POLITICAL ENVIRONMENT OF THE CORRIDOR AREA	6.1.6-1
			6.1.6.1 Governmental Jurisdictions	6.1.6-1
			6.1.6.2 Zoning and Land Use Plans	6.1.6-1
			6.1.6.3 Easements, Titles, and Agency Works	6.1.6-8
			6.1.6.4 Vicinity Scenic, Cultural, and Natural Landmarks	6.1.6-8
			6.1.6.5 Archaeological and Historic Sites	6.1.6-8
		6.1.7	BIOPHYSICAL ENVIRONMENT OF THE CORRIDOR AREA	6.1.7-1
			6.1.7.1 Land Use/Vegetation	6.1.7-1
			6.1.7.2 Affected Waters and Wetlands	6.1.7-9
			6.1.7.3 Ecology	6.1.7-9
			6.1.7.4 Other Environmental Features	6.1.7-11
		6.1.8	EFFECTS OF RIGHT-OF-WAY PREPARATION AND TRANSMISSION LINE CONSTRUCTION	6.1.8-1
			6.1.8.1 Construction Techniques	6.1.8-1
			6.1.8.2 Impacts on Water Bodies and Uses	6.1.8-5
			6.1.8.3 Solid Wastes	6.1.8-5
			6.1.8.4 Changes to Vegetation, Wildlife, and Aquatic Life	6.1.8-5
			6.1.8.5 Impact on Human Populations	6.1.8-9

TABLE OF CONTENTS
(Continued, Page 2 of 2)

Section			Page
	6.1.8.6	Impact on Regional Scenic, Cultural, and Natural Landmarks	6.1.8-9
	6.1.8.7	Impact on Archaeological/Historic Sites	6.1.8-9
6.1.9		POST-CONSTRUCTION IMPACTS AND EFFECTS OF TRANSMISSION LINE MAINTENANCE	6.1.9-1
	6.1.9.1	Maintenance Techniques	6.1.9-1
	6.1.9.2	Multiple Uses	6.1.9-1
	6.1.9.3	Changes in Species Populations	6.1.9-2
	6.1.9.4	Effects of Public Access	6.1.9-3
6.1.10		ELECTRIC AND MAGNETIC FIELDS AND OTHER POST-CONSTRUCTION EFFECTS	6.1.10-1
	6.1.10.1	Electric and Magnetic Field Values	6.1.10-1
	6.1.10.2	Corona Effects	6.1.10-1
6.2		NATURAL GAS PIPELINE	6.2.0-1
6.3		FUEL OIL PIPELINE	6.3.0-1
6.4		RAILROAD SPUR	6.4.0-1

LIST OF TABLES

Table		Page
6.1.4-1	Cost Projections for the Transmission Lines for the Polk Power Station Project in 1992 Dollars	6.1.4-2
6.1.6-1	Future Land Use Categories and Zoning Districts within 0.5 Mile of the Proposed Transmission Line Corridor	6.1.6-4
6.1.6-2	Easement, Title, and/or Crossing Approval Normally Required for Transmission Line Construction	6.1.6-9
6.1.10-1	Calculated Maximum EMF for the Polk Power Station 230-kV Transmission Lines	6.1.10-2

LIST OF FIGURES

Figure		Page
6.1.1-1	Existing and Proposed Electric Transmission Lines	6.1.1-2
6.1.2-1	Northern Transmission Line Corridor and Adjacent Study Area	6.1.2-2
6.1.3-1	Polk Power Station Transmission Structures	6.1.3-2
6.1.3-2	Conductor Profile for H-Frame Construction	6.1.3-3
6.1.3-3	Conductor Profile for Single Pole Construction	6.1.3-4
6.1.6-1	Future Land Use Categories Within 0.5 Mile of the Proposed Northern Transmission Line Corridor	6.1.6-3
6.1.6-2	Zoning Districts Within 0.5 Mile of the Proposed Northern Transmission Line Corridor	6.1.6-6
6.1.7-1	Land Use and Land Cover Within 0.5 Mile Radius of the Proposed Transmission Line Corridor	6.1.7-2
6.1.8-1	Polk Power Station Typical Access Road Plan and Cross-Section for Associated Transmission Lines	6.1.8-2
6.1.10-1	Lateral (Mid-Span) Profile of Electric Field at Maximum Operating Voltage--Northern Corridor, Scenario 1	6.1.10-3
6.1.10-2	Lateral (Mid-Span) Profile of Magnetic Field at Maximum Current Rating--Northern Corridor, Scenario 1	6.1.10-4
6.1.10-3	Lateral (Mid-Span) Profile of Electric Field at Maximum Operating Voltage--Northern Corridor, Scenario 2A	6.1.10-5
6.1.10-4	Lateral (Mid-Span) Profile of Magnetic Field at Maximum Current Rating--Northern Corridor, Scenario 2A	6.1.10-6
6.1.10-5	Lateral (Mid-Span) Profile of Electric Field at Maximum Operating Voltage--Northern Corridor, Scenario 2B	6.1.10-7
6.1.10-6	Lateral (Mid-Span) Profile of Magnetic Field at Maximum Current Rating--Northern Corridor, Scenario 2B	6.1.10-8
6.1.10-7	Lateral (Mid-Span) Profile of Electric Field at Maximum Operating Voltage--Northern Corridor, Scenario 3	6.1.10-9

LIST OF FIGURES
(Continued, Page 2 of 2)

Figure		Page
6.1.10-8	Lateral (Mid-Span) Profile of Magnetic Field at Maximum Current Rating--Northern Corridor, Scenario 3	6.1.10-10
6.1.10-9	Lateral (Mid-Span) Profile of Electric Field at Maximum Operating Voltage--Eastern Corridor, Scenario 1	6.1.10-11
6.1.10-10	Lateral (Mid-Span) Profile of Magnetic Field at Maximum Current Rating--Eastern Corridor, Scenario 1	6.1.10-12
6.1.10-11	Lateral (Mid-Span) Profile of Electric Field at Maximum Operating Voltage--Eastern Corridor, Scenario 2	6.1.10-13
6.1.10-12	Lateral (Mid-Span) Profile of Magnetic Field at Maximum Current Rating--Eastern Corridor, Scenario 2	6.1.10-14
6.1.10-13	Lateral (Mid-Span) Profile of Electric Field at Maximum Operating Voltage--Eastern Corridor, Scenario 3	6.1.10-15
6.1.10-14	Lateral (Mid-Span) Profile of Magnetic Field at Maximum Current Rating--Eastern Corridor, Scenario 3	6.1.10-16

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.

CHAPTER 7.0

ECONOMIC AND SOCIAL EFFECTS OF PLANT CONSTRUCTION AND OPERATION

Rev. 2, 06/18/93

TABLE OF CONTENTS

Section				Page
7.0	ECONOMIC AND SOCIAL EFFECTS OF PLANT CONSTRUCTION AND OPERATION			7.1.1-1
	7.1	SOCIO-ECONOMIC BENEFITS		7.1.1-1
		7.1.1	TAX REVENUES	7.1.1-1
		7.1.2	EMPLOYMENT	7.1.2-1
			7.1.2.1 Construction Workforce	7.1.2-1
			7.1.2.2 Operational Workforce	7.1.2-3
		7.1.3	BY-PRODUCT SALES	7.1.3-1
		7.1.4	ENHANCEMENT OF RECREATIONAL OR ENVIRONMENTAL VALUES	7.1.4-1
		7.1.5	CREATION OR IMPROVEMENT OF LOCAL TRANSPORTATION FACILITIES	7.1.5-1
	7.2	SOCIO-ECONOMIC COSTS		7.2.1-1
		7.2.1	TEMPORARY EXTERNAL COSTS	7.2.1-1
		7.2.2	LONG-TERM EXTERNAL COSTS	7.2.2-1
			7.2.2.1 Aesthetics	7.2.2-1
			7.2.2.2 Land Use	7.2.2-2
			7.2.2.3 Public Services	7.2.2-2

LIST OF TABLES

Table		Page
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	7.1.1-2
7.1.2-1	Annual Construction Workforce Payroll to Build-Out in 2010	7.1.2-2
7.1.2-2	Annual Operational Workforce Payroll to Build-Out in 2010	7.1.2-4

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~~ is produced in the syngas sulfur removal processes, and ~~have~~ has 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~~ 100 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~~ $5.8 million in revenues. Slag sales are estimated to generate approximately $200,000 in annual revenues.

CHAPTER 8.0

SITE AND PLANT DESIGN ALTERNATIVES

Rev. 2, 06/18/93

TABLE OF CONTENTS

Section				Page
8.0	SITE AND PLANT DESIGN ALTERNATIVES			8.0.0-1
	8.1	ALTERNATIVE SITES		8.0.0-3
		8.1.1	INTRODUCTION	8.1.1-1
		8.1.2	OVERALL PROGRAM APPROACH	8.1.2-1
		8.1.3	PHASE I--REGIONAL SCREENING	8.1.3-1
		8.1.4	PHASE II--INTERMEDIATE SCREENING	8.1.4-1
		8.1.4.1	Environmental Evaluations	8.1.4-1
		8.1.4.2	Engineering/Economic Evaluations	8.1.4-20
		8.1.4.3	Composite Results of Intermediate Screening	8.1.4-22
		8.1.4.4	Selection of Candidate Study Areas	8.1.4-23
		8.1.5	PHASE III--DETAILED ANALYSES	8.1.5-1
		8.1.5.1	Environmental Analyses of Candidate Study Areas	8.1.5-1
		8.1.5.2	Engineering/Economic Evaluation of Candidate Study Areas	8.1.5-8
		8.1.5.3	Composite Environmental and Economic Ratings	8.1.5-10
		8.1.5.4	Prime Siting Area Selection	8.1.5-10
		8.1.5.5	Site-Specific Environmental Evaluations of Prime Siting Areas	8.1.5-15
		8.1.5.6	Engineering/Economic Evaluation of Prime Siting Areas	8.1.5-23
		8.1.5.7	Future Scenario Analyses	8.1.5-26
		8.1.5.8	Selection of Preferred Site and Alternative Sites	8.1.5-28
		8.1.6	PROPOSED AND ALTERNATIVE SITES	8.1.6-1
		8.1.6.1	Proposed Polk Power Station Site	8.1.6-1
		8.1.6.2	Alternative Sites	8.1.6-2
	8.2	ALTERNATIVE MEANS OF SATISFYING THE NEED FOR THE PROJECT		8.2.0-1
		8.2.1	NEED FOR ADDITIONAL POWER SUPPLY	8.2.1-1
		8.2.2	ALTERNATIVES TO CONSTRUCTING NEW GENERATING FACILITIES	8.2.2-1

TABLE OF CONTENTS
(Continued, Page 2 of 3)

Section			Page
	8.2.3	ALTERNATIVE GENERATION TECHNOLOGIES	8.2.3-1
		8.2.3.1 Proposed Project Technologies	8.2.3-11
		8.2.3.2 Potential Alternative Technologies	8.2.3-12
8.3	PROPOSED SITE DESIGN ALTERNATIVES		8.3.1-1
	8.3.1	SITE LAYOUT ALTERNATIVES	8.3.1-1
		8.3.1.1 Proposed Site Layout	8.3.1-1
		8.3.1.2 Alternative Site Layout	8.3.1-2
	8.3.2	FUEL HANDLING AND STORAGE ALTERNATIVES	8.3.2-1
	8.3.3	COOLING SYSTEM ALTERNATIVES	8.3.3-1
		8.3.3.1 Proposed Cooling Reservoir System	8.3.3-1
		8.3.3.2 Alternative Cooling Tower System	8.3.3-3
	8.3.4	BIOLOGICAL FOULING CONTROL ALTERNATIVES	8.3.4-1
		8.3.4.1 Proposed Biofouling Control Method	8.3.4-1
		8.3.4.2 Potential Alternative Biofouling Control Methods	8.3.4-2
	8.3.5	COOLING WATER MAKEUP/PROCESS WATER SOURCE ALTERNATIVES	8.3.5-1
		8.3.5.1 Proposed Water Sources	8.3.5-1
		8.3.5.2 Potential Alternative Water Sources	8.3.5-2
	8.3.6	COOLING RESERVOIR WATER DISCHARGE ALTERNATIVES	8.3.6-1
		8.3.6.1 Proposed Discharge System	8.3.6-1
		8.3.6.2 Potential Alternative Discharge Systems	8.3.6-1

TABLE OF CONTENTS
(Continued, Page 3 of 3)

Section			Page
8.3.7	WASTEWATER CONTROL AND TREATMENT ALTERNATIVES		8.3.7-1
	8.3.7.1	Sanitary Wastewater System Alternatives	8.3.7-1
	8.3.7.2	Process Wastewater Treatment Alternatives	8.3.7-1
	8.3.7.3	Coal Gasification Process Water Handling Alternatives	8.3.7-4
	8.3.7.4	Chemical Cleaning Wastewater Disposal Alternatives	8.3.7-4
8.3.8	BY-PRODUCT DISPOSAL ALTERNATIVES		8.3.8-1
8.3.9	ASSOCIATED FACILITIES CORRIDOR ALTERNATIVES		8.3.9-1
	8.3.9.1	Transmission Lines	8.3.9-1
	8.3.9.2	Natural Gas Pipeline	8.3.9-2
	8.3.9.3	Fuel Oil Pipeline	8.3.9-3
	8.3.9.4	Railroad Spur	8.3.9-3
8.4	NO-ACTION ALTERNATIVE		8.4.0-1

LIST OF TABLES

Table		Page
8.1.3-1	Favorability Specifications for Regional Screening Criteria	8.1.3-2
8.1.4-1	Phase II--Intermediate Screening Criteria and Internal Weighting Factors	8.1.4-17
8.1.4-2	Summary of Phase II Environmental Ratings and Rankings for the CC and Baseload Development Option	8.1.4-19
8.1.4-3	Present Worth Cost Estimates for Preliminary Study Areas for the CC and Baseload Development Option	8.1.4-21
8.1.4-4	Indexed Composite Rating Results for the CC and Baseload Development Option	8.1.4-26
8.1.5-1	Phase III Environmental Ratings Results for the Candidate Study Areas for the CC and Baseload Development Option	8.1.5-9
8.1.5-2	Present Worth Cost Estimates for the Candidate Study Areas for the CC and Baseload Development Option	8.1.5-11
8.1.5-3	Phase III Indexed Composite Evaluation Results for the CC and Baseload Development Option	8.1.5-14
8.1.5-4	Summary of Air Issues	8.1.5-17
8.1.5-5	Summary of Ecological Issues: PLK Sites	8.1.5-18
8.1.5-6	Summary of Ecological Issues: HIL-7 Site	8.1.5-19
8.1.5-7	Summary of Water Issues: PLK Sites	8.1.5-20
8.1.5-8	Summary of Water Issues: HIL-7 Site	8.1.5-21
8.1.5-9	Summary of Land Use/Socioeconomic Issues	8.1.5-22
8.1.5-10	Present Worth Estimates for Prime Siting Areas Using Cooling Towers	8.1.5-24
8.1.5-11	Present Worth Cost Estimates for Prime Siting Areas Using Cooling Reservoirs Where Possible	8.1.5-25
8.1.5-12	Summary of the Future Scenario Analyses	8.1.5-27
8.2.3-1	Alternative Technology Preliminary Screening Analysis	8.2.3-2
8.2.3-2	Comparison of Key Facility and Environmental Requirements for Nominal 400-MW IGCC and PC Power Plants	8.2.3-17

LIST OF FIGURES

Figure		Page
8.1.2-1	Tampa Electric Company Service Area and Existing Generating Facility Locations and Site Selection Study Area	8.1.2-2
8.1.2-2	Generalized Work Flow Diagram from Tampa Electric Company Site Selection Assessment Program	8.1.2-4
8.1.3-1	Regional Screening Results: Composite Map	8.1.3-4
8.1.3-2	General Location of Preliminary Study Areas	8.1.3-6
8.1.4-1	Phase II Frontier Mapping Results for the Combined Cycle and Baseload Development Option	8.1.4-24
8.1.4-2	Phase II Frontier Mapping Results for the Combined Cycle and Baseload Development Option, Excluding HIL-7 Study Area	8.1.4-24
8.1.4-3	General Locations of Candidate Study Areas	8.1.4-28
8.1.5-1	Phase III Frontier Mapping Results for the Combined Cycle and Baseload Development Option	8.1.5-12
8.1.5-2	Phase III Frontier Mapping Results for the Combined Cycle and Baseload Development Option, Excluding HIL-7 Study Area	8.1.5-13
8.1.5-3	General Location of Prime Siting Areas	8.1.5-16
8.1.5-4	Polk Power Station Site (PLK-A) and Alternative Sites (PLK-1 and PLK-2)	8.1.5-30
8.2.3-1	Economic Screening Curves--Baseload Units	8.2.3-7
8.2.3-2	Economic Screening Curves--Intermediate Units	8.2.3-8
8.2.3-3	Economic Screening Curves--Peaking Units	8.2.3-9

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~~ EPA will be the lead federal agency for preparation of the EIS while ~~EPA~~ DOE 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.

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 SO_2 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~~ H_2SO_4) 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~~ H_2SO_4 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

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 SO_2 emissions relative to the ~~elemental sulfur recovery and~~ H_2SO_4 recovery 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~~ H_2SO_4 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.

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.

CHAPTER 9.0

POLK POWER STATION SITE RECLAMATION REQUIREMENTS

Rev. 2, 06/18/93

TABLE OF CONTENTS

Section				Page
9.0	POLK POWER STATION SITE RECLAMATION REQUIREMENTS			9.0.0-1
	9.1	BACKGROUND OF SITE RECLAMATION REQUIREMENTS AND PLANS		9.1.1-1
		9.1.1	RECLAMATION STATUS OF THE SITE	9.1.1-1
		9.1.1.1	American Cyanamid Old Lands (Parcel A)	9.1.1-1
		9.1.1.2	American Cyanamid Old Lands (Parcel B)	9.1.1-1
		9.1.1.3	American Cyanamid/IMC Fertilizer Land (Parcel C)	9.1.1-3
		9.1.1.4	Agrico--Plant Site (Parcel D)	9.1.1-4
		9.1.1.5	Agrico Land--Cooling Pond (Parcel E)	9.1.1-5
		9.1.1.6	Agrico Land--Eagle's Nest (Parcel F)	9.1.1-5
		9.1.1.7	Agrico Land--Reclaimed Lake (Parcel G)	9.1.1-6
		9.1.1.8	Agrico Land--Southwest Buffer Area (Parcel H)	9.1.1-6
		9.1.1.9	Agrico Land (Parcel I)	9.1.1-7
		9.1.2	PROCEDURES TO AMEND APPROVED RECLAMATION PLANS AND PROGRAMS	9.1.2-1
		9.1.3	TAMPA ELECTRIC COMPANY RECLAMATION PLANS	9.1.3-1
		9.1.4	APPLICABLE FDNR RECLAMATION RULES	9.1.4-1
	9.2	RELATIONSHIP OF PROPOSED PLANT AND ASSOCIATED FACILITIES TO RECLAMATION PLANS		9.2.1-1
		9.2.1	PLANT AND ASSOCIATED FACILITIES LOCATIONS	9.2.1-1
		9.2.2	WETLANDS	9.2.2-1
		9.2.3	WILDLIFE AND ENDANGERED SPECIES	9.2.3-1
	9.3	RELEASE PROCEDURES		9.3.0-1
	9.4	FINANCIAL RESPONSIBILITY		9.4.0-1
	9.5	VARIANCES AND AMENDMENTS		9.5.0-1

LIST OF TABLES

Table		Page
9.1.2-1	Acreages of Reclamation Program After Approval of Applications Related to Polk Power Station Site	9.1.2-3
9.1.4-1	Pre-Mining and Post-Reclamation Land Use and Vegetation Map Acreage Tabulations	9.1.4-3

LIST OF FIGURES

Figure		Page
9.1.1-1	Reclamation Status Parcels on Polk Power Station Site	9.1.1-2

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~~ approximately 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.

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~~ 1,110 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.

9.5 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~~ this standards and supporting information for this request is provided in the Conceptual Reclamation Plan Application submitted to FDNR as a separate document.

APPENDIX 11.1.1

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT APPLICATIONS

Rev. 2, 06/18/93

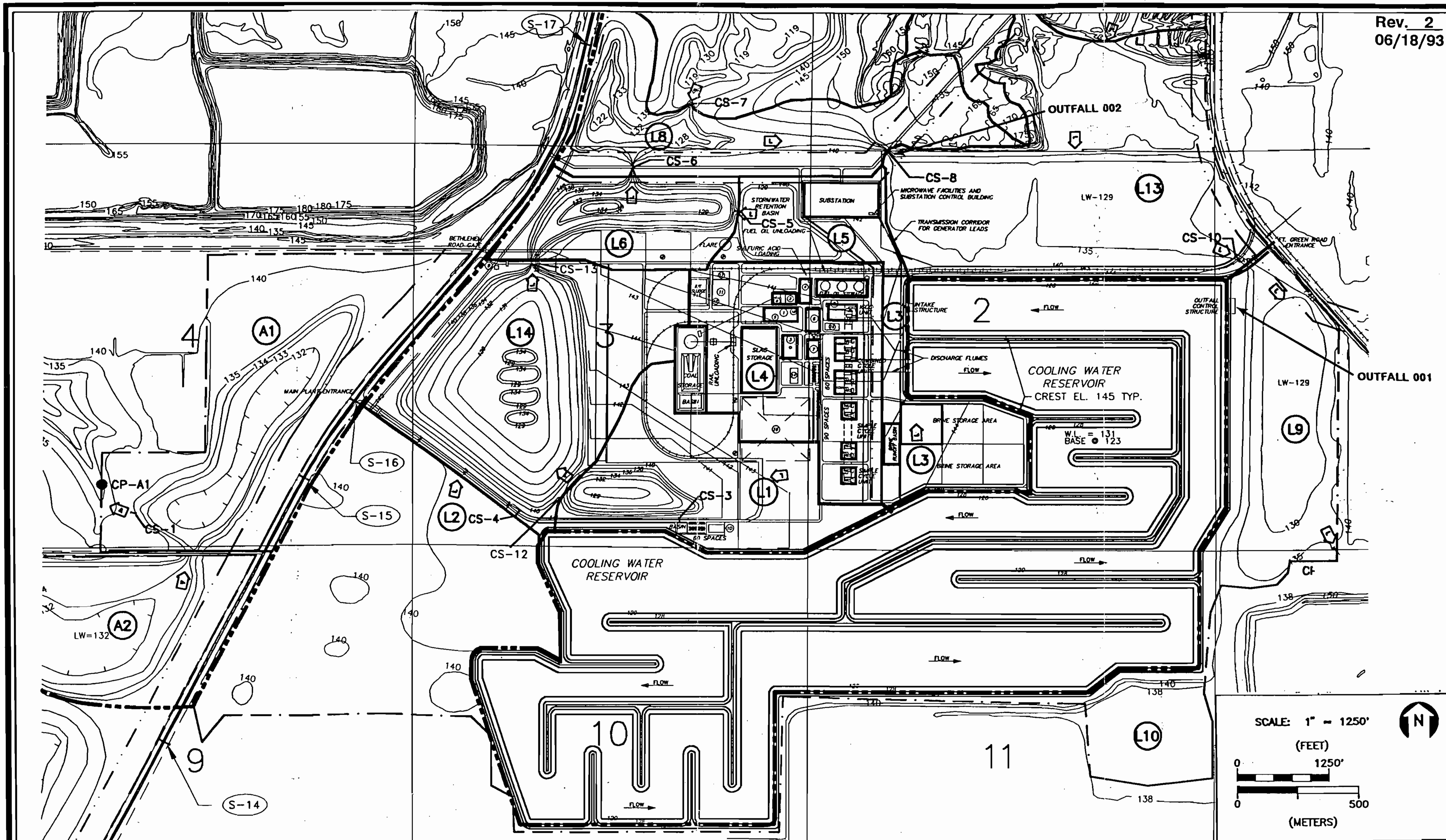

FIGURE 2.

SITE DRAINAGE PLAN AND OUTFALLS 001 AND 002

Source: ECT, 1993.

TAMPA ELECTRIC
A TECO ENERGY COMPANY

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~~ Approximately 94 percent (i.e., approximately ~~3,970~~ 4,070 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.

Table 1. Estimated Cooling Reservoir Discharge (Outfall 001) Effluent Water Quality

Parameter	Average Daily Concentration	Average Daily Mass (lb/day)	Source
Biochemical oxygen demand	0.7 mg/L	18.1	See note
Total organic carbon	34.2 mg/L	884	
Total suspended solids	11 mg/L	284	
Flow	3.1 MGD	--	
Ammonia nitrogen	~~0.019~~ 0.0 mg/L	~~0.5~~ 0.0	
Temperature, winter	65 °C	--	
Temperature, summer	87 °C	--	
pH, units	7.8	--	
Aluminum	0.033 mg/L	0.9	
Antimony	0.007 mg/L	0.2	
Arsenic	0.001 mg/L	0.03	
Barium	0.165 mg/L	4.3	
Beryllium	0.00009 mg/L	0.002	
Cadmium	0.00017 mg/L	0.004	
Chloride	31.0 mg/L	802	
Chlorine	0.0007 mg/L	0.02	
Chromium	0.00003 mg/L	0.0008	
Color, platinum-cobalt units	53	--	
Copper	0.002 mg/L	0.05	
Cyanide	0.000003 mg/L	0.00008	
Fecal coliform	0.3 MPN/100 mL	78 (MPN/day)	
Fluoride	0.82 mg/L	21.2	
Iron	0.63 mg/L	16.3	
Lead	0.001 mg/L	0.03	
Magnesium	24.2 mg/L	626	
Manganese	0.004 mg/L	0.1	
Mercury	0.000007 mg/L	0.0002	
Nickel	0.01 mg/L	0.3	
Nitrate	~~1.41~~ 1.67 mg/L	~~36.5~~ 43.2	
Oil and grease	0.56 mg/L	14.5	
Phosph~~ate~~orous	1.55 mg/L	40.1	
Radioactivity, Radium 226	2.5 pCi/L	--	
Selenium	0.00004 mg/L	0.001	
Sulfate	120 mg/L	3,103	
Sulfide	0.87 mg/L	22.5	
Surfactants	0.2 mg/L	5.2	
Zinc	0.027 mg/L	0.7	

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.

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~~ Approximately 94 percent (i.e., approximately ~~3,970~~ 4,070 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.

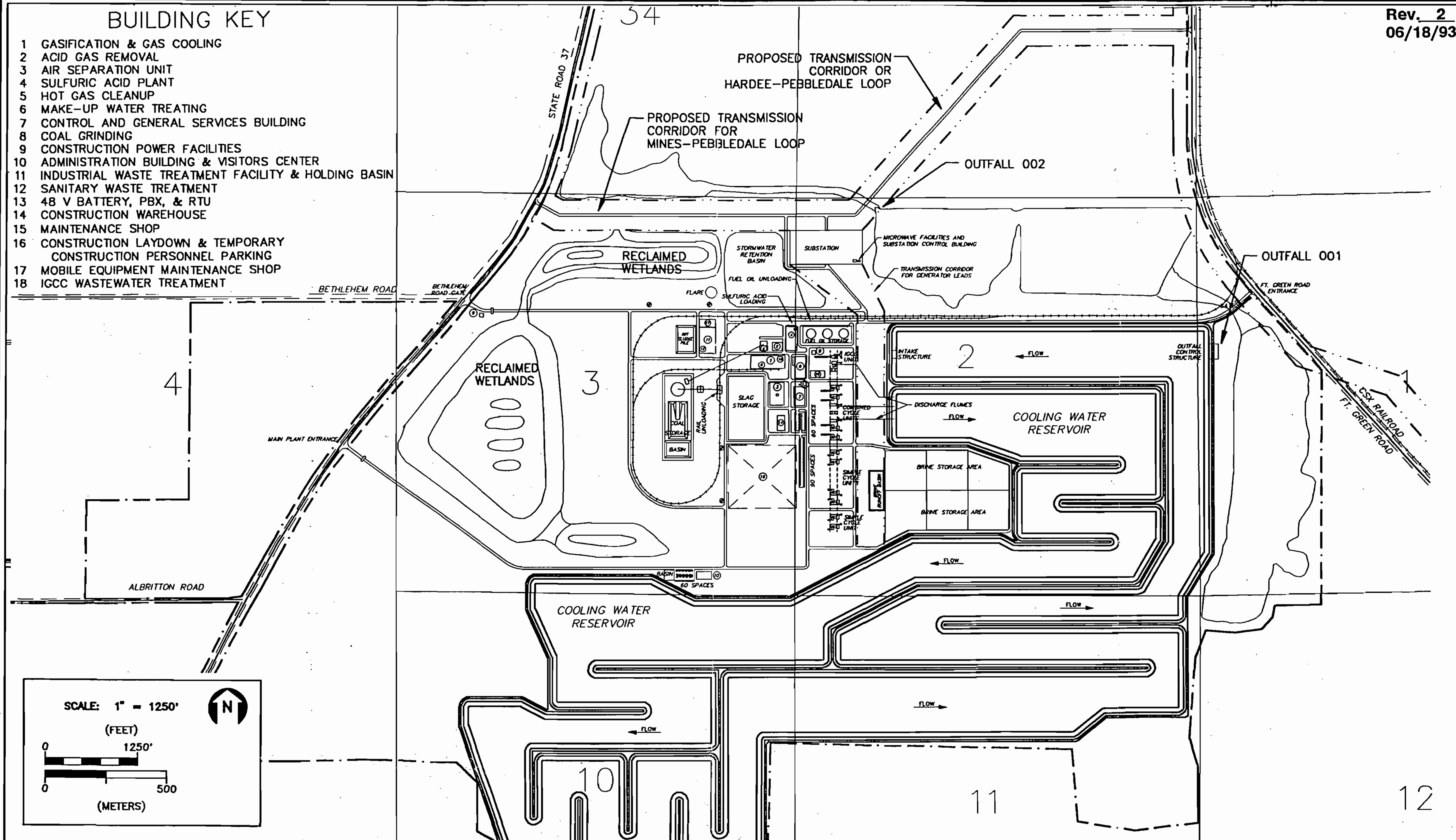

FIGURE 1.

POLK POWER STATION FACILITY SITE PLAN

Source: ECT, 1993.

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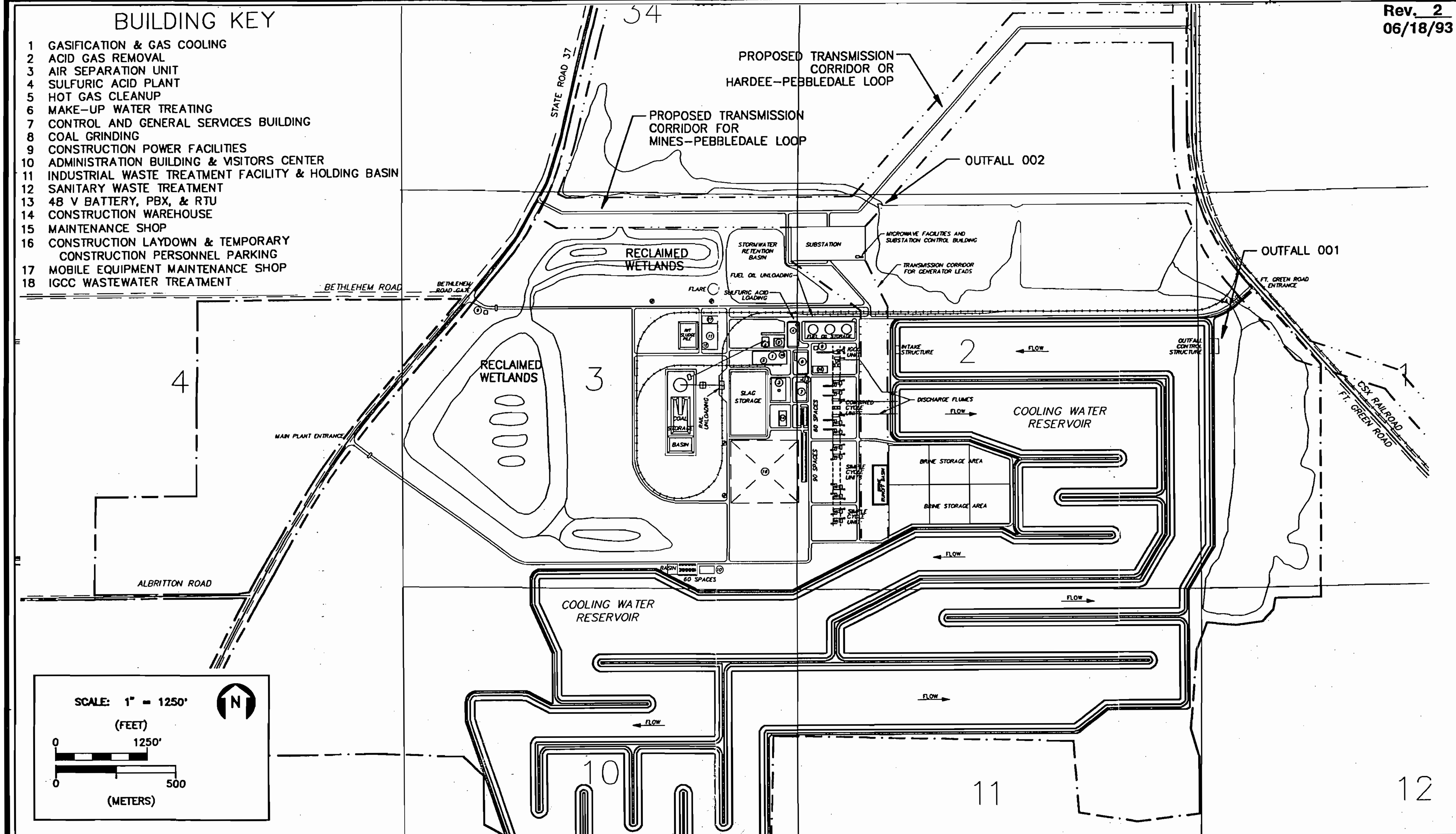

FIGURE 1.

POLK POWER STATION FACILITY SITE PLAN

Source: ECT, 1993.

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- 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~~ H_2SO_4, 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.

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 Figure 2 for a plant layout).

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.

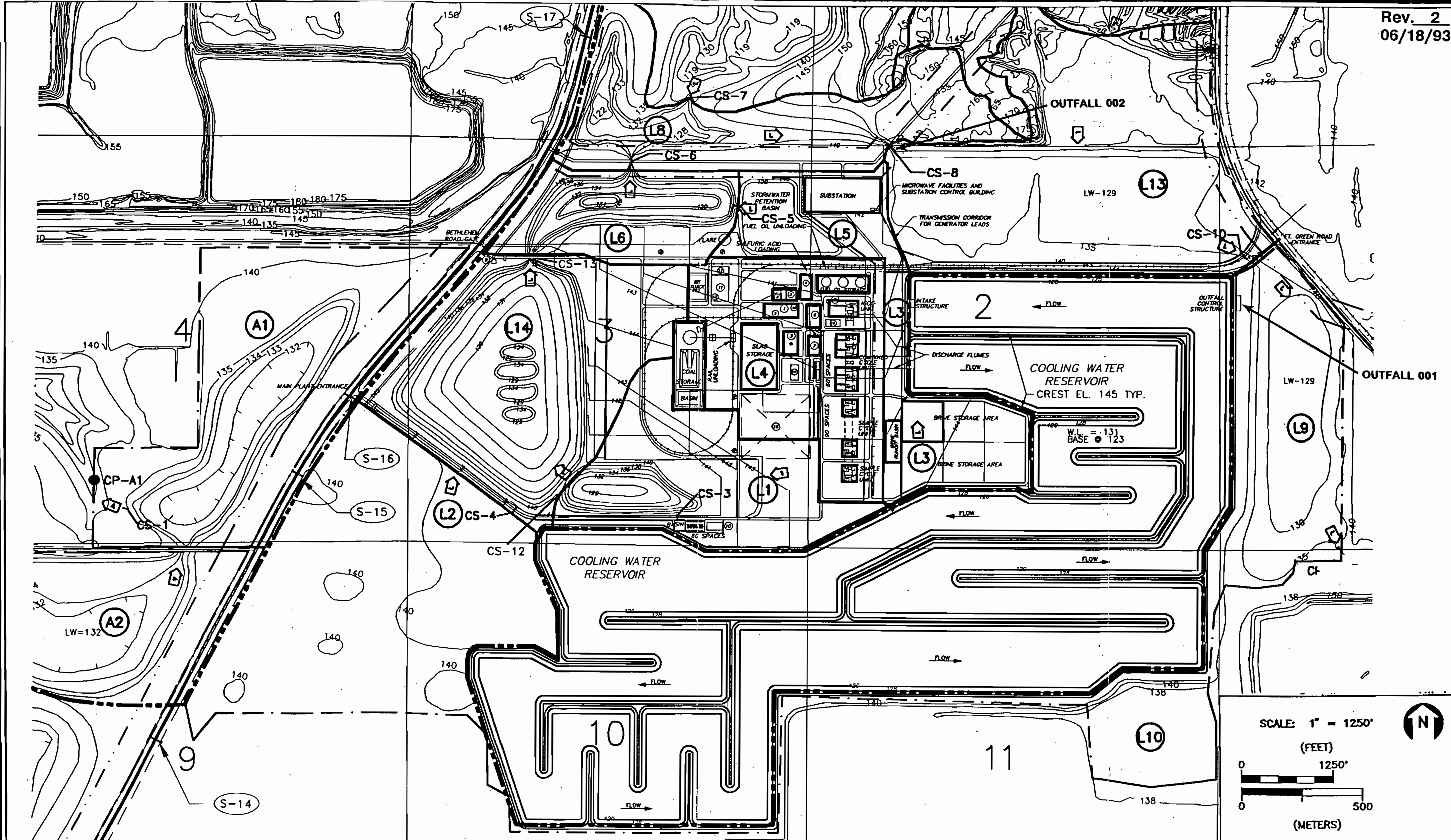

FIGURE 2.

SITE DRAINAGE PLAN AND OUTFALLS 001 AND 002

Sources: Bechtel, 1993. ECT, 1993.

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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~~ 835-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 coal gasification process area and sulfur storage area will be collected and routed to the industrial wastewater treatment (IWT) plant.

Runoff associated with industrial activity from combustion turbine/combined cycle 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.

APPENDIX 11.1.2

JOINT APPLICATION FOR WORKS IN THE WATERS OF FLORIDA

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FIGURE 3.
AERIAL PHOTOGRAPHY WITH USACE WETLAND DELINEATIONS (PAGE 6 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 7 OF 13)
DREDGE AND FILL PERMIT APPLICATION
Sources: I.F. Rooks & Assoc. Inc.; ECT, 1992.

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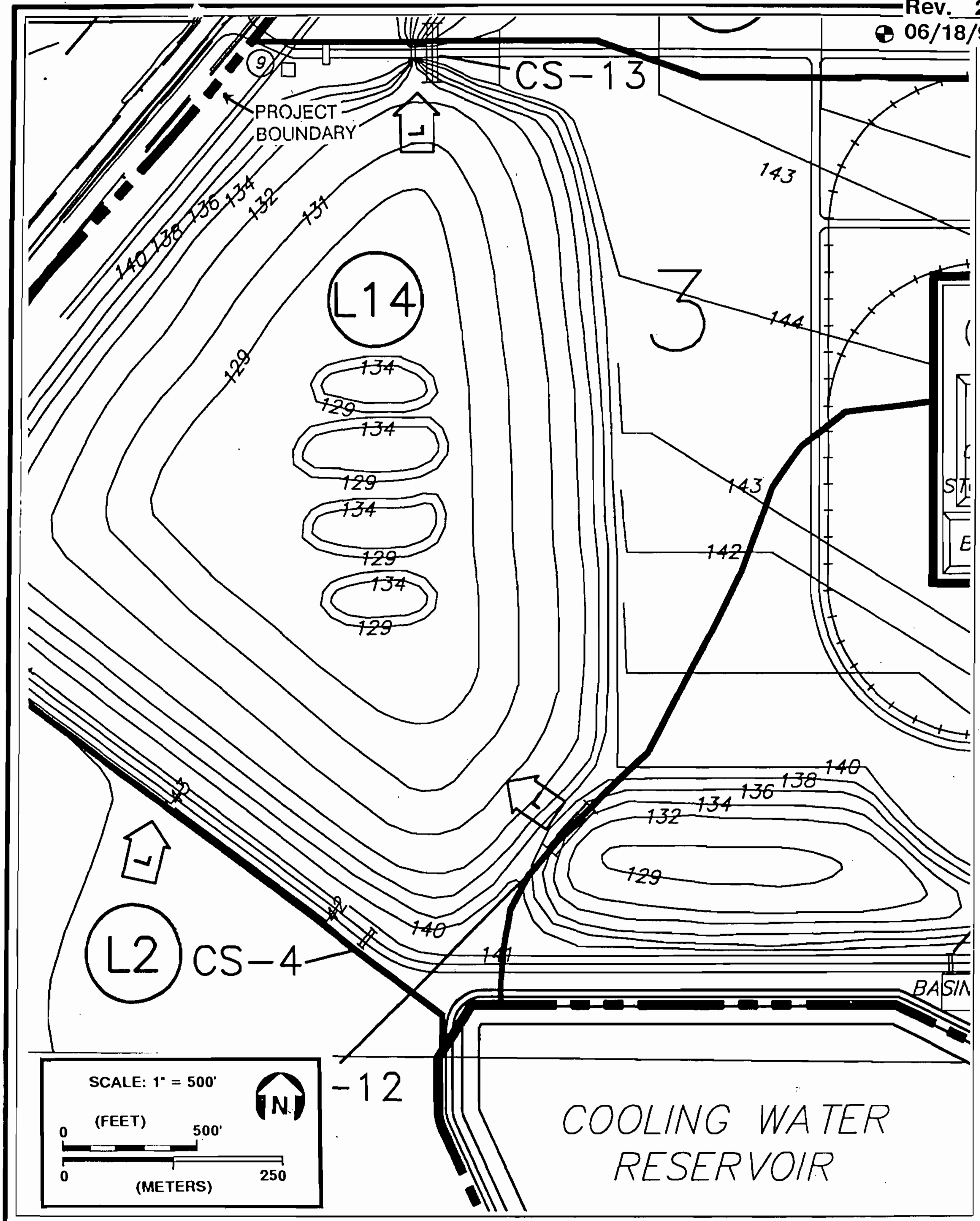

FIGURE 4.
POST-RECLAMATION TOPOGRAPHY (PAGE 6 OF 13)
DREDGE AND FILL PERMIT APPLICATION

Source: ECT, 1992.

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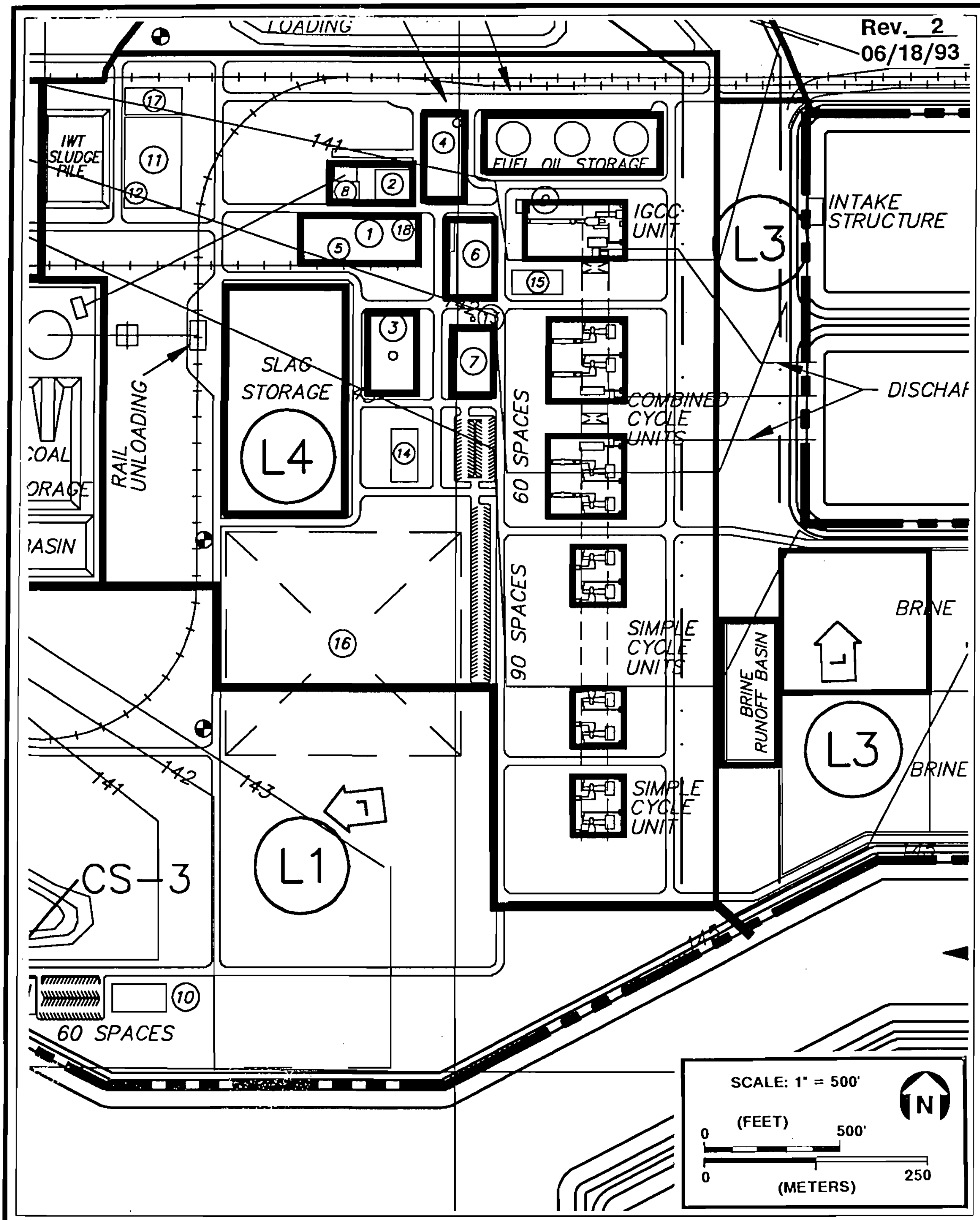

FIGURE 4.
POST-RECLAMATION TOPOGRAPHY (PAGE 7 OF 13)
DREDGE AND FILL PERMIT APPLICATION

Source: ECT, 1992.

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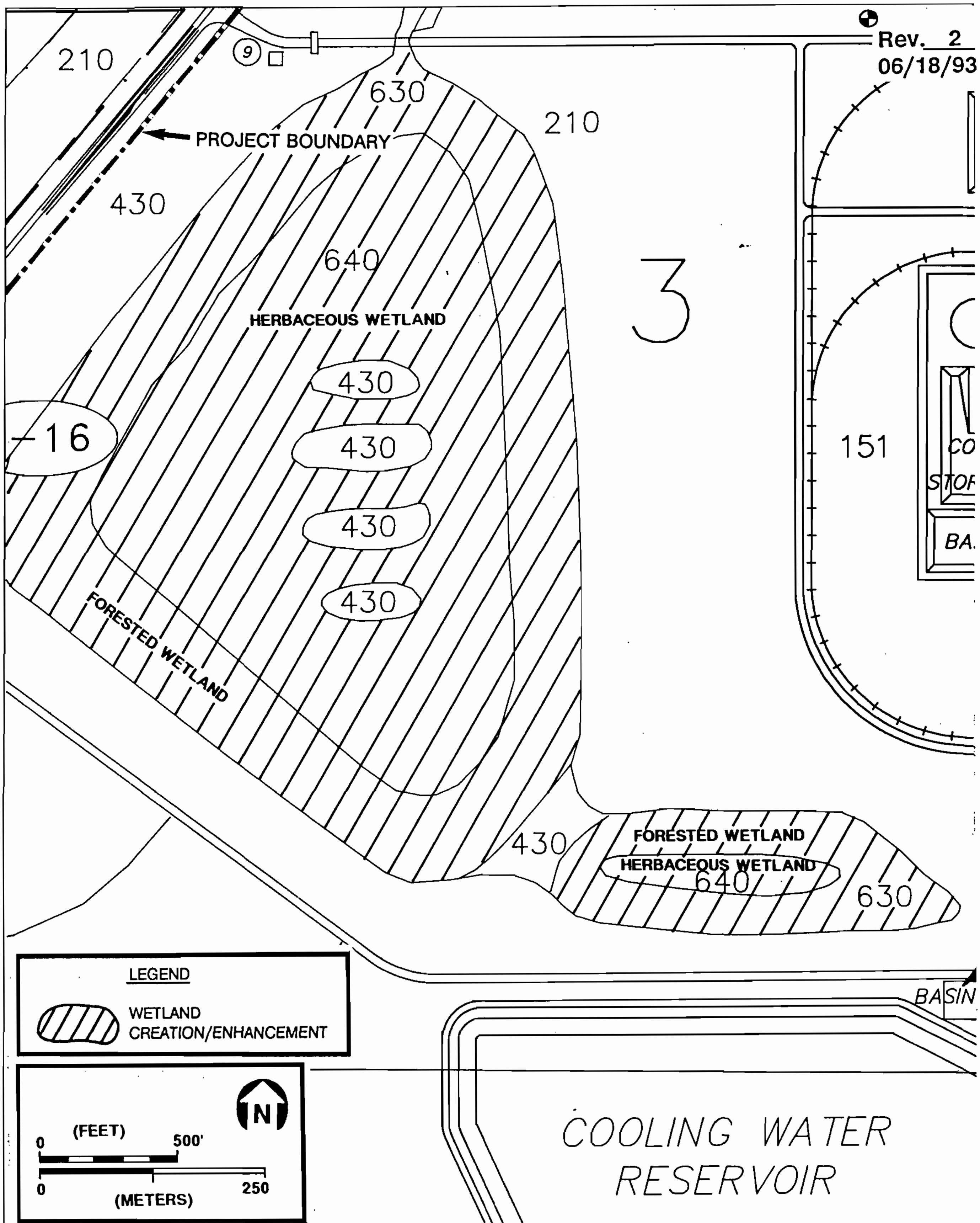

FIGURE 5. (PAGE 6 OF 13)
POST-RECLAMATION LAND USE WITH WETLAND CREATION/ENHANCEMENT AREAS DEPICTED DREDGE AND FILL PERMIT APPLICATION
Source: ECT, 1992.

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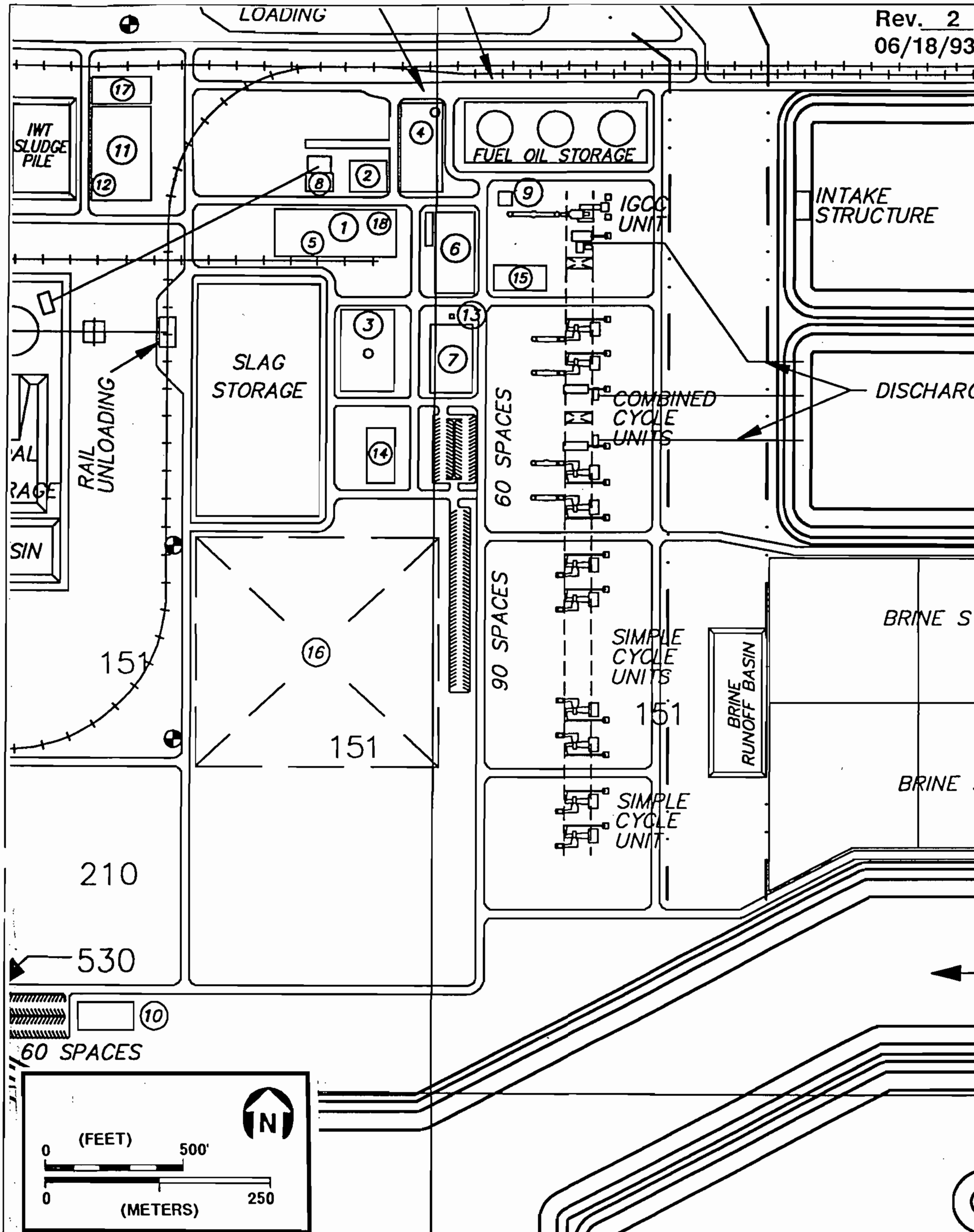

FIGURE 5. (PAGE 7 OF 13)
POST-RECLAMATION LAND USE WITH WETLAND CREATION/ENHANCEMENT AREAS DEPICTED
DREDGE AND FILL PERMIT APPLICATION
Source: ECT, 1992.

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APPENDIX 11.7.6

COOLING RESERVOIR--SURFICIAL AQUIFER MODEL

Rev. 2, 06/18/93

LIST OF FIGURES

Figure		Page
1	Model Area	7
2	Location of Soil Profile	9
3	Soil Profile A-A'	10
4	Groundwater Flow Model Grid	14
5	Illustration of Mining Related Features	16
6	Modeled Hydraulic Conductivity Distribution	19
7	Modeled Saturated Thickness Distribution	20
8	January - Groundwater Levels [Water Balance Simulation]	26
9	February - Groundwater Levels [Water Balance Simulation]	27
10	March - Groundwater Levels [Water Balance Simulation]	28
11	April - Groundwater Levels [Water Balance Simulation]	29
12	May - Groundwater Levels [Water Balance Simulation]	30
13	June - Groundwater Levels [Water Balance Simulation]	31
14	July - Groundwater Levels [Water Balance Simulation]	32
15	August - Groundwater Levels [Water Balance Simulation]	33
16	September - Groundwater Levels [Water Balance Simulation]	34
17	October - Groundwater Levels [Water Balance Simulation]	35
18	November - Groundwater Levels [Water Balance Simulation]	36
19	December - Groundwater Levels [Water Balance Simulation]	37
20	~~Dewatering Units of Modeling Grid [Dewatering Simulation]~~ Subareas for Cooling Water Reservoir and Wetland Areas	40
21	~~February 28, 1994 - Drawdown Levels [Dewatering Simulation]~~ February 28, 1995 - Groundwater Levels [Dewatering Simulation]	41
22	~~March 31, 1994 - Groundwater Levels [Dewatering Simulation]~~ February 28, 1995 - Drawdown Levels [Dewatering Simulation]	42

LIST OF FIGURES
(Continued, Page 2 of 2)

Figure		Page
~~23~~	~~March 31, 1994 - Drawdown Values [Dewatering Simulation]~~	~~43~~
~~24~~	~~July 31, 1994 - Groundwater Levels [Dewatering Simulation]~~	~~44~~
~~25~~	~~July 31, 1994 - Drawdown Values [Dewatering Simulation]~~	~~45~~
~~26~~	~~August 15, 1994 - Groundwater Levels [Dewatering Simulation]~~	~~46~~
~~27~~	~~August 15, 1994 - Drawdown Values [Dewatering Simulation]~~	~~47~~
~~28~~	~~September 15, 1994 - Groundwater Levels [Dewatering Simulation]~~	~~48~~
~~29~~	~~September 15, 1994 - Drawdown Values [Dewatering Simulation]~~	~~49~~
~~30~~	~~September 30, 1994 - Groundwater Levels [Dewatering Simulation]~~	~~50~~
~~31~~	~~September 30, 1994 - Drawdown Values [Dewatering Simulation]~~	~~51~~
~~32~~	~~October 31, 1994 - Groundwater Levels [Dewatering Simulation]~~	~~52~~
~~33~~	~~October 31, 1994 - Drawdown Values [Dewatering Simulation]~~	~~53~~
~~34~~	~~February 28, 1995 - Groundwater Levels [Dewatering Simulation]~~	~~54~~
~~35~~	~~February 28, 1995 - Drawdown Values [Dewatering Simulation]~~	~~55~~
~~36~~	~~March 31, 1995 - Groundwater Levels [Dewatering Simulation]~~	~~56~~
~~37~~	~~June 30, 1995 - Groundwater Levels [Dewatering Simulation]~~	~~57~~
~~38~~	~~September 30, 1995 - Groundwater Levels [Dewatering Simulation]~~	~~58~~
~~39~~	~~December 31, 1995 - Groundwater Levels [Dewatering Simulation]~~	~~59~~
~~40~~	~~March 31, 1996 - Groundwater Levels [Dewatering Simulation]~~	~~60~~

A second application of the groundwater flow model was to assess the drawdown impacts and assist in determining potential pumpage rates associated with the dewatering and construction of the cooling water reservoir. The bottom of the cooling reservoir was designed to be at a depth of approximately 120 ft-NGVD. Therefore, the dewatering must lower the water levels to a range between 119 and 120 ft-NGVD. The well package was used to assign a well to each cell of the cooling reservoir. The pumpage rate from the wells was increased until the groundwater elevation was between the desired elevation of 119 and 120 ft-NGVD for each cell. It has been determined that a dewatering depth of 129 ft-NGVD will be sufficient for construction of the reclaimed wetland areas (Subareas B and C in Figure 20). These changes in dewatering elevations have been incorporated into the surficial aquifer groundwater model. To minimize potential drawdown impacts from the dewatering activities, the water withdrawn during dewatering was applied to other adjacent areas of the mine cuts or reservoir. ~~The time schedule for the dewatering and application activities, and a summary of the modeled pumping rates are provided in Table 2. The locations of the dewatering units referenced in Table 2 are provided on Figure 20. Figures 21 through 35 illustrate the groundwater elevations and resulting drawdowns for the seven various stages of the dewatering activities. The drawdown values were determined with respect to the starting water level conditions on March 1, 1994. Figures 36 through 40 illustrate the water levels for approximately 1 year after ceasing dewatering activities.~~ The dewatering depths and the timing of the dewatering stages were adjusted to reflect the revised depths and schedule. Table 2 provides the currently planned dewatering schedule and anticipated pumpage rates for the revised model application. Based on the revised dewatering simulation, the drawdowns in the northwest area will be reduced from approximately 8 to 10 ft in the original simulation to approximately 2 to 4 ft. Offsite drawdown impacts were predicted at their greatest extent at the end of the dewatering simulation (i.e., February 1995). The resulting simulated water table surface drawdowns in February 1995 are illustrated in Figures 21 and 22. It should be noted that the withdrawals associated with the dewatering are considered short term, and the entire dewatering effort will not last longer than approximately 1 year in time. Also, these dewatering activities and resulting impacts are not significantly different than those associated with the phosphate mining in this region.

Table 2. Proposed Dewatering Schedule and Plan Summary

Dewatering Units	Start Date	Finish Date	Duration	Withdrawn Water Application Location	Dewatering Withdrawal Average (gpd)	Dewatering Withdrawal Average (gpm)
A1	03/01/94	04/01/94	31	A2 & D	87,478,000	60,749
B	03/01/94	04/01/94	31	C	6,364,000	4,419
Subtotal			31		93,842,000	65,168
A1	04/01/94	05/31/94	60	A2 & D	32,149,000	22,326
B	04/01/94	05/31/94	60	C	42,223,000	29,322
Subtotal			60		74,372,000	51,647
A1	05/31/94	07/31/94	61	A2 & D	34,090,000	23,674
A2	07/31/94	08/15/94	15	A1	25,576,000	17,761
A2	08/15/94	10/15/94	61	A1	9,605,000	6,670
Removing berms no pumping	10/16/94	10/31/94	15		0	0
D	10/31/94	11/30/94	30	A1 & A2	36,386,000	25,268
C	10/31/94	11/30/94	30	A1 & A2	4,544,000	3,156
Subtotal			30		40,930,000	28,424
D	11/30/94	02/28/95	90	A1 & A2	8,731,000	6,063
C	11/30/94	02/28/95	90	A1 & A2	35,000	24
Subtotal			90		8,766,000	6,088
Dewatering Rates:		Average–1994			32,633,800	22,662
		Maximum Month–1994			93,842,000	65,168
		Average–1995			8,766,000	6,088
		Maximum Month–1995			8,766,000	6,088

Sources: UE&C, 1992.
ECT, 1992.

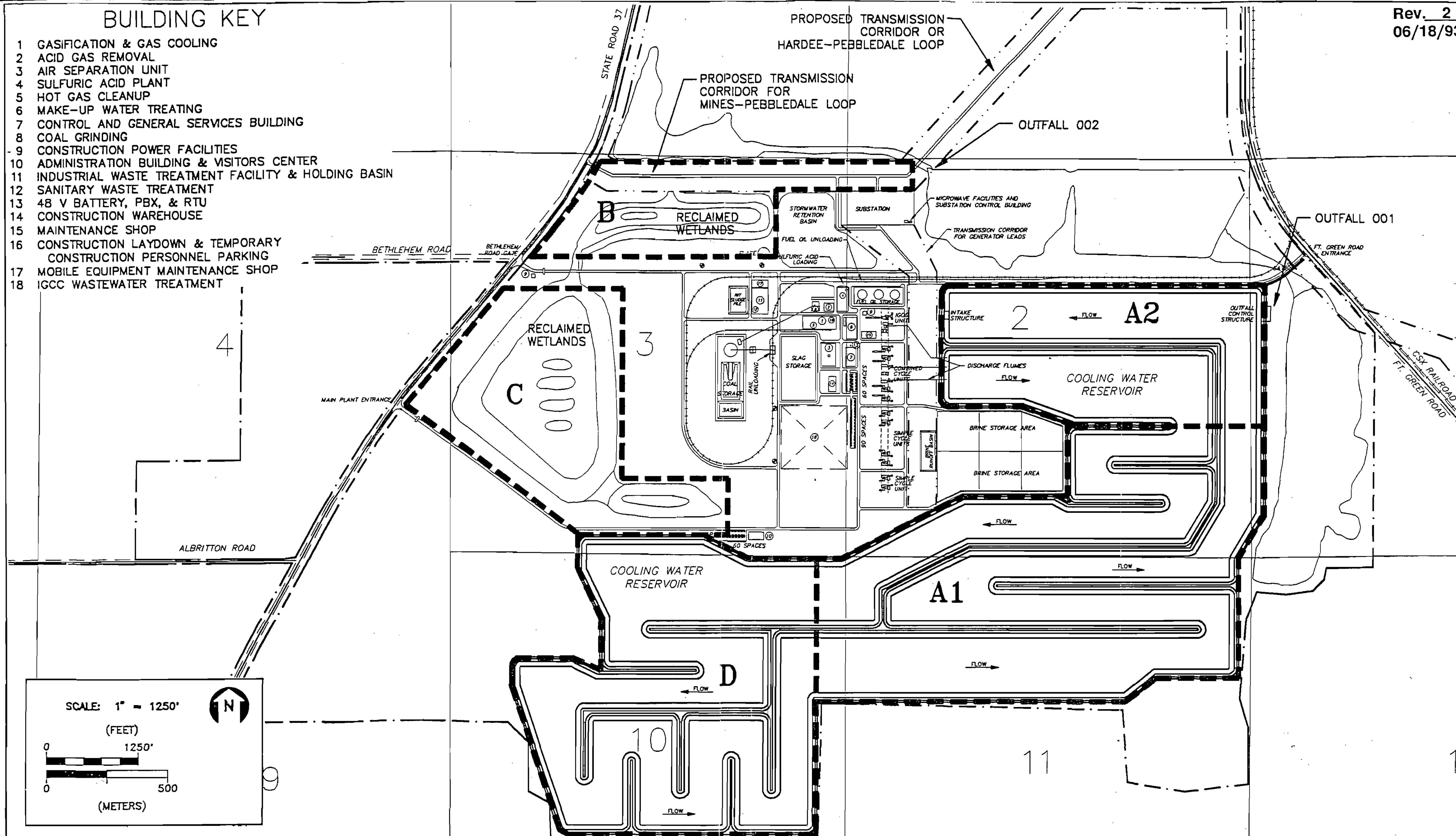

FIGURE 20.

DEWATERING SUBAREAS FOR COOLING WATER RESERVOIR AND WETLAND AREAS

Source: ECT, 1993.

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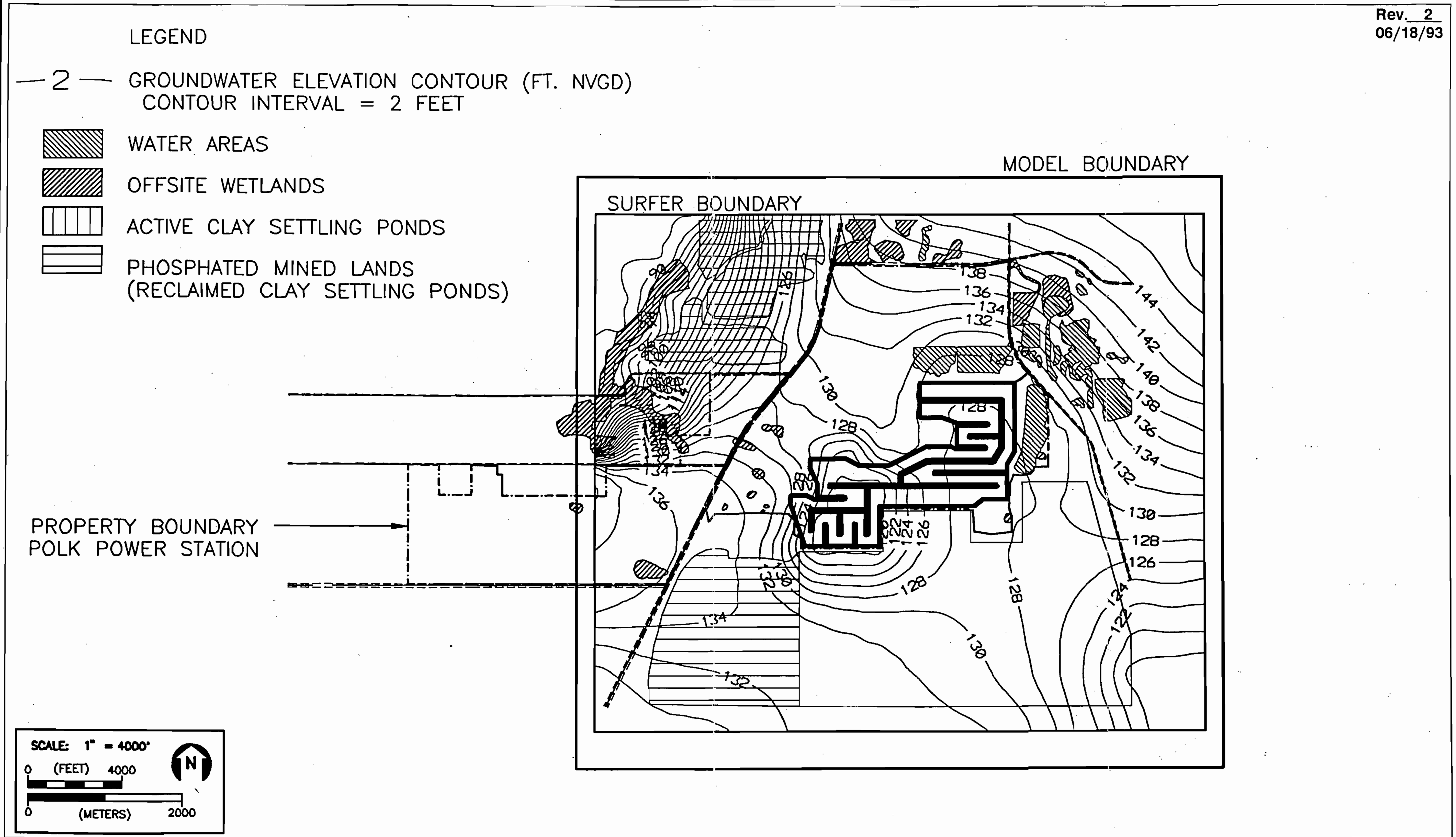

FIGURE 21.

FEBRUARY 28, 1995--GROUNDWATER LEVELS [DEWATERING SIMULATION]

Source: ECT, 1993.

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LEGEND

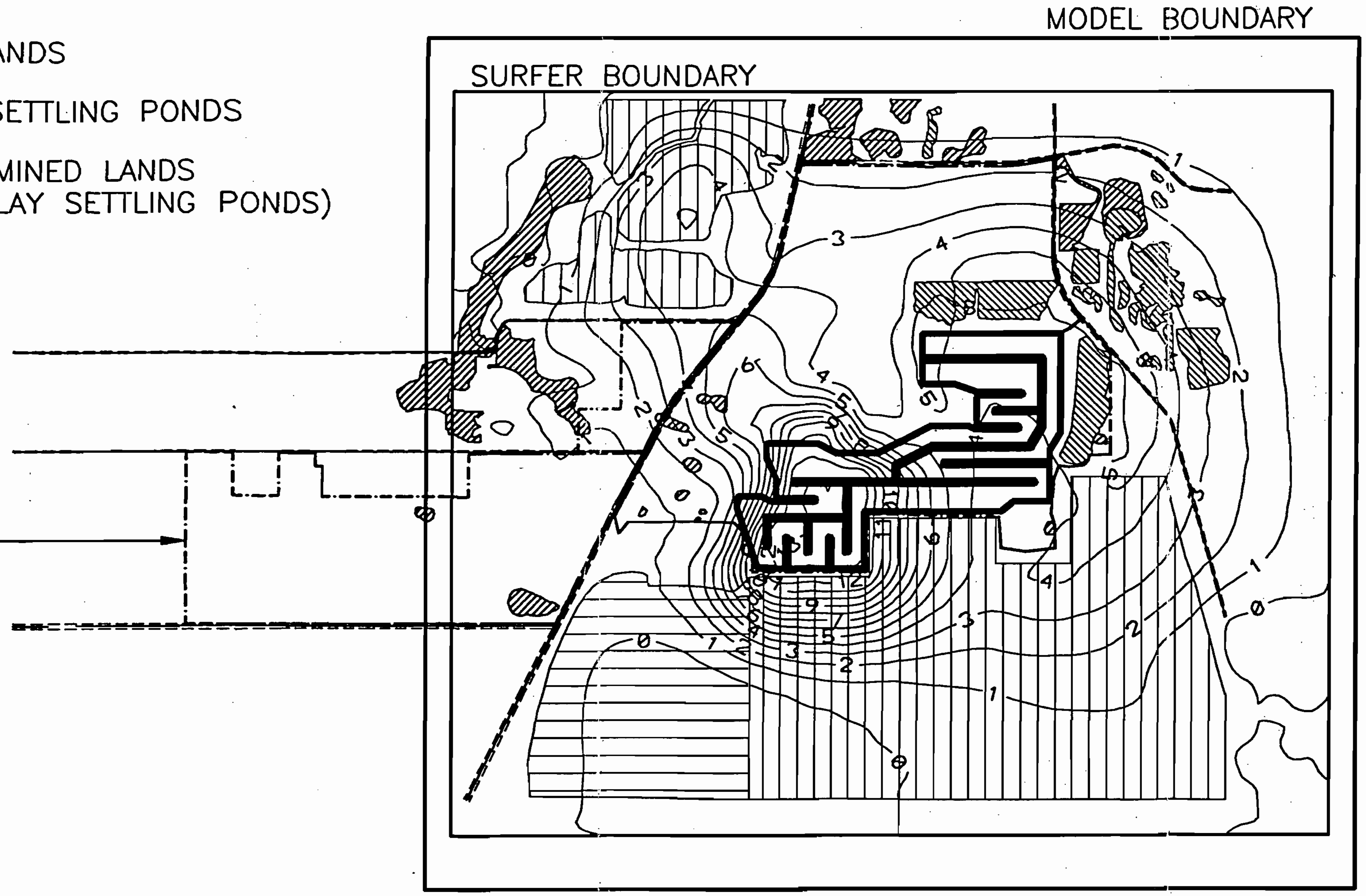
—2— DRAWDOWN VALUES CONTOUR (FT. NVGD)
CONTOUR INTERVAL = 1 FOOT

WATER AREAS

OFFSITE WETLANDS

ACTIVE CLAY SETTLING PONDS

PHOSPHATED MINED LANDS
(RECLAIMED CLAY SETTLING PONDS)



PROPERTY BOUNDARY
POLK POWER STATION

SCALE: 1" = 4000'
0 (FEET) 4000
0 (METERS) 2000
N

FIGURE 22.

FEBRUARY 28, 1995--DRAWDOWN LEVELS [DEWATERING SIMULATION]

Source: ECT, 1993.

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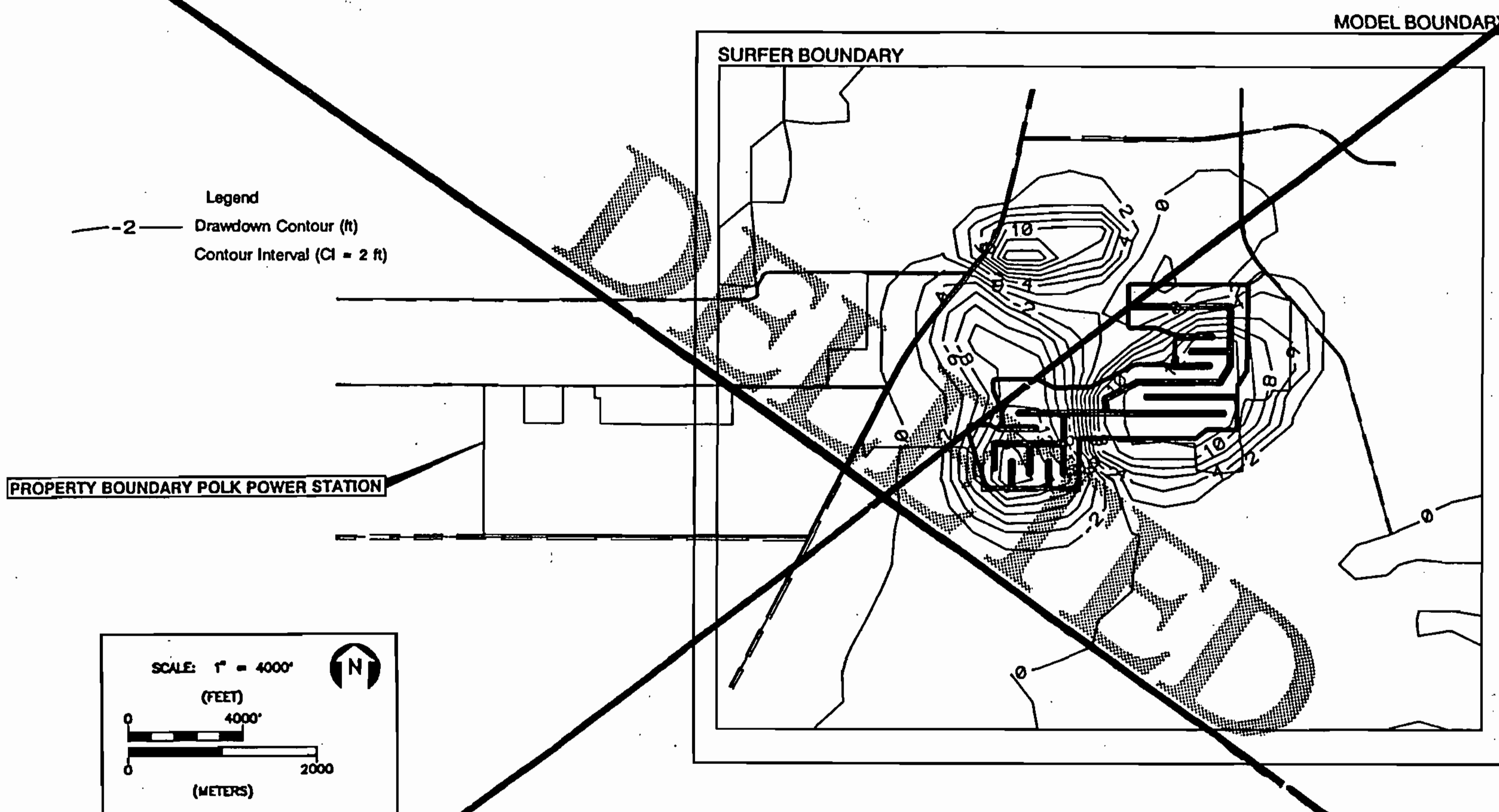

FIGURE 23
MARCH 31, 1994 - DRAWDOWN VALUES [DEWATERING SIMULATION]
TAMPA ELECTRIC COMPANY
POLK POWER STATION
Source: ECT, 1992.

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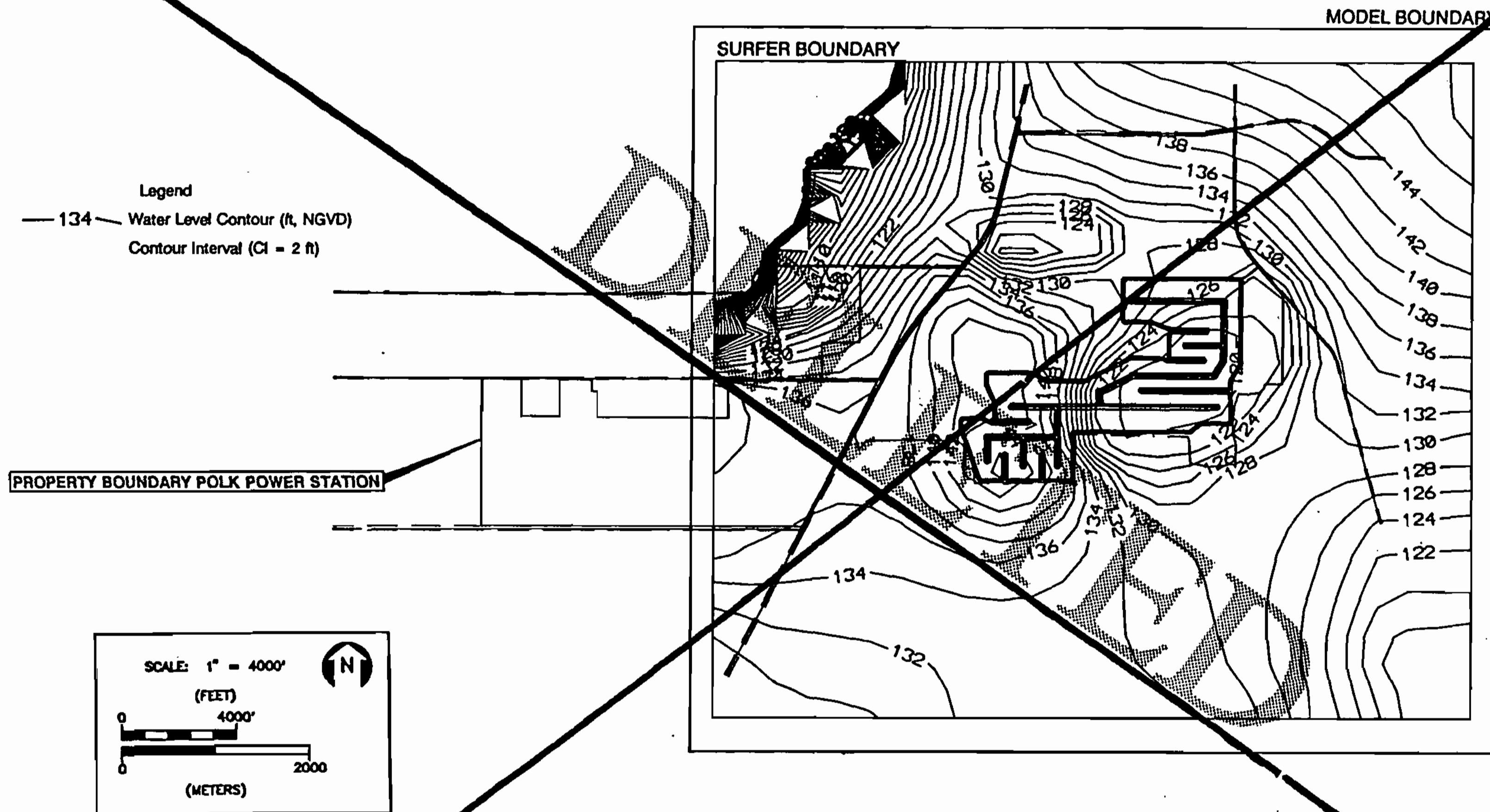

FIGURE 24
JULY 31, 1994 - GROUNDWATER LEVELS [DEWATERING SIMULATION]
TAMPA ELECTRIC COMPANY
POLK POWER STATION
Source: ECT, 1992.

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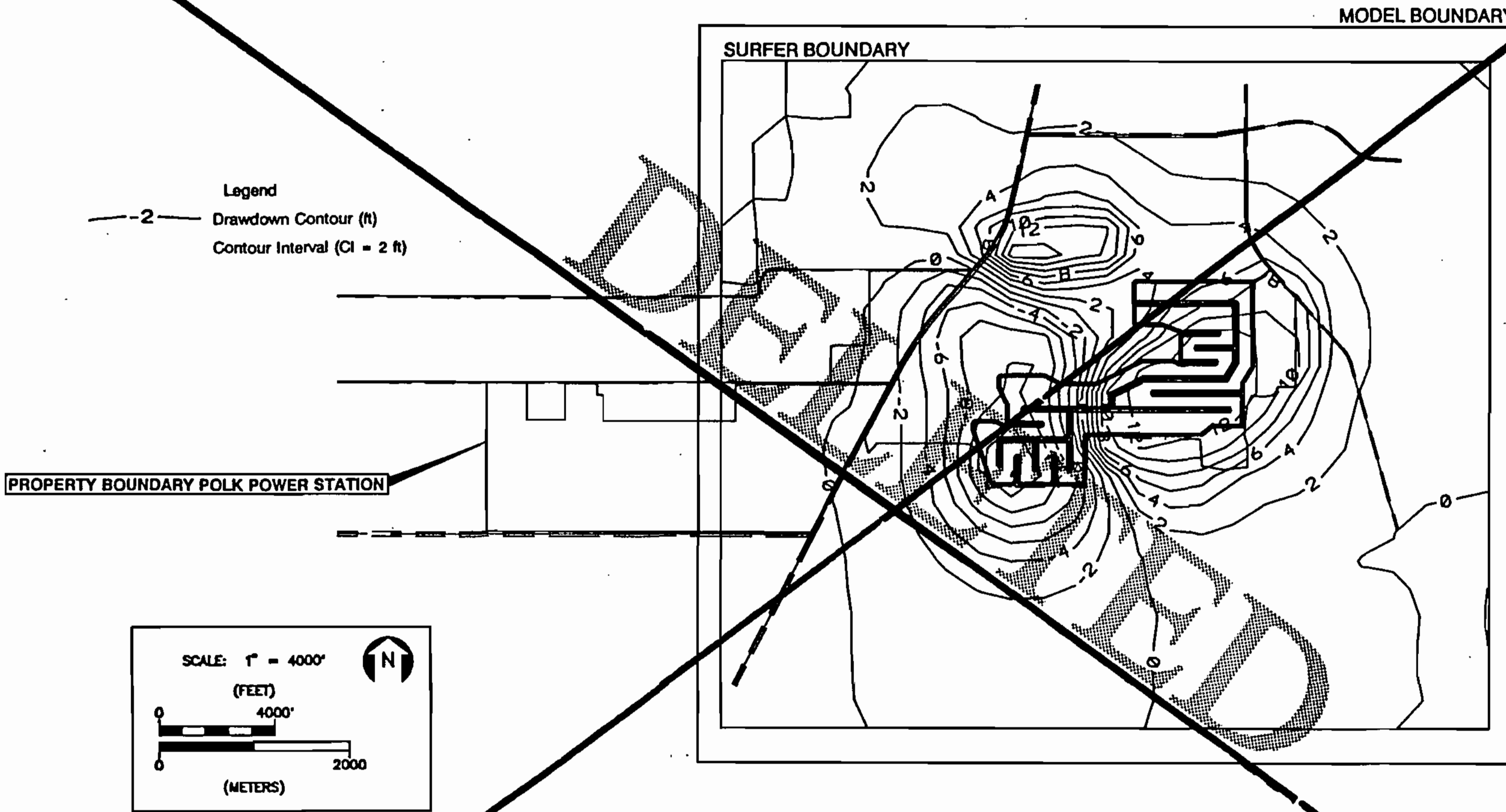

FIGURE 25
JULY 31, 1994 - DRAWDOWN VALUES [DEWATERING SIMULATION]
TAMPA ELECTRIC COMPANY
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Source: ECT, 1992.

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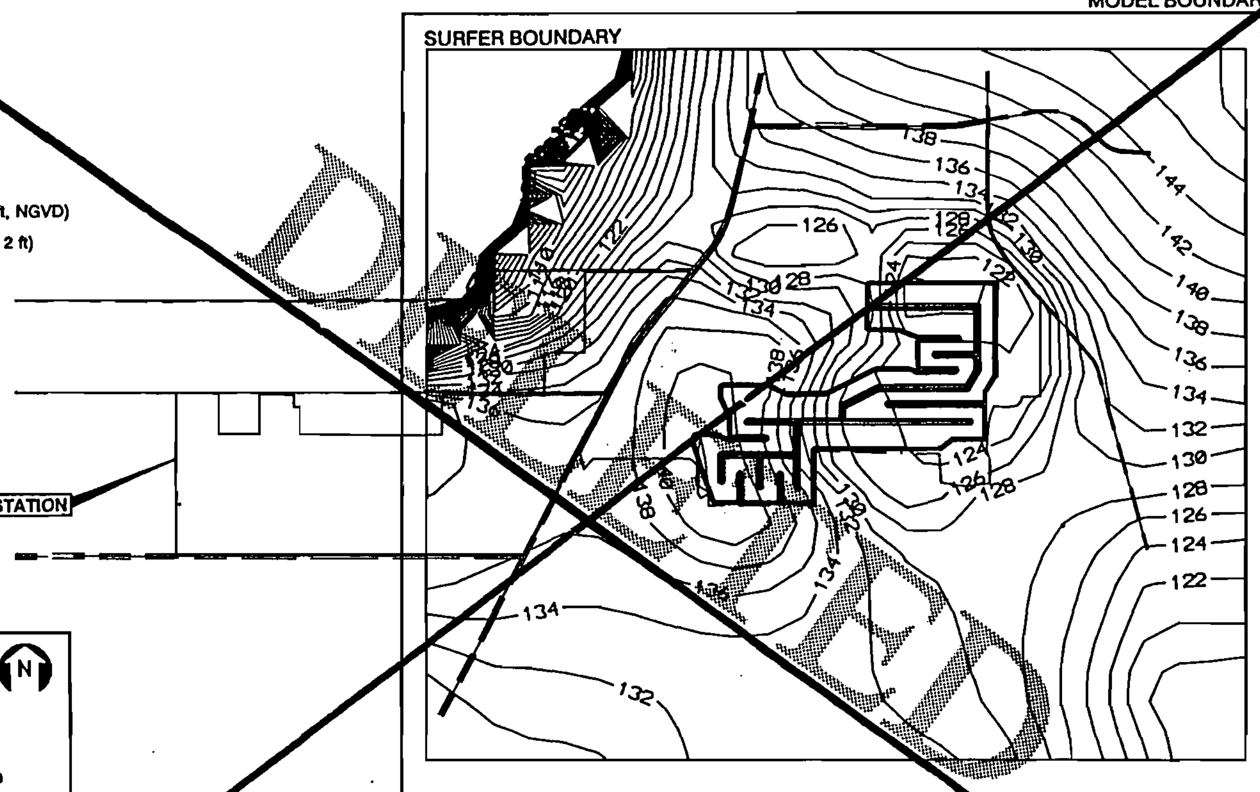
Legend
—134— Water Level Contour (ft, NGVD)
Contour Interval (CI = 2 ft)



SCALE: 1" = 4000'
(FEET)
0 4000'
0 2000
(METERS)

FIGURE 26
AUGUST 15, 1994 - GROUNDWATER LEVELS [DEWATERING SIMULATION]
TAMPA ELECTRIC COMPANY
POLK POWER STATION
Source: ECT, 1992.

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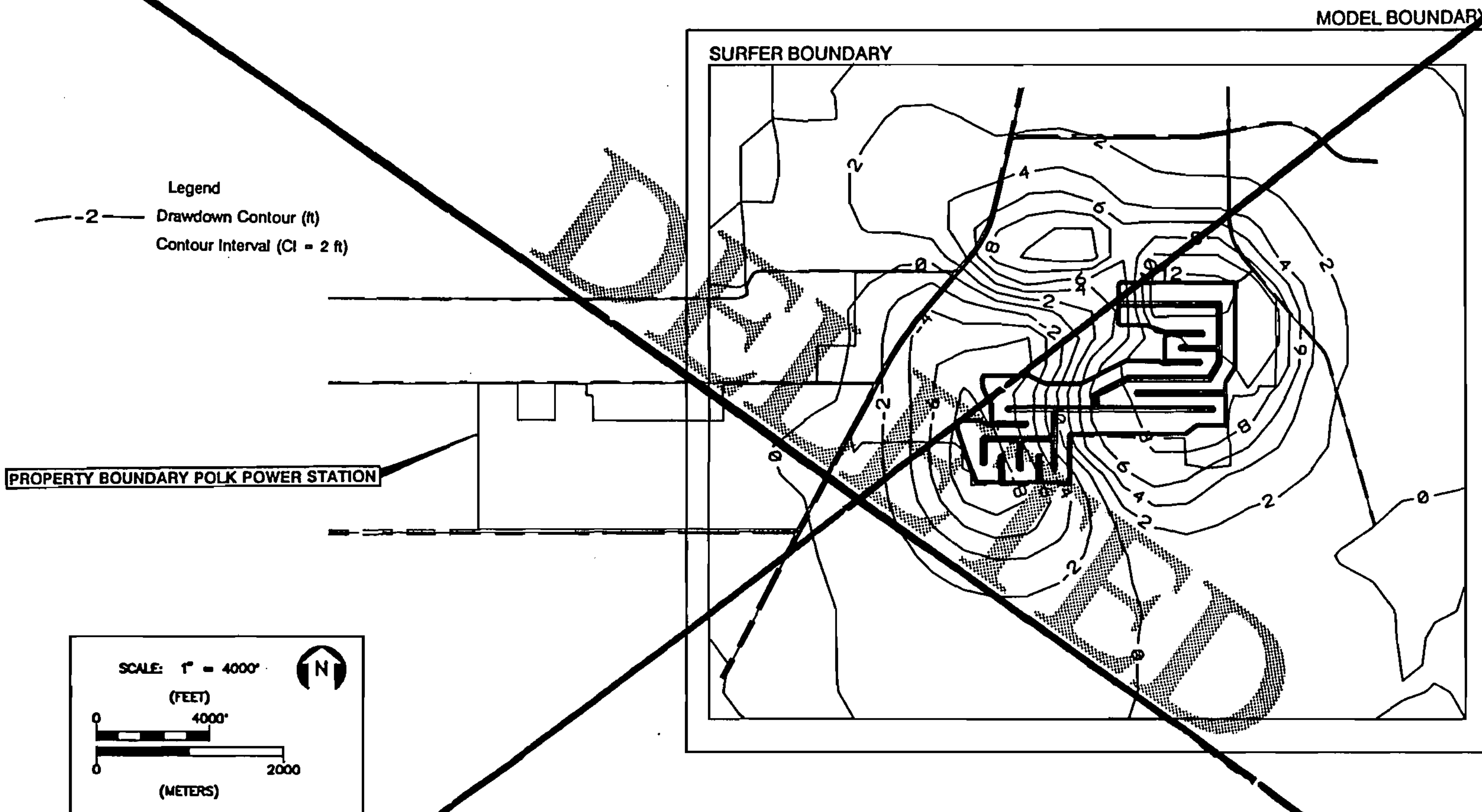

FIGURE 27
AUGUST 15, 1994 - DRAWDOWN VALUES [DEWATERING SIMULATION]
TAMPA ELECTRIC COMPANY
POLK POWER STATION
Source: ECT. 1992.

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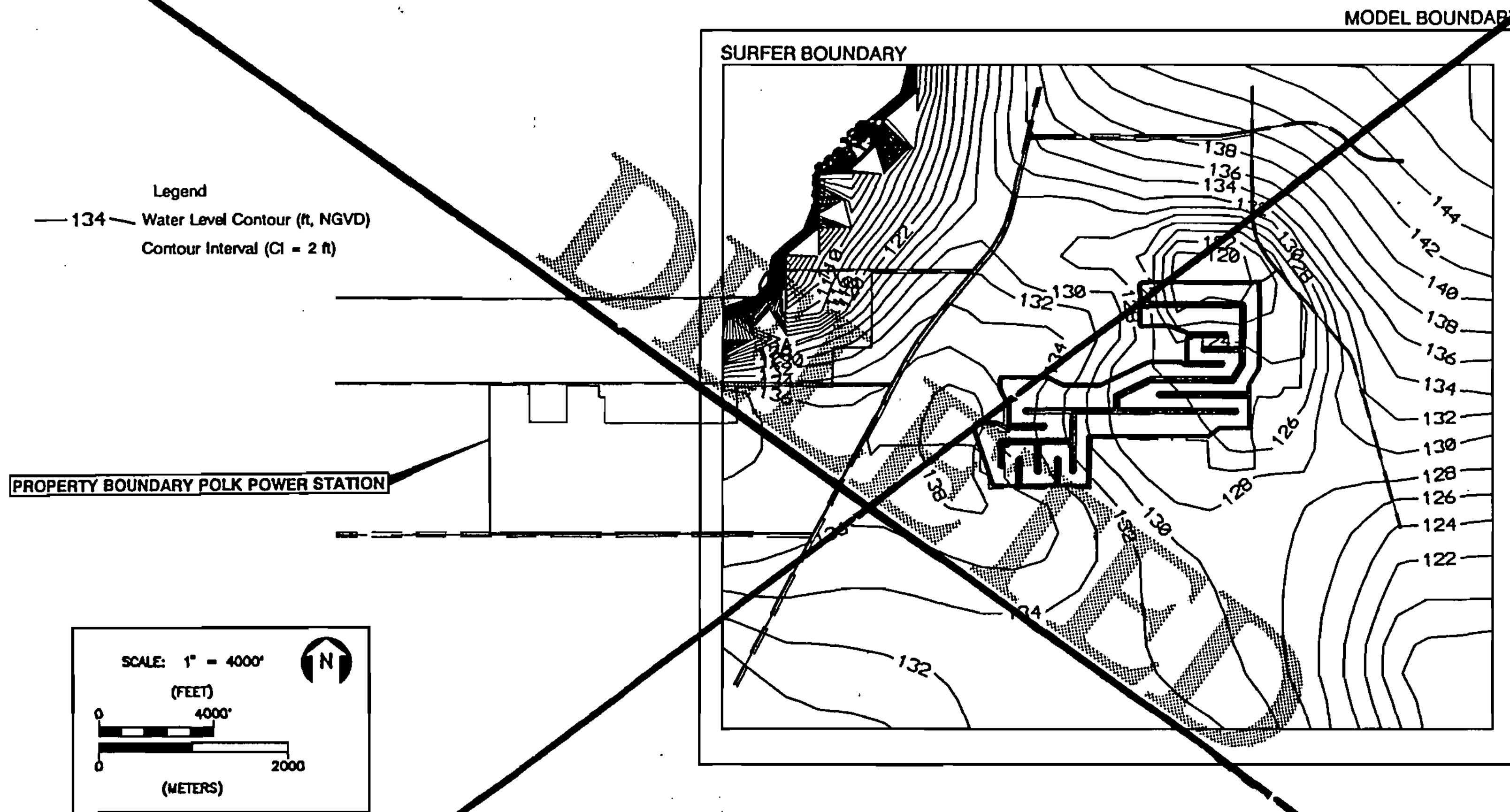

FIGURE 28
SEPTEMBER 15, 1994 - GROUNDWATER LEVELS [DEWATERING SIMULATION]
TAMPA ELECTRIC COMPANY
POLK POWER STATION
Source: ECT, 1992.

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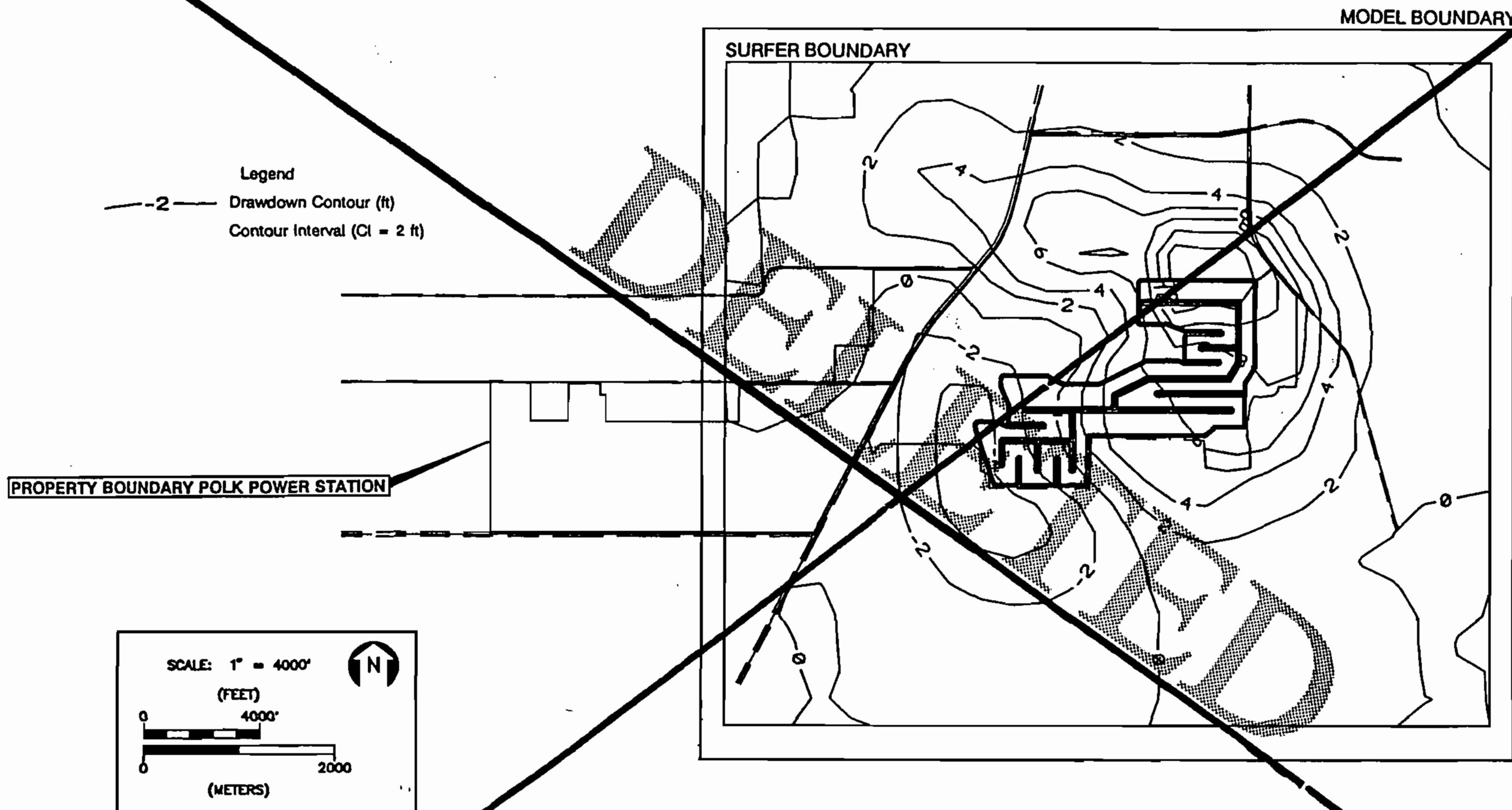

FIGURE 29
SEPTEMBER 15, 1994 - DRAWDOWN VALUES [DEWATERING SIMULATION]
TAMPA ELECTRIC COMPANY
POLK POWER STATION
Source: ECT, 1992.

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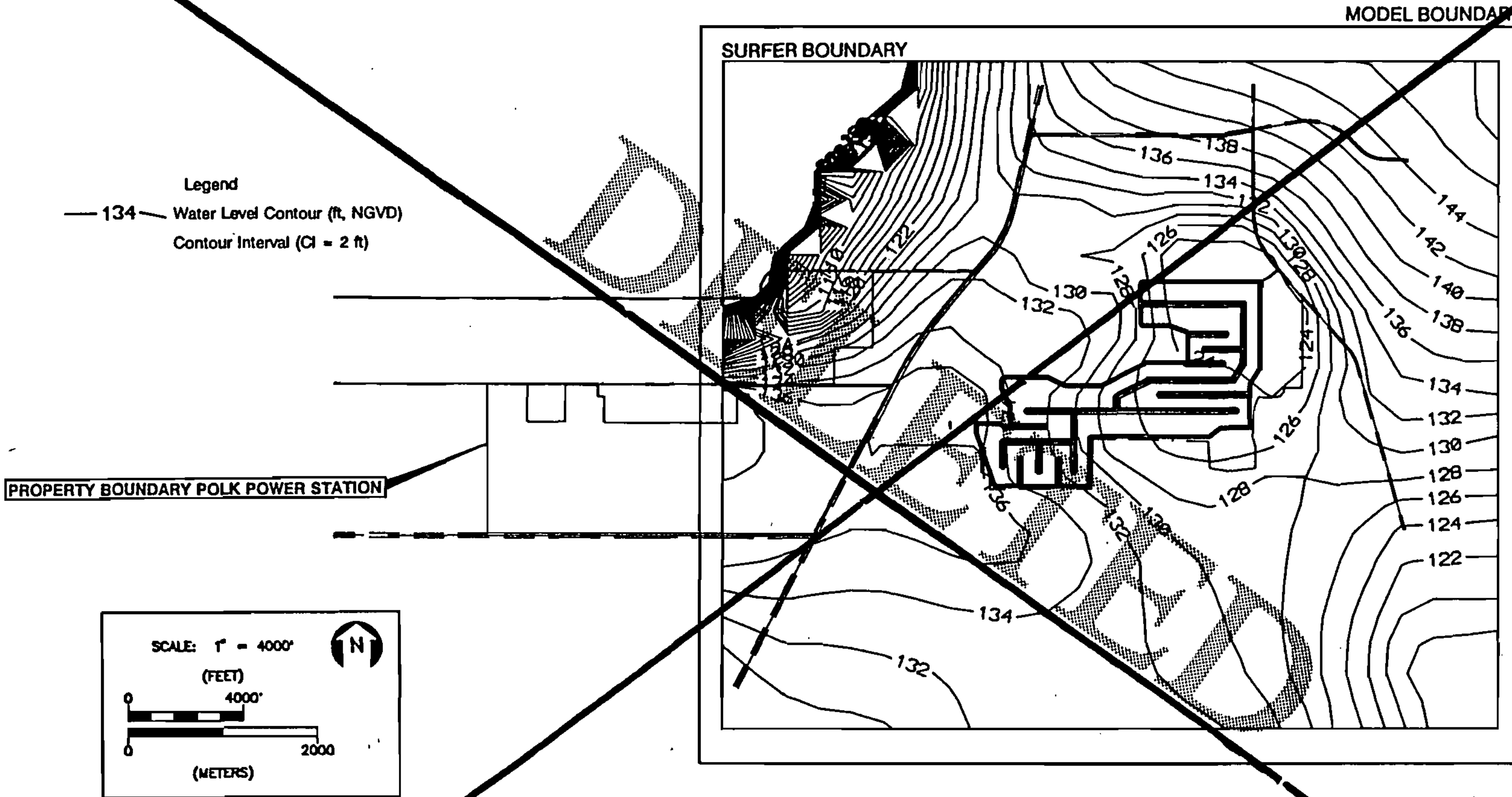

FIGURE 30
SEPTEMBER 30, 1994 - GROUNDWATER LEVELS [DEWATERING SIMULATION]
TAMPA ELECTRIC COMPANY
POLK POWER STATION
Source: ECT, 1992.

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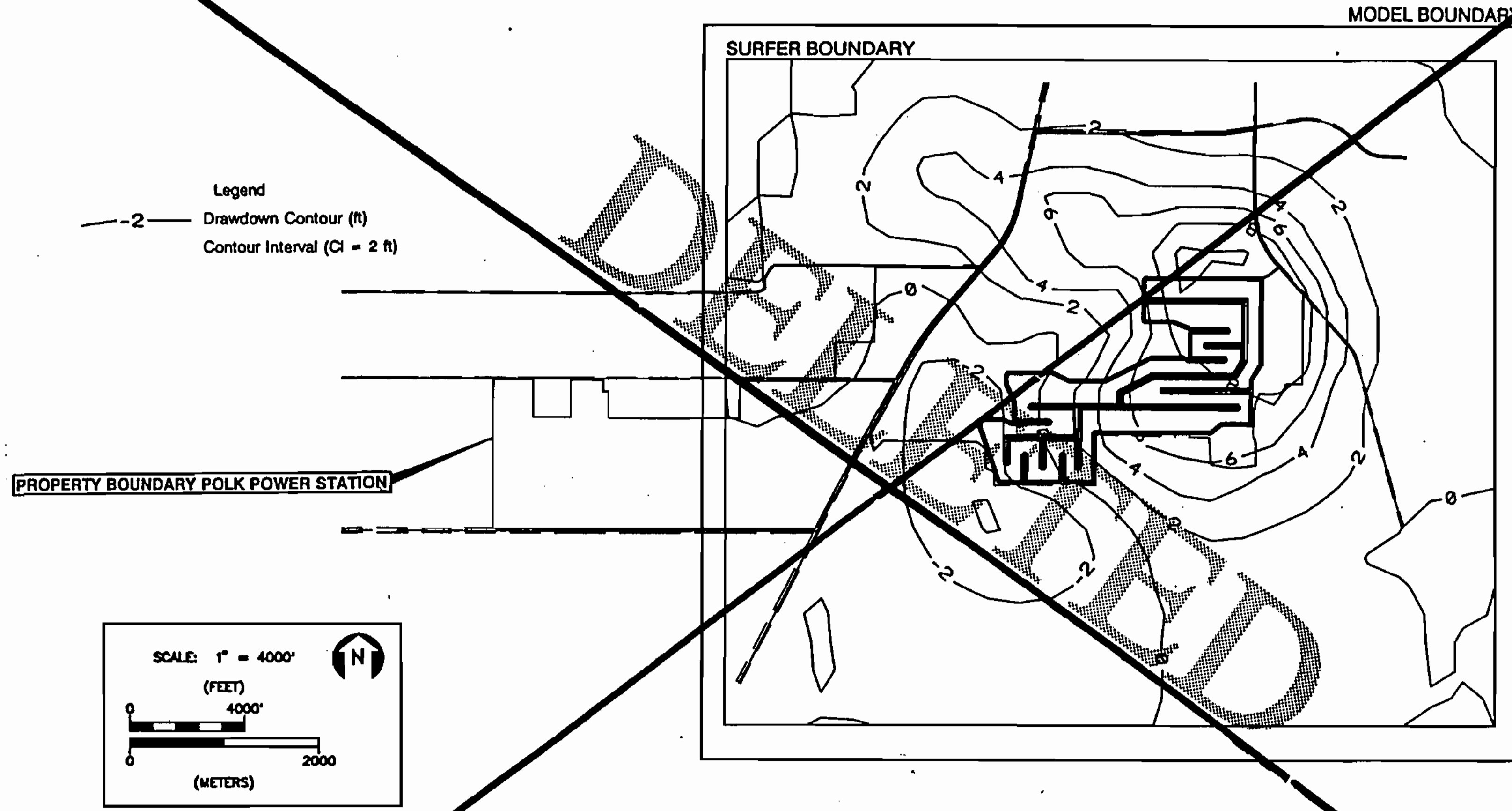

FIGURE 31
SEPTEMBER 30, 1994 - DRAWDOWN VALUES [DEWATERING SIMULATION]
TAMPA ELECTRIC COMPANY
POLK POWER STATION
Source: ECT, 1992.

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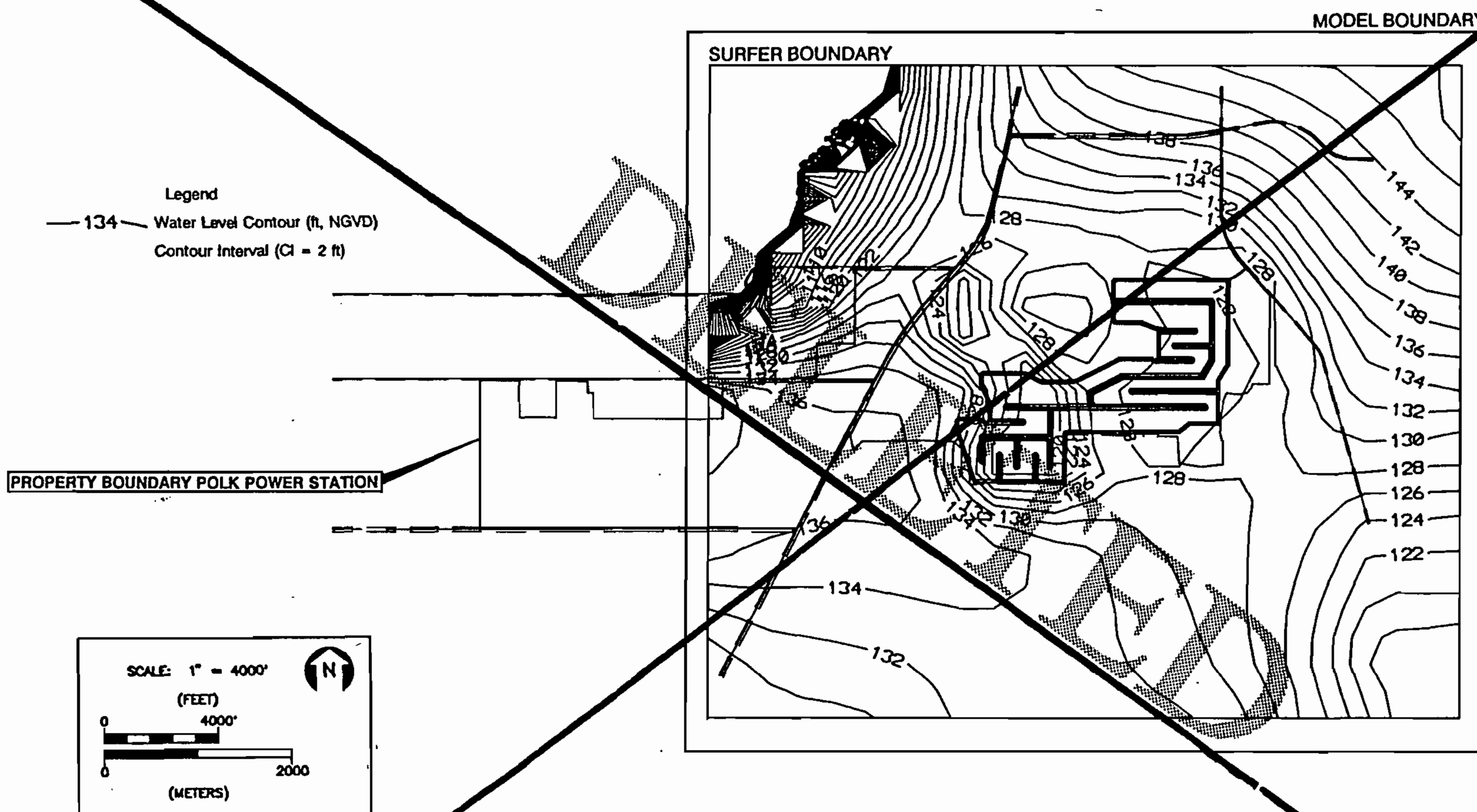

FIGURE 32
OCTOBER 31, 1994 - GROUNDWATER LEVELS [DEWATERING SIMULATION]
TAMPA ELECTRIC COMPANY
POLK POWER STATION
Source: ECT. 1992.

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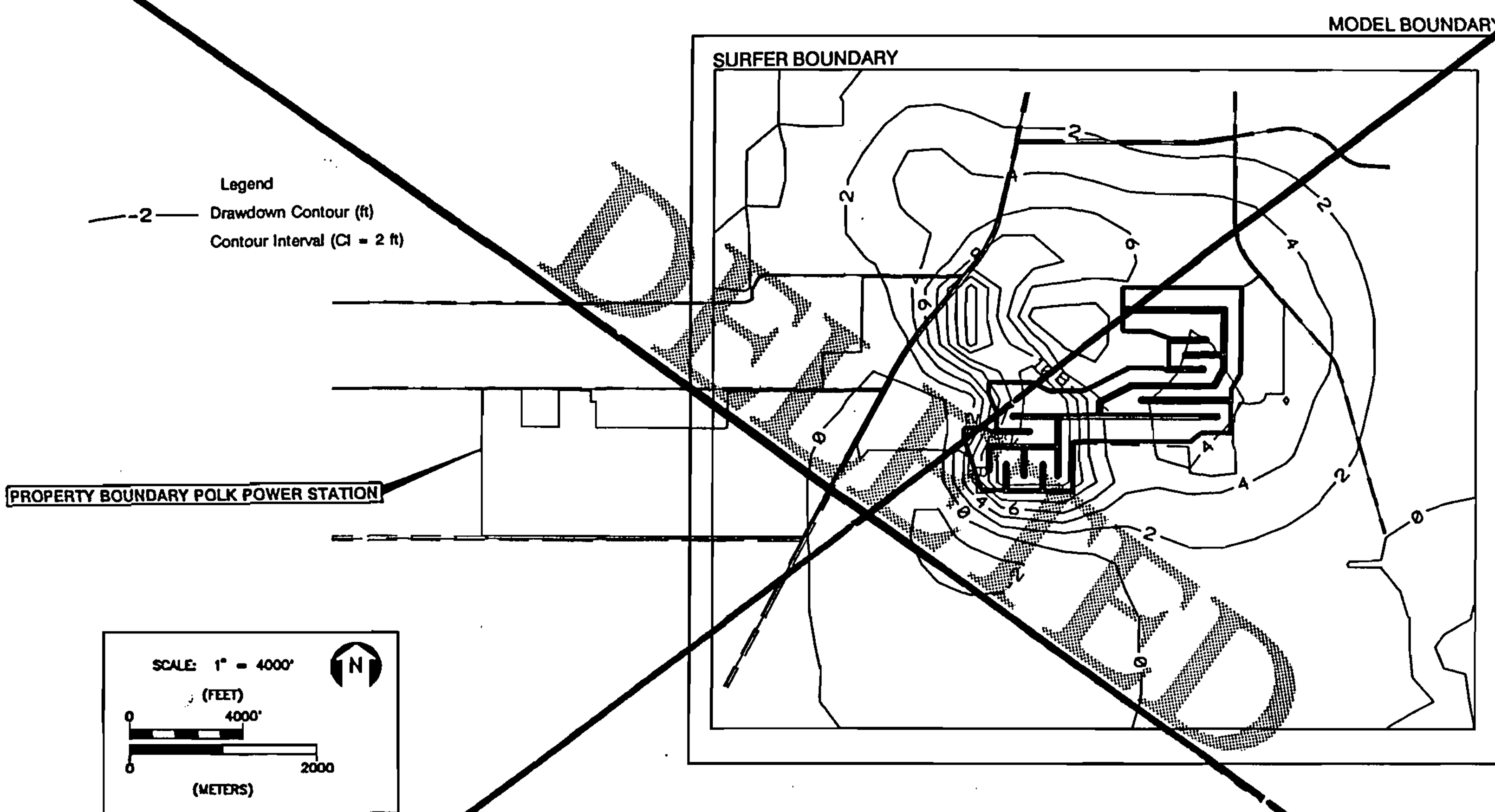

FIGURE 33
OCTOBER 31, 1994 - DRAWDOWN VALUES [DEWATERING SIMULATION]
TAMPA ELECTRIC COMPANY
POLK POWER STATION
Source: ECT, 1992.

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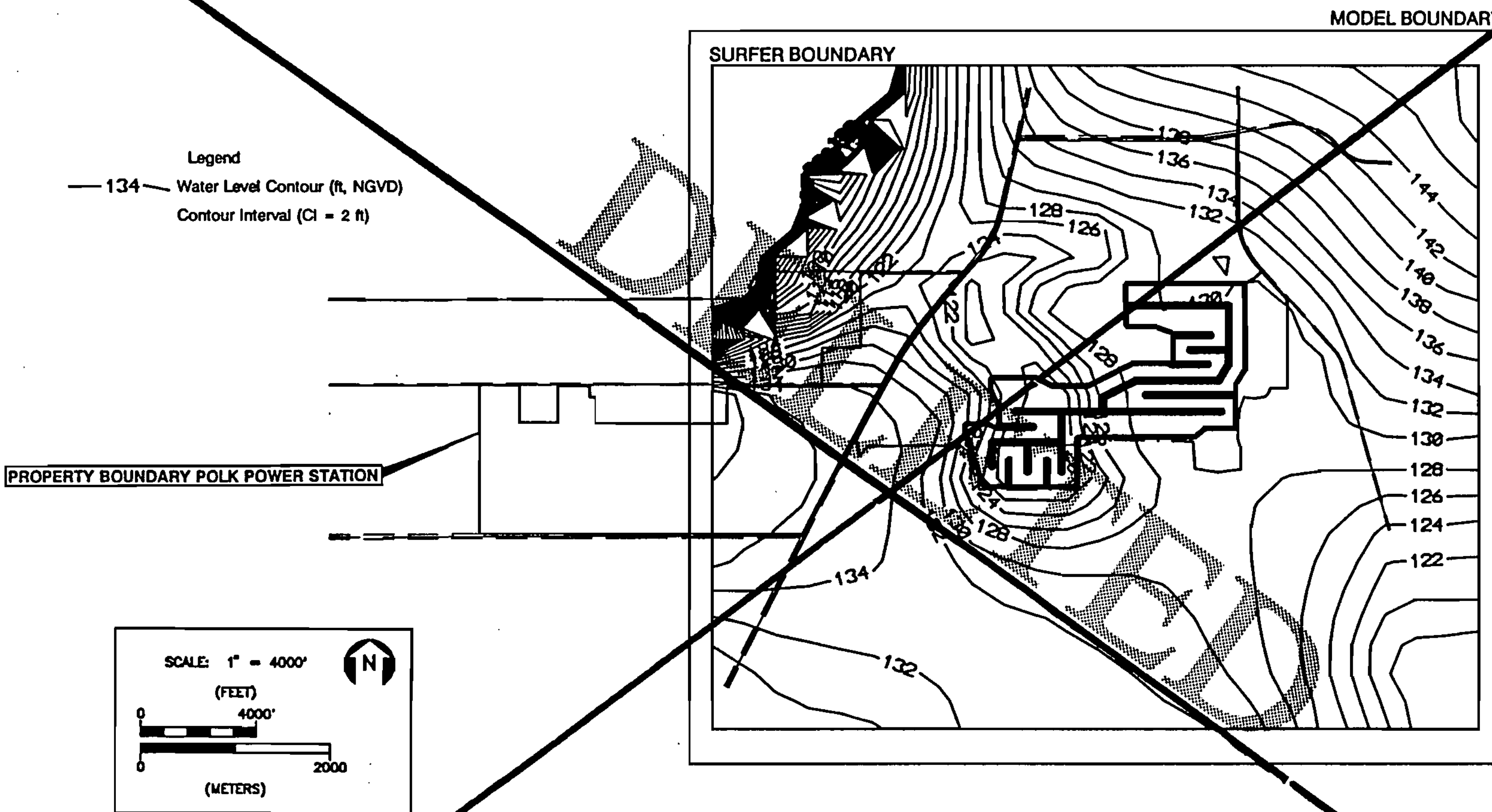

FIGURE 34
FEBRUARY 28, 1995 - GROUNDWATER LEVELS [DEWATERING SIMULATION]
TAMPA ELECTRIC COMPANY
POLK POWER STATION
Source: ECT, 1992.

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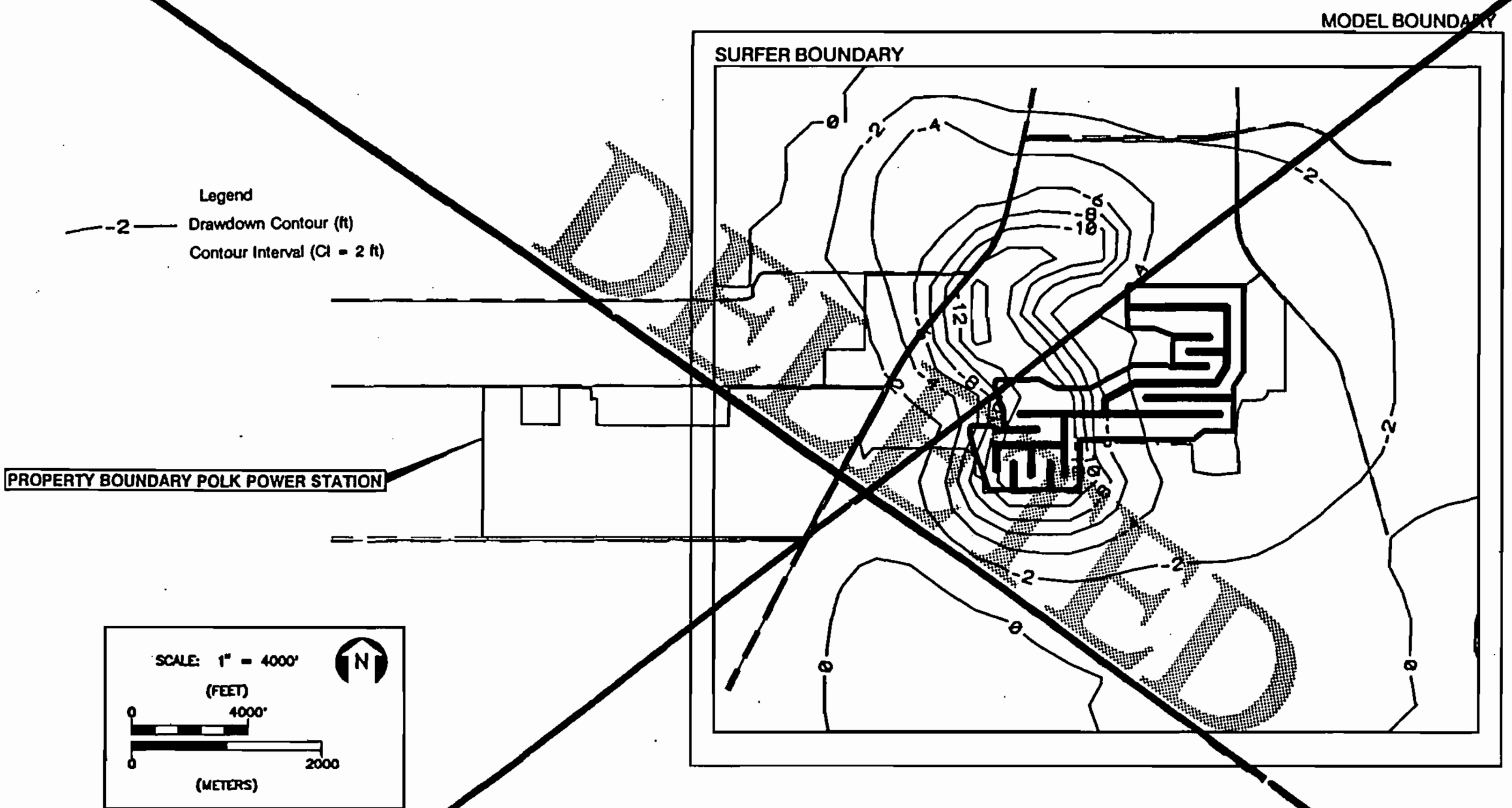

FIGURE 35
FEBRUARY 28, 1995 - DRAWDOWN VALUES [DEWATERING SIMULATION]
TAMPA ELECTRIC COMPANY
POLK POWER STATION
Source: ECT, 1992.

TAMPA ELECTRIC
A TECO ENERGY COMPANY

POLK POWER STATION

[illegible]401 07/92

Rev. 2
06/18/93

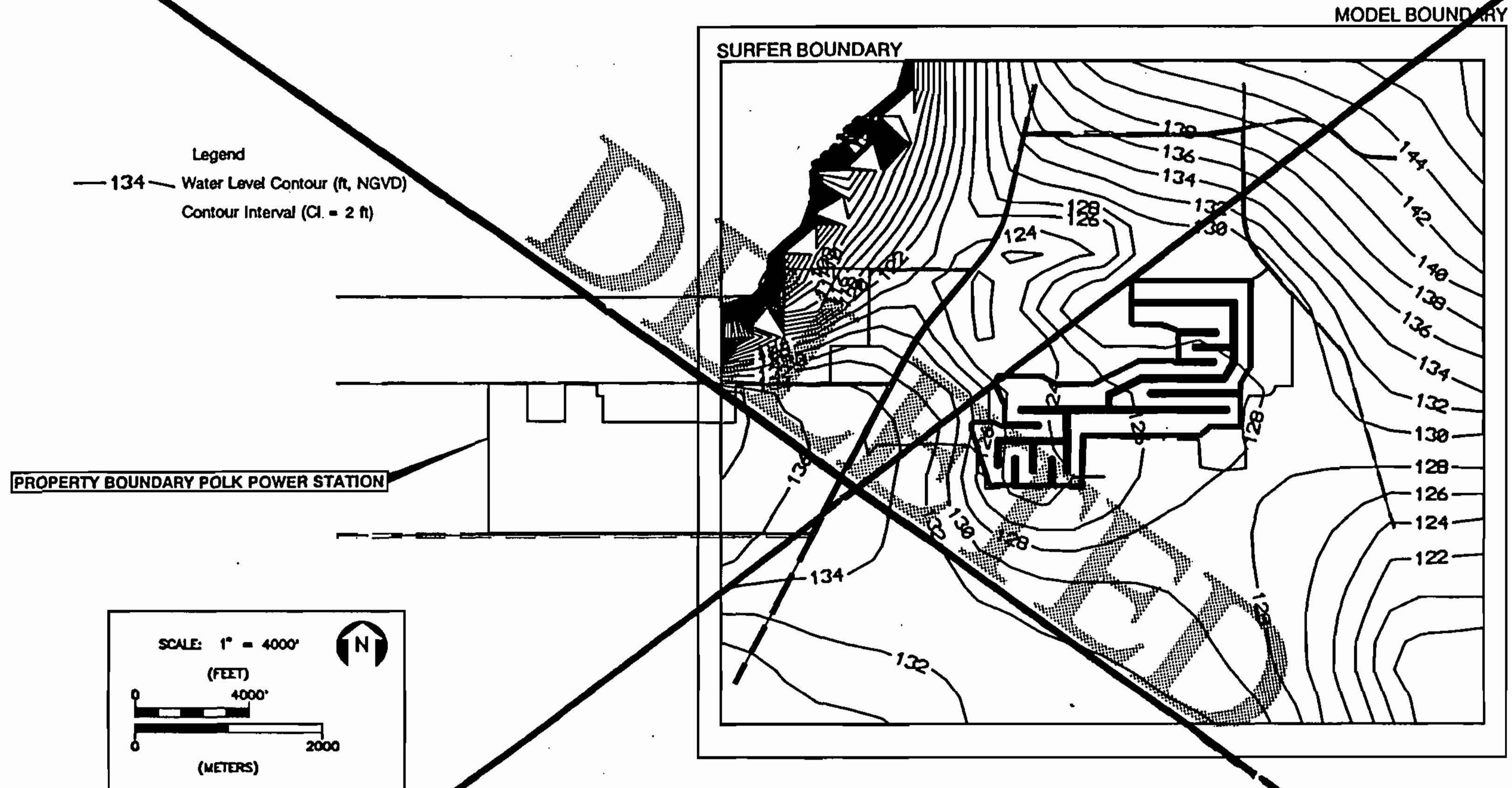

FIGURE 36
MARCH 31, 1995 - GROUNDWATER LEVELS [DEWATERING SIMULATION]
TAMPA ELECTRIC COMPANY
POLK POWER STATION
Source: ECT, 1992.

TAMPA ELECTRIC
A TECO ENERGY COMPANY

POLK POWER STATION

90263 0491 07/92

Rev. 2
06/18/93

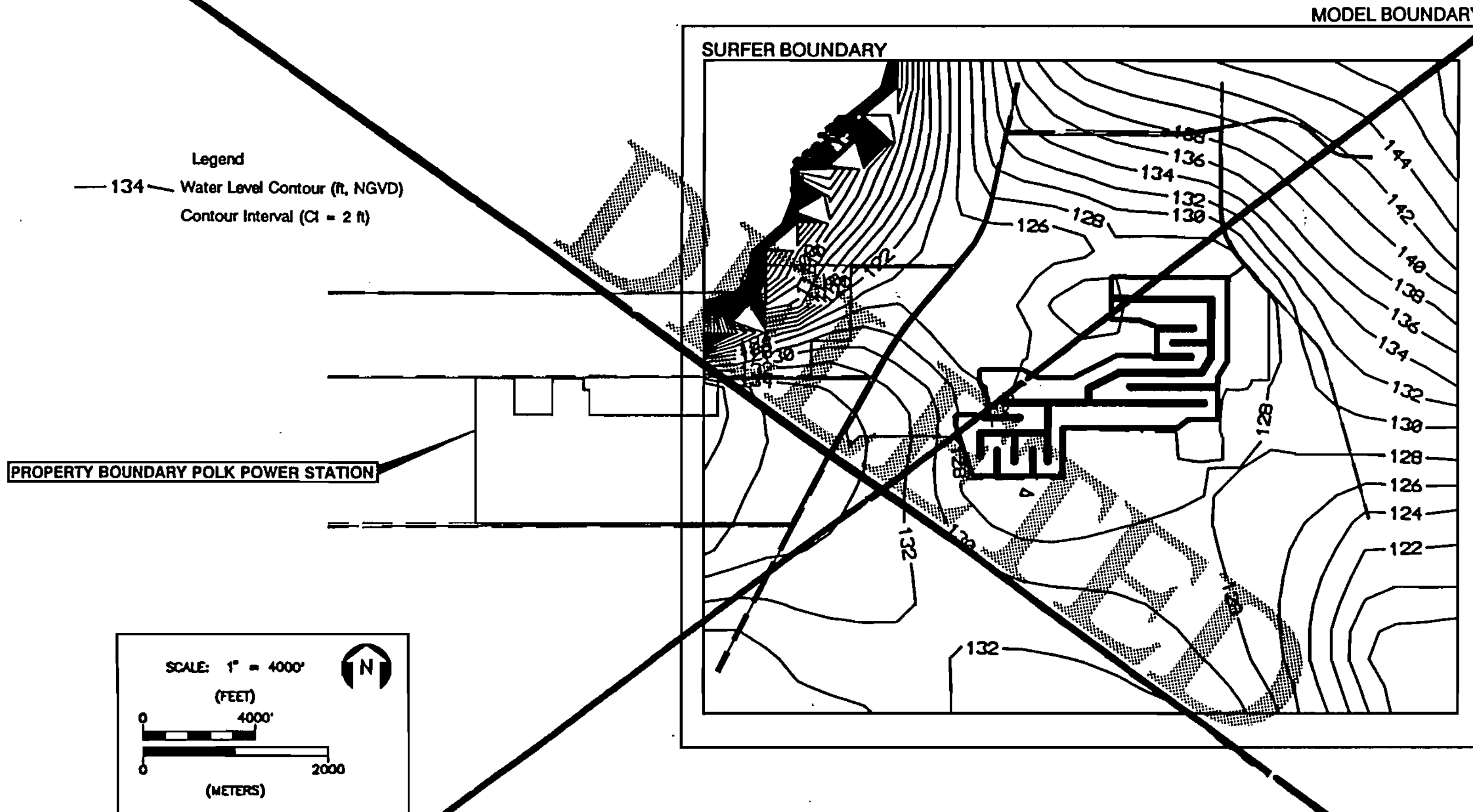

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FIGURE 37
JUNE 30, 1995 - GROUNDWATER LEVELS [DEWATERING SIMULATION]
TAMPA ELECTRIC COMPANY
POLK POWER STATION
Source: ECT, 1992.

TAMPA ELECTRIC
A TECO ENERGY COMPANY

POLK POWER STATION

Rev. 2
06/18/93

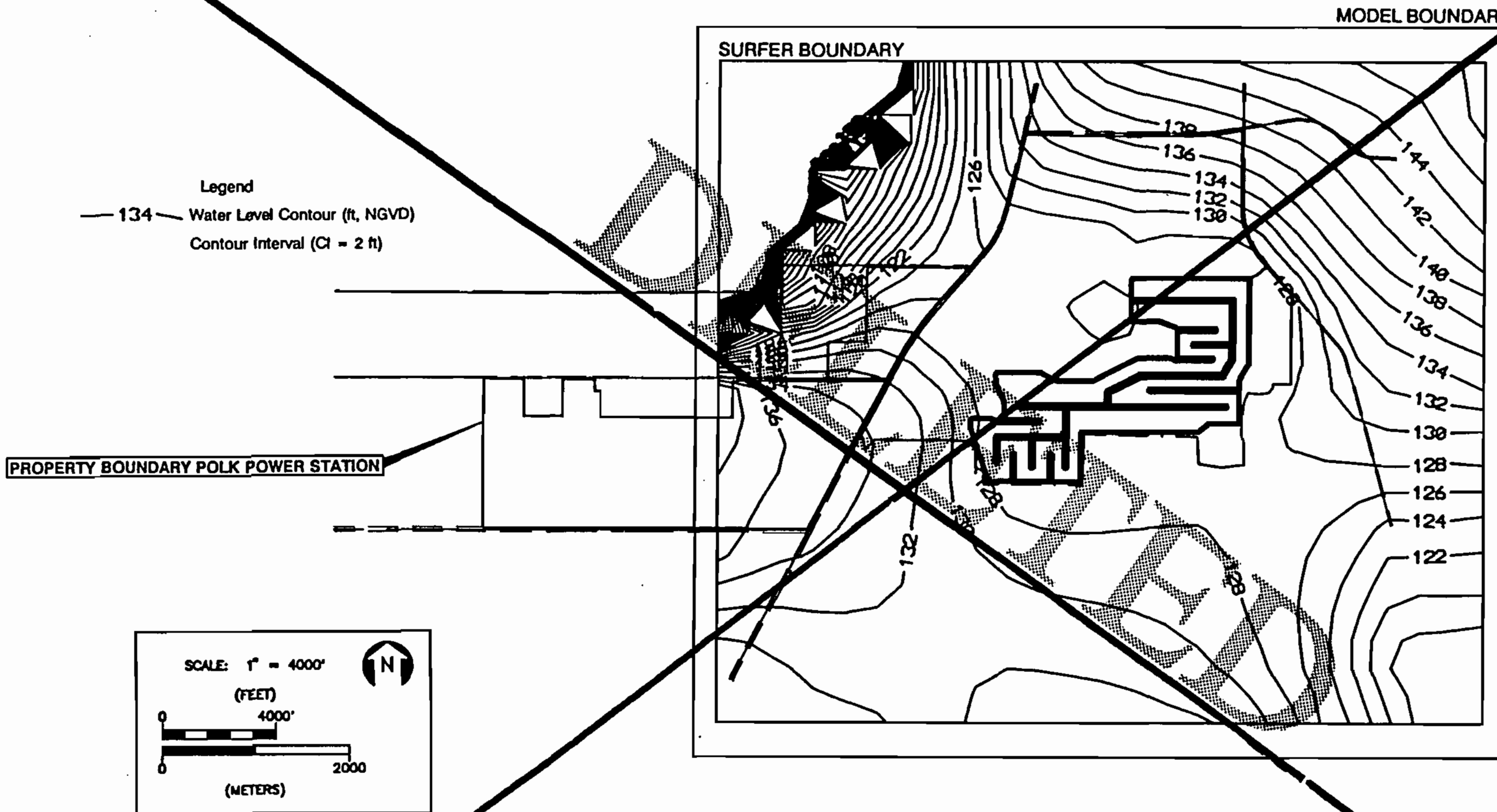


FIGURE 38
SEPTEMBER 30, 1995 - GROUNDWATER LEVELS [DEWATERING SIMULATION]
TAMPA ELECTRIC COMPANY
POLK POWER STATION
Source: ECT, 1992.

TAMPA ELECTRIC
A TECO ENERGY COMPANY

POLK POWER STATION

Rev. 2
06/18/93

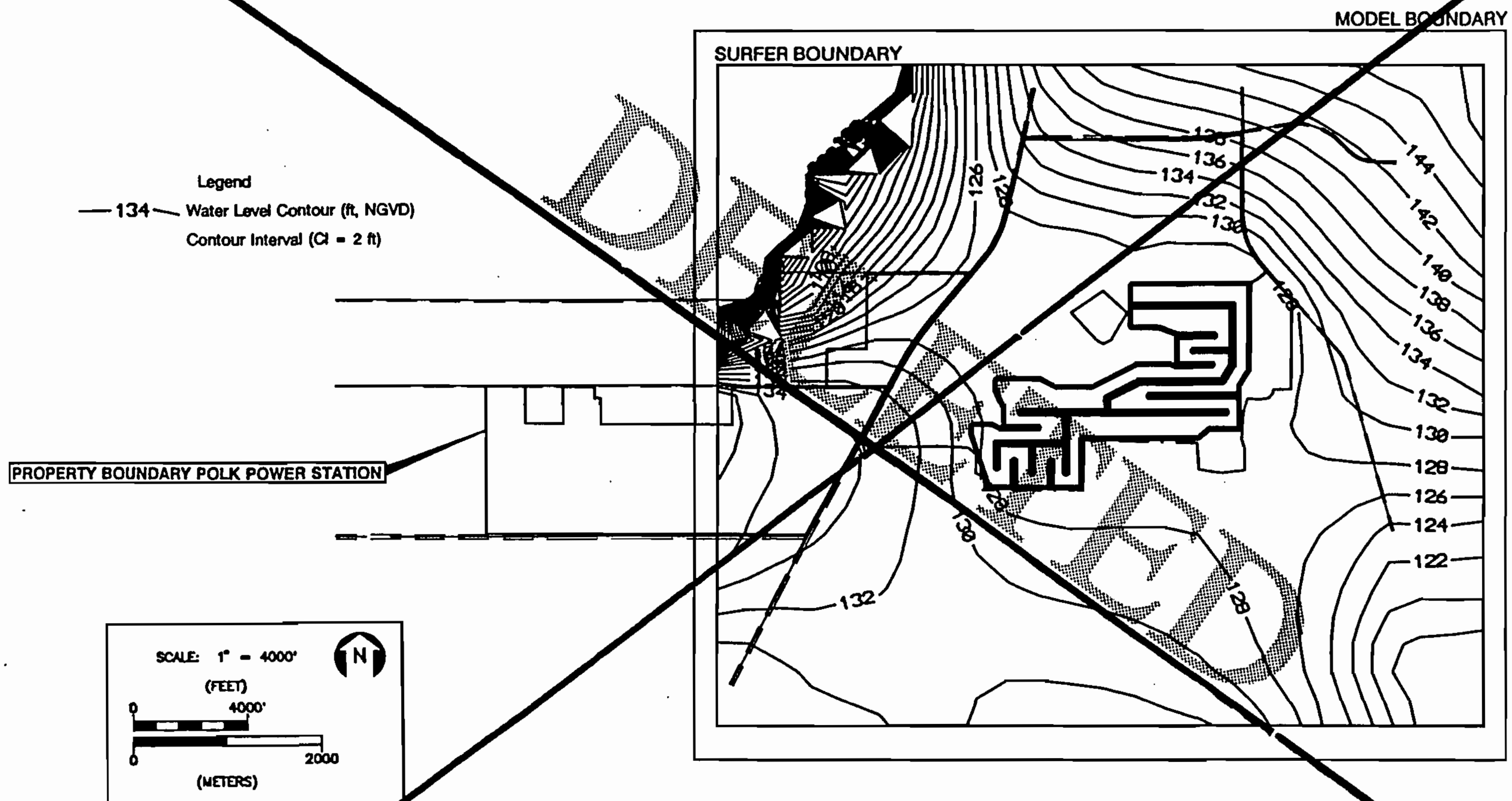


FIGURE 39
DECEMBER 31, 1995 - GROUNDWATER LEVELS [DEWATERING SIMULATION]
TAMPA ELECTRIC COMPANY
POLK POWER STATION
Source: ECT, 1992.

TAMPA ELECTRIC
A TECO ENERGY COMPANY

POLK POWER STATION

90263 0401 07/92

Rev. 2
06/18/93

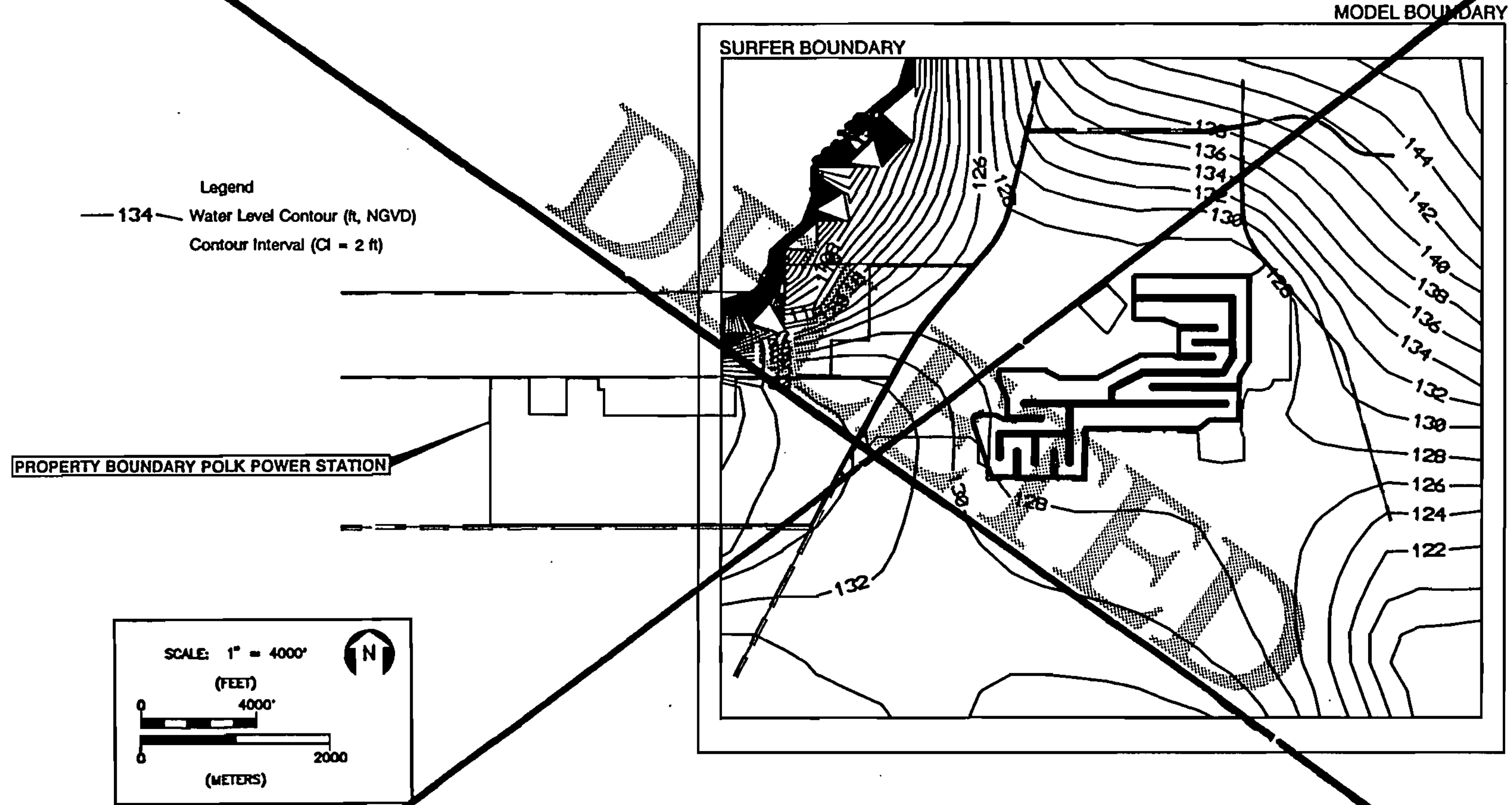


FIGURE 40
MARCH 31, 1996 - GROUNDWATER LEVELS [DEWATERING SIMULATION]
TAMPA ELECTRIC COMPANY
POLK POWER STATION
Source: ECT, 1992.

TAMPA ELECTRIC
A TECO ENERGY COMPANY

POLK POWER STATION

7.0 MODEL RESULTS

Model results were separated into two summaries: (1) groundwater volumetric flow budget into and out of the cooling reservoir considering full site build-out, and (2) drawdown impacts of dewatering during construction of the cooling reservoir and the wetlands at the Tampa Electric Company Polk Power Station.

7.1 COOLING RESERVOIR GROUNDWATER BALANCE

The model provided results simulating pumpage of sufficient Floridan aquifer makeup water into the reservoir to maintain a constant reservoir elevation of 136 ft-NGVD. The volumetric groundwater flow into the reservoir ranged from 182,407 to 380,926 gallons per day (gpd) in with a yearly average of approximately 281,712 gpd. The volumetric groundwater flow out of the cooling reservoir ranged from 474,793 gpd to 624,438 gpd out with a yearly average of approximately 522,000 gpd.

7.2 PREDICTED IMPACTS DURING DEWATERING

Based on the results obtained from the model, proposed average daily pumping rates required to achieve the necessary dewatering depths during the various stages of dewatering are summarized in Table 2. The model results indicate drawdowns at the property boundaries of approximately ~~8 to 10~~ 2 to 4 ft and ~~8~~ 5 ft, respectively, at the northwest corner and the east border of the Tampa Electric Company Polk Power Station. The drawdown at the southern border of the site, adjacent to the clay settling ponds, are anticipated to range from 10 to 12 ft.

The Tampa Electric Company Polk Power Station will use groundwater from the Floridan aquifer as makeup for the cooling reservoir and industrial processes. To ensure groundwater and surface water discharge quality standards are met, detailed calculations pertaining to makeup, blowdown, operating level, and water quality for the cooling reservoir were performed. The resulting water quality data are presented within the SCA. The lowest quality water and the lowest volume of water are incorporated into the design of the power plant to meet the water quality criteria for technical and economical reasons.

The worst-case model simulated dewatering impacts indicated drawdowns at the property boundaries of approximately ~~8 to 10~~ 2 to 4 ft and ~~8~~ 5 ft, respectively, at the northwest corner and the east border of the Tampa Electric Company Polk Power Station. The drawdown at the southern border of the site, adjacent to the clay settling ponds, are anticipated to range from 10 to 12 ft. The adjacent water supply withdrawals identified in the SCA do not utilize the shallow surficial aquifer for potable purposes. This indicates that under the conditions simulated, no existing legal withdrawal will be significantly or adversely impacted. Furthermore, a dewatering monitoring and mitigation plan was provided in Section 4.3.2 of the SCA to ensure minimal offsite impacts.

APPENDIX 11.13.1

PRELIMINARY SPILL PREVENTION, CONTROL, AND COUNTERMEASURE PLAN

Rev. 2, 06/18/93

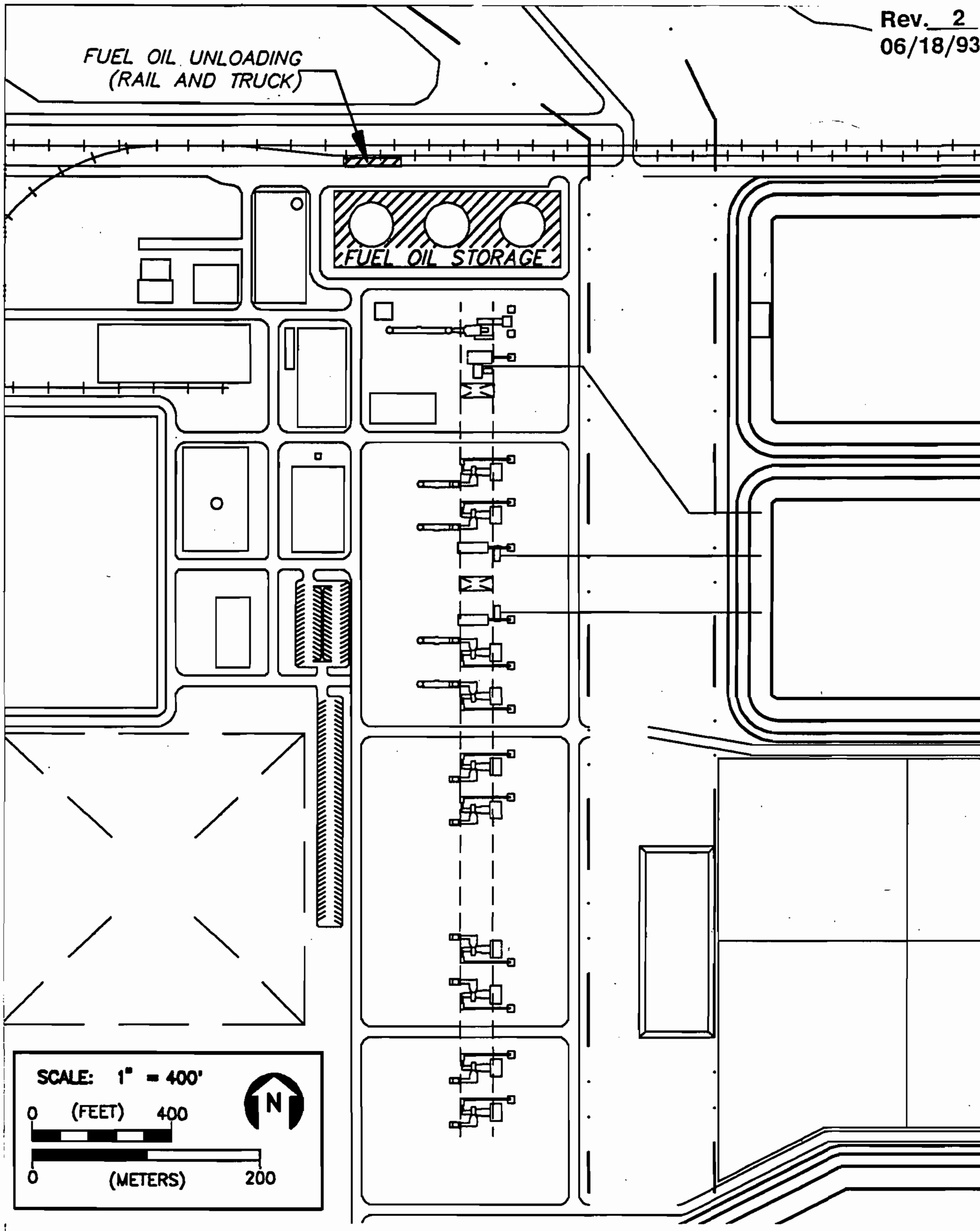


FIGURE 1.

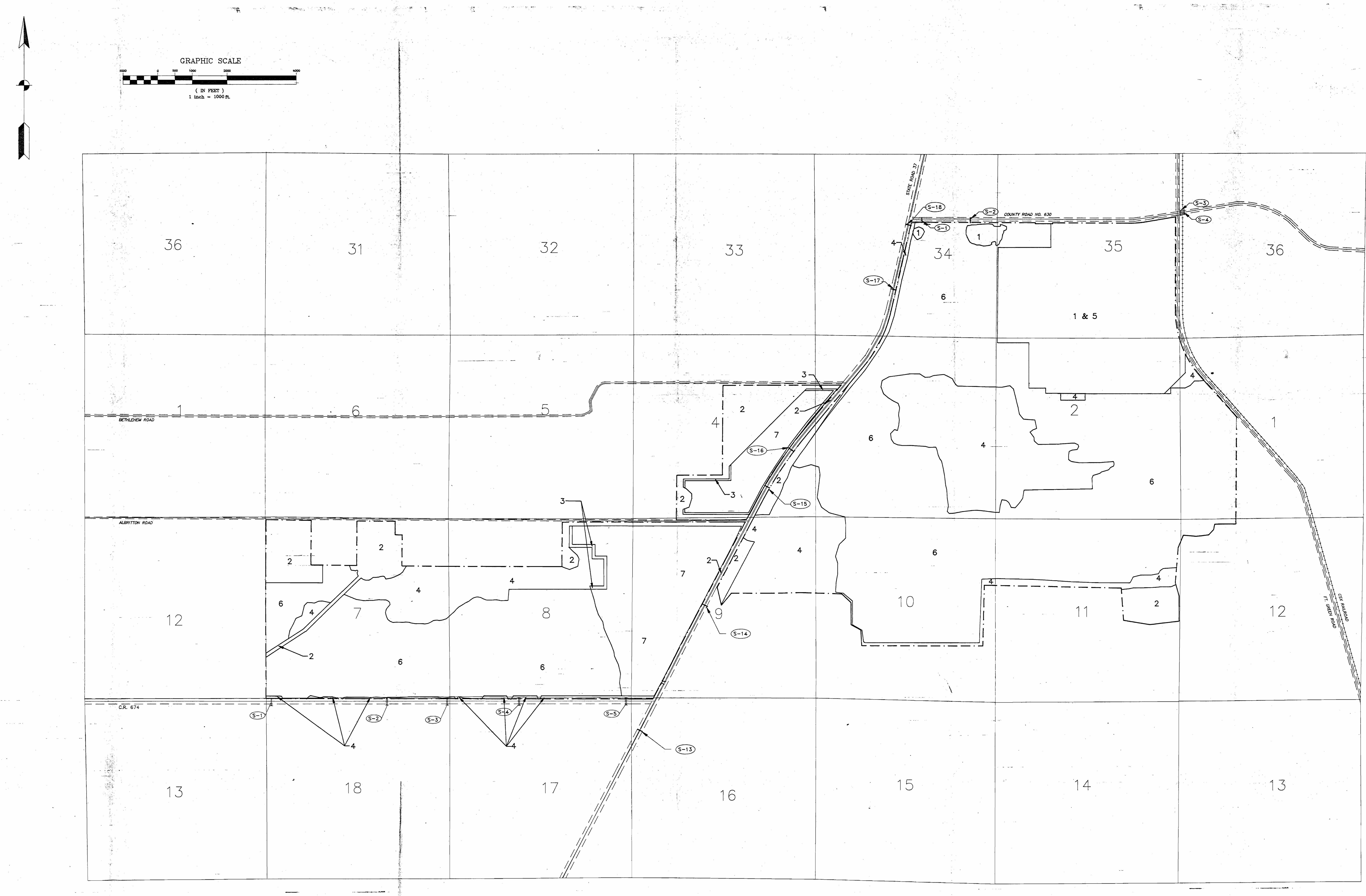
POLK POWER STATION FUEL OIL STORAGE LOCATION

Source: ECT, 1992.

TAMPA ELECTRIC
A TECO ENERGY COMPANY

POLK POWER STATION

0550018-A0
(1)



LEGEND

MAJOR ROADWAYS
PROPERTY BOUNDARY (LESS ROW)
RECLAMATION STATUS BOUNDARY

RECLAMATION LIABILITY BY PARCEL

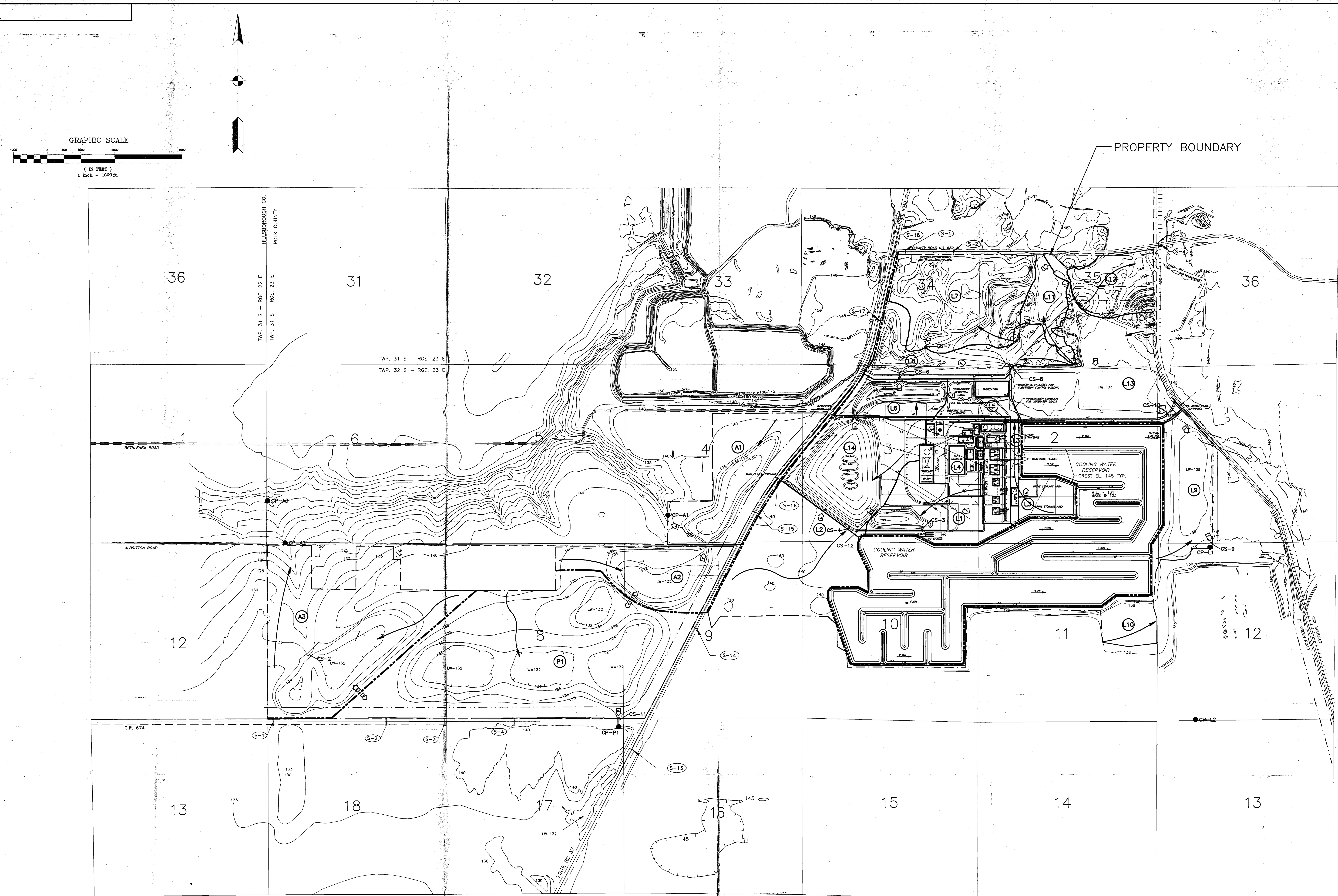
CURRENT OWNER	MAN.	NON MAN.	SUBTOTAL
AGRICO	3573	0	3573
AmCy/IMCF	248	0	248
AmCy (AGR FG84(3))	4	0	4
AmCy OTHER	0	523	523
SUBTOTAL	3825	523	4348

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	TAMPA ELECTRIC COMPANY POLK POWER STATION PROJECT A TECO ENERGY COMPANY
SOURCE: ECT		
DATE: 6/16/93	SCALE: 1 in = 1000 ft	ECT Environmental Consulting & Technology, Inc. / United Engineers & Constructors A Raytheon Company
FILE: STATMP4	PROJECT: 90263-0404	

055C018-A0
2



LEGEND

- PROJECT BOUNDARY
- 140 ELEVATION CONTOUR
- CP-A1 CRITICAL POINT
- S-5 EXISTING DRAINAGE STRUCTURES
- CS-3 PROPOSED POSTRECLAMATION DRAINAGE STRUCTURES
- 1 DRAINAGE BASIN NO.
- FLOW PATHS
- WATERSHED DIVIDE
- L 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
AGRICO	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

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	
	50 FT WEIR	135.12	
CS-2	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-12	300 FT. BERM	135.00	
CS-13	THREE 42 INCH CULVERTS	133.00	132.80
PAYNE CREEK			
CS-11	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 ROOKS' AERIAL MAPPING, UE&C, IMC FERTILIZER, TAMPA ELECTRIC COMPANY, AND AGRICO

FIGURE:	6	TITLE:	POST RECLAMATION TOPOGRAPHY & DRAINAGE
SOURCE:	ECT/UEC		
DATE:	06/15/93	SCALE:	1 in = 1000 ft
FILE:	PSTTOP20	PROJECT:	90263-0407

TAMPA ELECTRIC COMPANY
POLK POWER STATION PROJECT
A TECO ENERGY COMPANY

ECT
Environmental Consulting & Technology, Inc.

United Engineers & Constructors
A Raytheon Company

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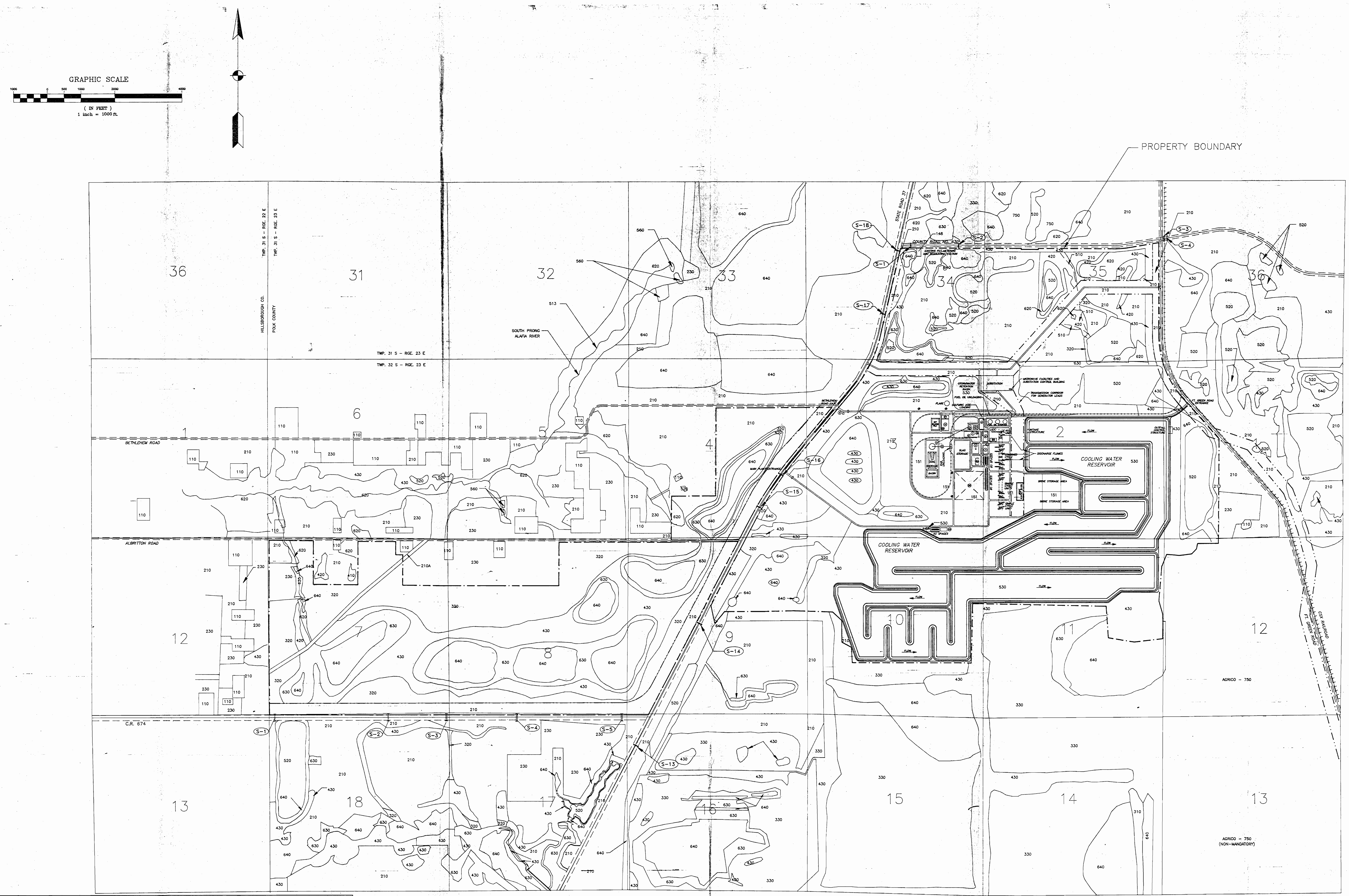

POST RECLAMATION VEGETATION WITHIN PROJECT BOUNDARY

		NON-MANDATORY ACRES	MANDATORY ACRES	TOTAL ACRES
140	TRANSPORTATION	0	3	3
148	GAS TRANSMISSION SUBSTATION	0	1	1
151	ELECTRICAL POWER FACILITY	0	306	306
210A	PASTURE OVER GAS TRANSMISSION LINE	0	13	13
210	PASTURE	211	524	735
230	CITRUS	0	18	18
320	SHRUBLAND	4	548	552
330	MIXED RANGELAND	6	0	6
420	UPLAND HARDWOOD FOREST	29	27	56
430	UPLAND MIXED FOREST	34	733	767
520	LAKES	165	87	252
530	RESEVOIRS	0	840	840
620	WETLAND HARDWOOD FOREST	40	21	61
630	WETLAND MIXED FOREST	11	299	310
640	HERBACEOUS WETLAND	23	405	428
		TOTAL 523	TOTAL 3825	TOTAL 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 IGCC WASTEWATER TREATMENT

NOTES:

1. COOLING WATER RESERVOIR MAKEUP TO BY SUPPLIED BE GROUND...
2. POST RECLAMATION VEGATATION 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			
DATE: 06/15/93	SCALE: 1 in = 1000 ft	ECT Environmental Consulting & Technology, Inc.	United Engineers & Constructors A Raytheon Company
FILE: POSTVG20	PROJECT: 90263-0407		

KBN

August 15, 1994

Mr. Murray T. Brinson
Vice President, Sugar Processing
U.S. Sugar Corporation
P.O. Drawer 1207
Clewiston, FL 33440

Re: Revision of Reasonably Available Control Technology (RACT) Limits
U.S. Sugar Corporation, Bryant Mill

Boiler No. 1	AO50-191891
Boiler No. 2	AO50-191899
Boiler No. 3	AO50-182890

Dear Mr. Brinson:

United States Sugar Corporation (U.S. Sugar) owns a sugar cane processing mill in Palm Beach County which includes four primarily bagasse-fired boilers and associated facilities (Bryant Mill). On March 8, 1994, the Florida Department of Environmental Protection (FDEP) issued air operation permit amendments for U.S. Sugar's Bryant Boilers 1, 2, and 3 to specify compliance test requirements and methods, as well as to incorporate reasonably available control technology (RACT) emission limits. The limits in the amendments were set at the maximum emission rates allowed under the Department's revised RACT rule, 17-296.570, Florida Administrative Code (F.A.C.): 5.0 pounds per million British thermal units (lb/MMBtu) for volatile organic compound (VOC) emissions and 0.9 lb/MMBtu for nitrogen oxide (NO_x) emissions.

Based on KBN's evaluation of test data obtained from U.S. Sugar boilers and other boilers operated throughout the sugar industry during the past two crop seasons, U.S. Sugar is requesting that the permit amendments for Bryant Boilers 1, 2, and 3 be revised to incorporate emission limits lower than those contained in the RACT rule for carbonaceous fuel-fired boilers. These lower limits have been determined after careful consideration of the test data obtained using EPA Method 7E to determine NO_x emissions and EPA Method 25A to determine VOC emissions, with EPA Method 18 used to identify and subtract out the methane emissions. Methane generally constitutes more than half of the VOC levels in the emissions from these and other industry bagasse-fired boilers.

The following discussion presents the VOC and NO_x test data obtained for the Bryant mill, the proposed RACT limits, and proposed test methods to demonstrate compliance.

KBN ENGINEERING AND APPLIED SCIENCES, INC.

1034 Northwest 57th Street, Gainesville, Florida 32605, 904-331-9000, FAX 904-332-4189
5405 West Cypress Street, Suite 215, Tampa, Florida 33607, 813-287-1717 FAX 813-287-1716
1801 Clint Moore Road, Suite 105, Boca Raton, Florida 33487, 407-994-9910, FAX 407-994-9393
6821 Southpoint Drive North, Suite 216, Jacksonville, Florida 32216, 904-296-9663 FAX 904-296-0146
1616 'P' Street N.W., Suite 450, Washington, D.C. 20036, 202-462-1100, FAX 202-462-2270

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Test Data From Bryant Mill
A summary of the test data from the three U.S. Sugar boilers (Boilers 1, 2, and 3) at the Bryant Mill that are subject to regulation under the RACT rule is presented in Table 1. Tests were conducted when firing bagasse in the boilers. Test data from all three boilers were grouped together in Table 1 since these boilers are of similar design and capacity.

NO_x Test Data
All NO_x emission tests were conducted using EPA Method 7E. This is a continuous emission monitoring method. As shown in Table 1, a total of 13 individual test runs were performed. Test runs were generally 2 hours in duration. NO_x emission levels were low and averaged 0.15 lb/MMBtu for the three Bryant boilers. The NO_x emissions test data reflect a variability ranging from 0.093 to 0.251 lb/MMBtu for individual test runs. Test results from the sugar industry as a whole showed a broader range of NO_x emissions up to 0.33 lb/MMBtu.

VOC Test Data
All VOC emission tests were conducted using a combination of EPA Methods 25A and 18. Method 25A is a continuous emission monitoring method which measures total hydrocarbons. Method 18 is a gas chromatograph method which provides the relative concentration of methane in the gas stream. Based on the results from Methods 25A and 18, the total non-methane VOC emissions are obtained.

The Department recently issued a guidance memorandum discussing the appropriate use of VOC analytical Methods 18, 25 and 25A (DARM-EM-02, dated March 17, 1994). The enclosed letter from Steve Neck of Air Consulting and Engineering, Inc. (Attachment A), examines the use of these methods for analysis of sugar industry VOC emissions and concludes that Methods 18 and 25A provide the proper analytical approach under the guidelines established by the Department.

As shown in Table 1, a total of 13 individual test runs were performed. Test runs were generally 2 hours in duration. VOC emission levels are shown to be generally more variable than NO_x emissions. The VOC emissions averaged 0.10 lb/MMBtu for the three boilers. The VOC emissions ranged from 0.022 to 0.285 lb/MMBtu for individual test runs. For the sugar industry as a whole, VOC emissions ranged from 0.0 to 2.29 lb/MMBtu.

Proposed RACT Limits
Based on evaluation of these test data, U.S. Sugar proposes the following revised RACT limits for Boiler Nos. 1, 2, and 3 at Bryant:

NO_x (carbonaceous): 0.45 lb/MMBtu
VOC (carbonaceous): 1.5 lb/MMBtu

It is emphasized that the NO_x and VOC limits being proposed are based upon the use of Method 7E to determine NO_x emissions and Methods 25A/18 to determine VOC emissions.

In order to demonstrate compliance with the RACT limits, U.S. Sugar proposes to perform an annual compliance test.

Proposed Test Methods

For the purpose of conducting annual stack tests on the U.S. Sugar Bryant boilers, Reference Methods 25A and 18 are proposed for VOC emissions, and Reference Method 7E is proposed for NO_x emissions. These methods were used to obtain all of the test data described and analyzed for the sugar industry.

Method 25A is a flame ionization technique which measures total hydrocarbons. Method 18 is a gas chromatograph technique which measures the methane content of the gas stream. By taking the difference between the Method 25A and Method 18 results, the non-methane hydrocarbon emission rates are obtained. In regard to ozone nonattainment areas, the definition of VOC excludes methane because this compound is not sufficiently reactive to serve as an ozone precursor.

Method 7E is a continuous instrumental method. It is the method of choice for NO_x emissions monitoring because of its ability to provide on-site NO_x data while testing is being performed.

U.S. Sugar appreciates the Department's cooperation during the RACT determination and would be glad to answer any questions you may have concerning this submittal.

Sincerely,

David A. Buff

David A. Buff, P.E.
Principal Engineer

DAB/abb

cc: File (2)

Table 1. Summary of NOx and VOC Emission Tests Performed on Bagasse Boilers at U.S. Sugar Corporation - Bryant, 92/93 and 93/94 Crop Seasons.

Mill/Boiler	Boiler Type	NOx Emissions (lb/MMBtu)				VOC Emissions (lb/MMBtu)			
		Number of Test Runs	Minimum	Average	Maximum	Number of Test Runs	Minimum	Average	Maximum
U.S. Sugar Corporation - Bryant									
Boiler 1, 2, 3	Vibrating Grate	13	0.093	0.145	0.251	13	0.022	0.103	0.285

ATTACHMENT A

ACE
AIR CONSULTING
& ENGINEERING, INC.
2106 N.W. 67th Place • Suite 4 • Gainesville, Florida • 32606
(904) 335-1889 FAX (904) 335-1891

August 4, 1994

Mr. David Buff
KBN Engineering and Applied Sciences
1034 NW 57th Street
Gainesville, FL 32605

REF: Use of Method-25A and Method-18 for measurement of VOC emissions from bagasse-fired boilers.

Dear Mr. Buff:

We have reviewed the Florida Department of Environmental Protection (FDEP) guidance memorandum DARM-EM-02 (Attachment-1) in light of the extensive work we have done over the years with bagasse-fired boilers in the sugar industry. While this memo states that EPA "Method-25 is the recommended method for measuring non-methane organic emissions from stationary sources . . . -especially combustion sources", it also recognizes the significant positive interference experienced when testing sources with (percent moisture) x (percent carbon-dioxide) products greater than 100. The extent of this interference was noted in a U.S. EPA Memorandum dated October 25, 1993 from Mr. John B. Rasnic, Director of the Stationary Source Compliance Division, Office of Air Quality Planning and Standards (Attachment-2). Rasnic's memorandum indicates that the magnitude of the positive interference caused by high carbon dioxide (>10%) in the presence of high moisture (>10%) can be as high as 150 ppm.

Extensive testing conducted during the 1993-1994 crop season on sugar industry boilers showed that boiler exhausts routinely have carbon dioxide levels of 8-14% with moisture levels of 20-30%, and total non-methane organic concentrations of 50-1000 ppm. The resultant (percent moisture) x (percent carbon-dioxide) products range from 160-420. Thus, there is ample potential for very significant positive interference when using Method-25 on these sources.

The only other commonly applied approved test method for evaluating total gaseous non-methane organic (TGNMO, also called volatile organic compounds or VOC) emissions is EPA Method-25A. However, to accurately determine the non-methane hydrocarbon emissions, the Method-25A results must be corrected for the methane contribution to the flame ionization detector (FID) response by using Method-18 to measure methane. This is done because methane is not considered a reactive hydrocarbon ozone precursor and is not regulated under VOC emission standards.

Our experience with bagasse fired boilers has consistently shown that approximately 50% of the total carbon present as hydrocarbons is in the form of methane. Attachment-3 shows a plot of results from 251 tests of sugar industry boiler emissions during the 1993-1994 crop season using Method-25A and Method-18 for total hydrocarbons and methane, respectively.

Currently no test method is specified to determine VOC emissions from bagasse-fired boilers under F.A.C. 17-296 or 17-297. Both Method-25A and Method-18 have been approved by FDEP and incorporated by reference in the Florida Administrative Code (17-297.401). It has generally been the practice of the FDEP to allow any promulgated test method under such circumstances.

Because of Method-25's potential for significant positive bias when applied to bagasse fuel emissions, we recommend that Method-25A, corrected for methane using Method-18, be used to determine VOC emissions from bagasse-fired boilers.

We make this recommendation although we are fully aware that Method-25A measures the response of a FID to the total hydrocarbon content of the sample gas stream, and that the FID response is not universal or linear with respect to hydrocarbons and carbon content when compared to a chosen calibration gas such as propane in air. We feel that these limitations are less severe than the potential problems associated with the use of Method-25 for these sources.

In this context, one should consider that no emission test method is exact. Frequently, the measurement method is used to define the "pollutant" and set emission standards. For example, particulate matter (PM) is defined as any material that is retained on a 0.1 µm glass fiber filter heated to 250±25°F. This definition is based on the standard measurement method (Method-5) for PM. Following this approach, we feel that it is consistent to accept a VOC RACT standard that is defined by a specific test method, i.e. EPA Method-25A corrected for methane using EPA Method-18. This is also consistent with the F.A.C. 17-297.310(147) definition of "VOC" which states "Volatile Organic Compounds may be measured by an EPA reference, equivalent or alternative method or by procedures specified under 40 CFR Part 60." This is almost identical to the definition of PM listed in F.A.C. 17-297.310(105).

Method-25A corrected for methane using Method-18 has been used extensively to monitor VOC emissions from bagasse-fired boilers for many years. Results from these measurements constitute the bulk of VOC emission data from this source category. We also note that various air permits issued to date, including RACT permits issued to U.S. Sugar Bryant and Talisman Sugar Corporation, specifically authorize EPA Method-25A as a compliance test method.

Respectfully,

AIR CONSULTING AND ENGINEERING, INC.

Stephen L Neck

Stephen Neck, P.E.

attachments

ACE File 236-gen

ATTACHMENT 1

Memorandum

Florida Department of
Environmental Protection

DARM-EM-02

TO: District Air Program Administrators
County Air Program Administrators
Bureau of Air Regulation Engineers

FROM: Howard L. Rhodes, Director
Division of Air Resources Management

DATE: March 17, 1994

SUBJECT: Guidance on The Use of EPA Methods 18, 25 and 25A for Measuring Gas Stream Volatile Organic Compounds (VOC) Concentration

This memo is to provide guidance concerning the appropriate EPA methods for use in the measurement of VOC concentrations. The commonly used methods are EPA Methods 25 and 25A, and occasionally EPA Method 18. This memo does not preclude the requirement for obtaining an Alternate Standard or Procedure (ASP) per 17-297.620, F.A.C.

Method 25 is the recommended method for the measurement of total gaseous nonmethane organic emissions from most air pollution sources - especially combustion sources. The lower limit of detection for EPA Method 25 is 50 ppmv as carbon. The presence of water vapor and carbon dioxide may positively bias (observed emissions higher than true emissions) the results of the method. Pursuant to 40 CFR 60 Appendix A, the bias is not considered to be significant if the product of the volumetric concentrations of water vapor and carbon dioxide is not greater than 100. For example, the bias is not significant for a source having 10 percent CO_2 and 10 percent water vapor, but it would be significant for a source near the detection limit having 10 percent CO_2 and 20 percent water vapor. EPA Method 25 shall be the required VOC measurement technique whenever it is required by Chapter 17-296, F.A.C., or 17-297, F.A.C., or an applicable federal NSPS or NESHAP. It shall also be the required VOC measurement technique for combustion sources, sources controlled by VOC incinerators (afterburners), and sources that emit an unknown mix of organic compounds. Any owner who wants to use another measurement technique (i.e., EPA Method 25A) in lieu of EPA Method 25 must apply for and obtain approval of an ASP.

Method 25A is the recommended method for measurement of compounds consisting of only carbon and hydrogen, or a single organic solvent if the analyzer used during the testing is calibrated for this solvent. EPA EMTIC Guideline Document EMTIC GD-011 and the attached EPA memo dated October 25, 1993, recommends the use of EPA Method 25A if the VOC concentration at the outlet of an incinerator is less than 50 ppmv as carbon. However, the presence of partially oxidized organic compounds in a combustion source or VOC incinerator (afterburner) may cause the results obtained with Method 25A to be biased low. EPA Method 25A shall be the required VOC measurement technique whenever it is required by Chapter 17-296, F.A.C., or 17-297, F.A.C., or an applicable federal NSPS or NESHAP. Any owner who wants to use another measurement technique in lieu of EPA 25A must apply for and obtain approval of an ASP.

EPA Method 18 applies to the analysis of approximately 90 percent of the total gaseous organic compounds emitted from an industrial source. It is an extremely flexible procedure and is primarily used for the measurement of emissions from sources in the synthetic organic chemical manufacturing industry. EPA Method 18 shall be the required VOC measurement technique whenever it is required by Chapter 17-296, F.A.C., or 17-297, F.A.C., or an applicable federal NSPS or NESHAP. Any owner who wants to use another measurement technique in lieu of EPA Method 18 must apply for and obtain approval of an ASP.

If the estimated concentration of VOC emissions from the exhaust of a combustion source (incinerator/afterburner) are estimated to be less than 50 ppmv as carbon, the owner may request approval to use EPA Method 25A in lieu of EPA Method 25. The request must be accompanied by the results of simultaneous EPA Method 25 and EPA Method 25A compliance tests which meet all applicable audit requirements. In order to be acceptable the tests must be conducted at 90 to 100% of the maximum permitted capacity, and the EPA Method 25 must pass the required audit, produce EPA Method 25A results that are less than 50 ppmv, and also produce EPA Method 25 results that are not greater than 75 ppmv as carbon. The use of EPA Method 25A for subsequent compliance tests may be approved through the process for alternate standards or procedures under those circumstances.

If it is deemed desirable to subtract methane from the total hydrocarbons measured by EPA Method 25A, EPA Method 18 should be required to identify and measure most (~90%) of the hydrocarbons. EPA Method 18 will determine the degree of negative bias due to partially oxidized/chlorinated organic compounds.

The approval of alternate test methods is handled by the Emissions Monitoring Section. Any questions on the ASP process should be referred to Mike Harley at SC 278-1344 or (904) 488-1344.

HLR/sa/cjh

ATTACHMENT 2

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

AIR PROGRAMS BRANCH

RECEIVED

OCT 27 1993

OFFICE OF AIR AND RADIATION

EPA-REGION IV
ATLANTA, GA.

OCT 25 1993

MEMORANDUM

SUBJECT: EPA's VOC Test Methods 25 ~~and~~ 25A

FROM: John B. Rasnic, Director Richard Biondi /for
Stationary Source Compliance Division
Office of Air Quality Planning and Standards

TO: Air, Pesticides, and Toxics Management Division Directors
Regions I and IV

Air and Waste Management Division Director
Region II

Air, Radiation, and Toxics Division Director
Region III

Air and Radiation Division Director
Region V

Air, Pesticides, and Toxics Division Director
Region VI

Air and Toxics Division Directors
Regions VII, VIII, IX and X

As a result of requests from industry, Regional Offices and State programs, we have reviewed our guidance regarding the use of Methods 25 and 25A for measuring gas stream volatile organic compounds (VOC) concentration. Information obtained during this review has resulted in the following revised guidance, which is effective immediately and which supersedes all previous guidance on this matter. This revision has been coordinated with the other divisions within the Office of Air Quality Planning and Standards.

The EPA has decided to add an option 3 to permit further the use of Method 25A in lieu of Method 25 under certain conditions. Therefore, our new guidance is as follows. The EPA mandates the use of Method 25 for measuring gas stream VOC concentration when determining the destruction efficiency (DE) of afterburners. It also allows the use of Method 25A, in lieu of Method 25, under any of the following circumstances: 1) when the applicable regulation

METHOD 25

INTRODUCTION: Method 25 is the best method for gas streams where organic concentrations are greater than 100 ppm and moisture is either less than 5% with an associated high CO_2 concentration (>5%) or less than 10% with an associated low CO_2 (<5%). The interference which results from CO_2 dissolving in condensed moisture can bias the results high as much as 150 ppm in the presence of moisture concentrations exceeding 10%.

METHODOLOGY: In Method 25, volatile organic carbon (VOC) sample is collected by drawing gases from an emitting source through a heated stainless steel sample probe followed by a glass fiber filter maintained at 250 ± 5°F, which removes particulate carbon from the sampling stream. The VOC sample stream is then drawn through a dry ice cooled stainless steel U-tube condenser packed with quartz wool. In this portion of the train, "condensable" organics are collected. The lighter volatiles then travel through a valve rotameter to an evacuated four liter stainless steel tank. The tank sample represents the "non-condensable" portion of the collected sample. A sample is taken at a constant flow rate over usually a one-hour period. Following each test run, the sample train is disconnected, the trap and tank portions sealed, and the traps are stored on dry ice until analyses are performed.

APPLICABILITY: The minimum detectable for the method is 50 ppm as carbon. At the outlet of a thermal or catalytic incinerator, if functioning correctly, the VOC concentration should be quite low (<50 ppm as C). Hence, the method, even though appropriate for measuring inlet concentrations, would not give good results for outlet concentrations less than 50 ppm.

In an attempt to control the quality of EPA Method 25 stack test results, EPA initiated a program to develop audit material to assess the accuracy of Method 25 sampling and analysis procedures. The audit gas sampling/analysis program has some shortcomings, which are being looked into by an EPA contractor.

DEP, when evaluating a Method 25 stack test result, determines how the test results are possible biased upon the audit sample result.

limits the exhaust VOC concentration to less than 50 ppm; 2) when the VOC concentration at the inlet of the control system and the required level of control are such to result in exhaust VOC concentrations of 50 ppm or less; or 3) if, because of the high efficiency of the control device, the *anticipated* VOC concentration at the control system exhaust is 50 ppm or less, regardless of the inlet concentration.

Further, if a source elects to use Method 25A under option 3, above, the exhaust VOC concentration must be 50 ppm or less and the required DE must be met for the source to have demonstrated compliance. If the Method 25A test results show that the required DE apparently has been met, but the exhaust concentration is above 50 ppm, this is an indicator that Method 25A is not the appropriate test method and that Method 25 should be used.

BACKGROUND

The primary industry impacted by this policy is the printing industry, which has consistently claimed that the Method 25 test procedure is too expensive and cumbersome to be used as a compliance demonstration tool. They have stated that current state-of-the-art technology afterburners routinely achieve 98-99 percent destruction efficiency, generally significantly greater than is required by regulations. As a result, control system outlet VOC concentrations are commonly less than 50 ppm, regardless of the inlet concentration.

Regulations which specify performance requirements for the subject control systems have typically been based on older technology, which was less efficient than current technology. We agree with the printing industry's claim that VOC destruction technology currently available can perform at greater levels than as specified by the regulations. It is therefore appropriate to revise our guidance on the usage of these compliance demonstration methods.

This guidance specifies the circumstances under which Method 25 and Method 25A are to be used. It will reduce the administrative burden on a significant number of regulated industrial sources but will not reduce the stringency of any currently applicable regulatory requirements.

cc: OAQPS Division Directors

METHOD 25A

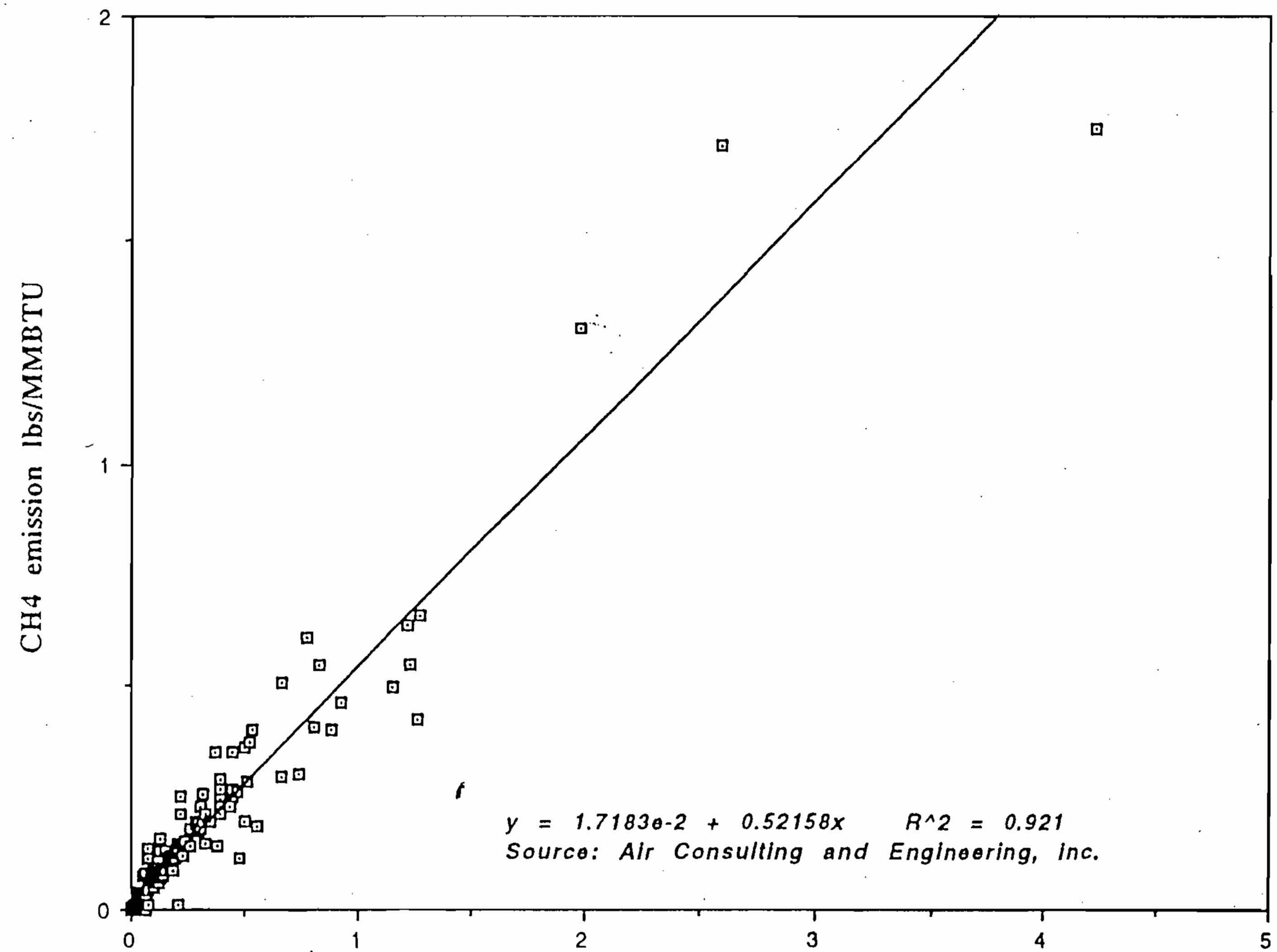
INTRODUCTION: Method 25A is a better method for measuring hydrocarbon concentrations greater than 2 ppm and less than 100 ppm. The method gives good results when the hydrocarbons are all hydrogen and carbon. When applied to measuring hydrocarbons containing oxygen, nitrogen, and chlorine, the efficiency of the method is reduced.

METHODOLOGY: A gas sample is drawn from the source through a heated sample line, if necessary, and glass fiber filter to a flame ionization analyzer (FIA). Results are reported as volume concentrations equivalents of the calibration gas or as carbon equivalents.

APPLICABILITY: The flame ionization analyzer (FIA) can be easily calibrated if dealing with a known mixture containing one or two compounds. The difficulty rises when confronted with an unknown mixture. Generally, in these cases, FIA cannot reasonably measure true mass. Also, in sources where incineration is used as a control measure, oxygenated hydrocarbons may be present in the exit mixture. The FIA response for the oxygenated compounds is biased low, thereby introducing an error.

Boiler Emission Data from 251 Emission Tests, 1993-1994 Sugar Industry Production Season

ATTACHMENT 3



THC emissions lbs/MMBTU

UNITED STATES SUGAR CORPORATION
Post Office Drawer 1207 Clewiston, Florida 33440
Telephone: (813) 983-8121 Telex: 510-952-7753

August 16, 1994

Mr. Clair Fancy
Bureau Chief
Bureau of Air Regulation
Florida Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, Fl. 32399-2400

RE: Revision of RACT Limits and Test Methods
U. S. Sugar Corporation - Bryant Mill

Boiler No. 1 - AO50-191891
Boiler No. 2 - AO50-191899
Boiler No. 3 - AO50-182890

Dear Mr. Fancy::

The United States Sugar Corporation (U. S. Sugar) requests that the Department approve revised reasonably available control technology (RACT) emission levels for volatile organic compounds (VOCs) and nitrogen oxides (NOx) applicable to the above-referenced bagasse-fired boilers. These levels -- 1.5 lb/MMBtu for VOCs and 0.45 lbs/MMBtu for NOx -- are based on an industry-wide testing program conducted during the most recent sugar cane crop season. The results of the testing program and the proposed emission limits are described in the enclosed letters prepared in conjunction with U. S. Sugar's consultants and pursuant to earlier consultation with the Bureau of Air Regulation.

Based on the results of the testing program, and the Department's recently-issued guidelines for VOC testing, U.S. Sugar also proposes to use EPA Method 25A in conjunction with EPA Method 18 to determine nonmethane VOC emissions from bagasse boilers.

If the request is approved, we ask that the Bryant RACT amendments be revised to read as follows:

SPECIFIC CONDITIONS 11-13 (No changes to the other conditions)

11. Volatile Organic Compound (VOC) emissions shall not exceed 1.5 pounds per million Btu heat input. [Requested by permittee.]

12. Nitrogen Oxides (NOx) emissions shall not exceed 0.45 pounds per million Btu heat input. [Requested by permittee.]

13. U.S. Sugar shall test this boiler for VOCs and NOx on an annual basis within 60 days of the date of January 1. Each compliance test shall be conducted in

accordance with 40 CFR 60, appendix A, using the method indicated [Rule 17-297.340(1) (d), F.A.C.]:

(A) VOC - EPA Method 25A in conjunction with EPA Method 18 to determine nonmethane VOC.

(B) NOx - EPA Method 7 or 7E.

We appreciate your attention to this matter and the time devoted by the Department to resolving your concerns and those of the sugar industry, and U. S. Sugar Corporation in particular, with respect to these permits.

Very truly yours,

UNITED STATES SUGAR CORPORATION

Murray T. Brinson

Murray T. Brinson
Vice President
Sugar Processing

MTB:jt

Enclosures

cc: Ronald D. Blackburn - DEP, South District
Arthur Lyle - DEP, South District
A.J. Satyal - P.B. Co. Dept.of Health
Jeff Braswell, Esq. - DEP Tallahassee
Peter Briggs - USSC
David Buff - KBN
Steve Neck - ACE
Robert F. Van Voorhees - Bryan Cave

File: \WS\Fancy-DEP

SITE CERTIFICATION APPLICATION
AND
ENVIRONMENTAL INFORMATION DOCUMENT

PLAN OF STUDY

W. C. MACINNES STATION
ELECTRIC POWER
GENERATION FACILITY

Submitted to the:

State of Florida Department of Environmental Regulation, U.S. Environmental Protection Agency, and Other Appropriate Federal, State, and Local Agencies

By:

TAMPA ELECTRIC
A TECO ENERGY COMPANY
P.O. Box 111 Tampa, Florida 33601

SITE CERTIFICATION APPLICATION
AND
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Submitted to the
State of Florida Department of Environmental Regulation,
U.S. Environmental Protection Agency,
and
Other Appropriate Federal, State, and Local Agencies

By
Tampa Electric Company
P.O. Box 111
Tampa, Florida
February 1982

TABLE OF CONTENTS

Section	Title	Page
1	GENERAL STUDY DESCRIPTION	1- 1
	1.1 Introduction	1- 1
	1.2 Plan of Study Development	1- 2
	1.3 Permitting Phases	1- 2
2	PROJECT DESCRIPTION	2- 1
	2.1 Site	2- 1
	2.2 Plant	2- 1
3	SITE CERTIFICATION APPLICATION AND ENVIRONMENTAL INFORMATION DOCUMENT TABLE OF CONTENTS	3- 1
4	ENVIRONMENTAL STUDY PLANS	4- 1
	4.1 Air Quality/Meteorology	4- 1
	4.2 Surface Water Quality/Hydrology	4-10
	4.3 Hydrogeology	4-20
	4.4 Terrestrial Ecology	4-27
	4.5 Aquatic Ecology	4-37
	4.6 Socioeconomics/Land Use/Demography	4-48
	4.7 Archaeology	4-52
	4.8 Noise	4-54
5	ANALYTICAL LABORATORY SERVICES	5- 1
6	PROJECT SCHEDULE	6- 1
7	PROJECT TEAM AND CONTACTS	7- 1

Section 1

GENERAL STUDY DESCRIPTION

1.1 INTRODUCTION

In March 1981, Tampa Electric Company prepared a "Ten Year Site Plan For Electrical Generating Facilities and Associated Transmission Lines" for the period of January 1981 to December 1990. Based on this study the W. C. MacInnes site was designated as the preferred site for a coal-fired generating facility.

This Site Certification Application and Environmental Information Document (SCA/EID) Plan of Study for the plant and associated transmission lines has been prepared by Post, Buckley, Schuh & Jernigan, Inc. (PBS&J) under the direction of Tampa Electric Company. It is being submitted to the State of Florida Department of Environmental Regulation (FDER), the U.S. Environmental Protection Agency Region IV (EPA), and other appropriate local, state, and federal regulatory agencies for review and approval.

This Plan of Study is directed toward the following objectives:

1. To formally advise the regulatory agencies of Tampa Electric Company's intent to construct the plant;
2. To encourage timely agency input to the permitting process;
3. To generally describe the site and plant;
4. To present an outline for the SCA/EID;
5. To identify, describe, and organize the diverse activities required to gather, analyze, and report environmental information necessary for compliance with applicable regulations;
6. To establish the basis for the collection, interpretation, and utilization of information;
7. To define the project schedule; and
8. To describe the organization and management of the technical evaluations to be conducted.

The Plan of Study has been developed with the understanding that a single document, referred to as the SCA/EID, will satisfy the FDER requirements under the Florida Electrical Power Plant Siting Act, and EPA requirements under the National Environmental Policy Act.

1.2 PLAN OF STUDY DEVELOPMENT

In developing the sections of this Plan of Study, which detail the proposed outline for the SCA/EID (Section 3) and the Environmental Study Plans (Section 4), information from FDER guidelines for Application for Certification of Proposed Electric Power Generating Plant Site (FDER Form 17-1.122(72), January 1979), the report to EPA on Environmental Impact Assessment Guidelines for New Source Fossil Fueled Steam Electric Generating Stations (EPA-130/6-79-001, July 1979), and the Memorandum of Understanding between EPA and the FDER regarding power plant permitting, dated October 1, 1980 was considered. The SCA/EID outline presented in Section 3 reflects both federal and state requirements.

The Environmental Study Plans are organized by study discipline in Sections 4.1 - 4.8. Each section is further organized by tasks to be accomplished. Each task is described through a presentation of the task "Introduction", task "Objective", task "Scope of Work", and task "Use of Results". The "Use of Results" subsections reference other Environmental Study Plan tasks and/or specific sections of the SCA/EID.

For chapters/sections in the SCA/EID that are not covered by the wording in the specific Environmental Study Plans, the informational requirements of FDER Form 17-1.122(72) will be utilized.

1.3 PERMITTING PHASES

The environmental permitting procedure to be utilized by Tampa Electric Company consists of the following activities:

1. Field Investigations and Data Analysis - performance of detailed environmental field monitoring programs and analytical study programs meeting all requirements of the various regulatory agencies.

2. Permit Application Preparation - performed concurrently with Phase 1, consisting of the actual preparation, review, finalization, and submittal of the required local, state, and federal environmental permit applications for the selected site.

3. Permit Application Support Activities - includes responding to regulatory agency questions; providing testimony at public hearings; gathering, preparing, and analyzing required supplemental data for submittal to reviewing agencies; and other support functions as needed.

Section 2

PROJECT DESCRIPTION

2.1 SITE

The proposed W.C. MacInnes Station is located 10 miles southwest of Ruskin, Hillsborough County, Florida, on the eastern shore of Tampa Bay. The site is about 25 miles south of the city of Tampa and about 12 miles southeast of St. Petersburg, across Tampa Bay.

Figure 2-1 shows the site location and its contiguous areas. Two transmission line corridors will extend east of the site. The ultimate land area for the site is anticipated to contain approximately 3,200 acres. The maximum elevation is along the eastern edge of the site, reaching a maximum of 10 feet above mean sea level. The planned power facility will occupy approximately 600 acres and will probably be located in the western portion of the site.

Access to the site will be provided by U.S. Highway 41, which bisects the site, and by proposed railroad spurs from the Seaboard Coast Line Railroad. Barge deliveries of both fuel and large equipment will be made through facilities at Port Manatee, located approximately one-half mile south of the site.

2.2 PLANT

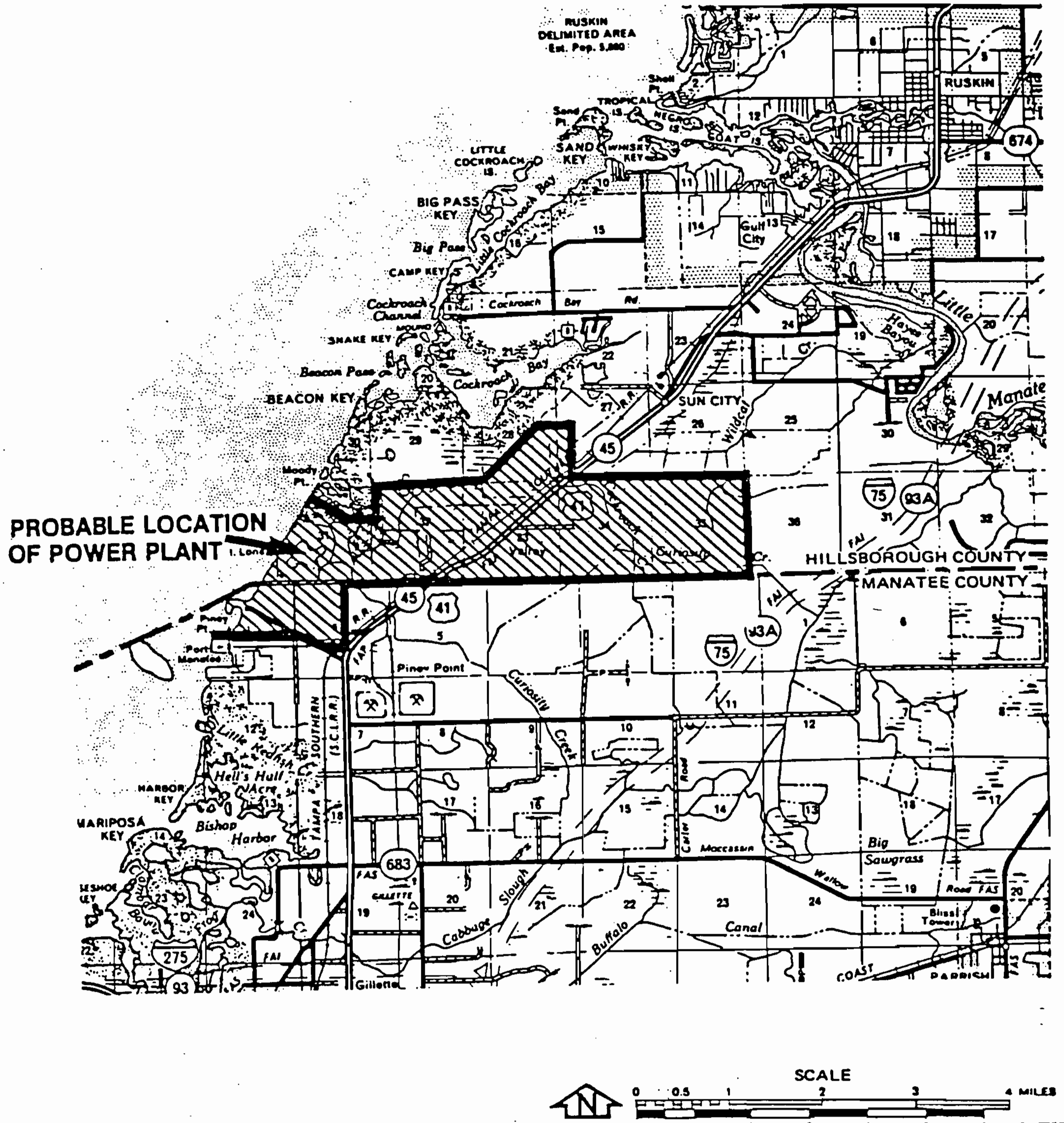
The proposed W.C. MacInnes Station Unit 1 is scheduled for commercial operation in 1990. This new coal-fired steam-electric generating unit will have a gross capacity of 500 megawatts (MW) and will be the first unit constructed at the proposed multi-unit site, which is capable of accommodating 3,200 MW.

Conceptually, the Unit 1 plant will be structural steel supported by pile foundations. The main structural mass will consist of an enclosed turbine hall and a boiler support structure. Large associated structures may include air pollution control devices, such as an electrostatic precipitator and a flue gas desulfurization system; and a heat dissipation system.

The plant will employ best available control technology (BACT), as it relates to the air quality control system, and best management practices (BMPs), as they relate to the handling of liquid and solid wastes. The plant will also employ best available technology (BAT), as it relates to the design and location of intake and discharge structures.

Design alternatives, such as once-through cooling and saltwater cooling towers, will be evaluated during the initial phase of the project, and the preferred conceptual design will be presented in the SCA/EID.

Directly associated transmission lines and site layouts will also be evaluated during the initial phase of the project, and the preferred alternatives will be presented.



SOURCE: TAMPA ELECTRIC COMPANY, MARCH 1981, TEN-YEAR
SITE PLAN FOR ELECTRICAL GENERATING FACILITIES AND ASSOCIATED TRANSMISSION LINES

FIGURE 2-1 TAMPA ELECTRIC COMPANY/W. C. MacINNES SITE

Section 3

SITE CERTIFICATION APPLICATION AND ENVIRONMENTAL INFORMATION DOCUMENT TABLE OF CONTENTS

Section	Title
1	Purpose of the Proposed Facility and Associated Transmission Lines
	1.1 System Demand and Reliability
	1.1.1 Load Characteristics
	1.1.1.1 Load Analysis
	1.1.1.2 Demand Projections
	1.1.1.3 Capacity Exchanges
	1.1.1.4 Conservation
	1.1.2 System Capacities
	1.1.3 Reserve Margins
	1.2 Other Objectives
	1.3 Consequences of Delay
2	The Site
	2.1 Site Location and Layout
	2.1.1 Maps
	2.1.2 Site Modifications
	2.1.3 Existing and Proposed Uses
	2.2 Land and Water Use
	2.2.1 Land Use
	2.2.1.1 Land Use Characterization
	2.2.1.2 Cultural and Historic Sites
	2.2.1.3 Archaeological Sites
	2.2.2 Water Use
	2.2.2.1 Groundwater
	2.2.2.2 Surface Water
	2.3 Socioeconomics
	2.3.1 Demographic Profile

TABLE OF CONTENTS (Continued)

Section	Title
2.3.1.1	Population Description
2.3.1.2	Employment and Income Statistics
2.3.2	Community Services Profile
2.3.2.1	Education
2.3.2.2	Health Care
2.3.2.3	Recreation
2.3.2.4	Public Safety
2.3.3	Infrastructure Profile
2.3.3.1	Housing
2.3.3.2	Highways
2.3.3.3	Public Utilities
2.3.3.4	Public Finance
2.4	Geology and Soils
2.4.1	Physiography
2.4.2	Regional Geology
2.4.2.1	Stratigraphy
2.4.2.2	Structure
2.4.3	Regional Seismic History
2.4.4	Site Geology
2.4.4.1	Surficial Deposits
2.4.4.2	Bedrock
2.4.4.3	Subsurface Soil and Rock Conditions
2.5	Hydrology and Water Quality
2.5.1	Surface Water
2.5.2	Groundwater
2.6	Meteorology
2.6.1	General Meteorology
2.6.2	Dispersion Meteorology
2.7	Air Quality
2.7.1	Standards
2.7.2	Baseline Air Quality
2.7.3	Existing Air Pollution Sources

TABLE OF CONTENTS (Continued)

Section	Title
	2.8 Aquatic Ecology
	2.8.1 Aquatic Environment in the Area
	2.8.2 Phytoplankton
	2.8.3 Zooplankton
	2.8.4 Ichthyoplankton
	2.8.5 Invertebrate Meroplankton
	2.8.6 Benthic Fauna
	2.8.7 Fisheries
	2.8.8 Emergent and Submergent Vegetation
	2.8.9 Important Species
	2.9 Terrestrial Ecology
	2.9.1 General Terrestrial Ecology
	2.9.1.1 Plant Communities
	2.9.1.2 Animal Communities
	2.9.2 Specific Description of the Terrestrial Environment of the Site Area
	2.9.2.1 Plant Communities
	2.9.2.2 Animal Community Associated with Plant Communities
	2.10 Other Environmental Features
	2.10.1 Noise
	2.10.2 Aesthetics
3	The Plant
	3.1 External Appearance
	3.2 Fuel
	3.2.1 Fuel Types
	3.2.2 Fuel Quantities
	3.2.3 Fuel Quality
	3.2.4 Fuel Handling and Storage
	3.3 Plant Water Use
	3.3.1 Makeup Demineralizer System
	3.3.2 Condensate Polishing Demineralizer System
	3.3.3 Cooling Water System
	3.3.4 Flue Gas Desulfurization (FGD) System
	3.3.5 Bottom Ash System

TABLE OF CONTENTS (Continued)

Section   Title

3.3.6 Fly Ash System
3.3.7 Other Water Uses

3.4 Heat Dissipation Systems

3.4.1 Intake and Outfall
3.4.2 Source of Cooling Water
3.4.3 System Design
3.4.4 Trash Disposal

3.5 Chemical and Biocide Wastes

3.5.1 Chemical

3.5.1.1 Water Treatment
3.5.1.2 Equipment Washing and Boiler Chemical Cleaning
3.5.1.3 Floor and Equipment Drainage
3.5.1.4 Boiler Blowdown
3.5.1.5 Cooling Tower Blowdown

3.5.2 Wastewater and Solid Waste Treatment Systems

3.5.2.1 Settling Ponds
3.5.2.2 Coal Pile Runoff System
3.5.2.3 Ash Handling System
3.5.2.4 Scrubber By-Product Handling System

3.5.3 Recycle System

3.6 Sanitary and Other Wastes

3.6.1 Volumes and Quality
3.6.2 Treatment and Disposal

3.7 Air Emissions

3.7.1 Combustion and Flue Gas Systems
3.7.2 Air Pollution Control System
3.7.3 Expected Emissions
3.7.4 Best Available Control Technology (BACT) Data

3.8 Directly Associated Transmission Lines

3.8.1 Route and Size
3.8.2 Structures
3.8.3 Land Use Impacts

TABLE OF CONTENTS (Continued)

Section | Title

3.8.4 Beneficial Uses
3.8.5 Associated Transmission Structures

3.9 Directly Associated Facilities
3.10 On-Site Drainage Systems

4 Environmental Effects of Site Preparation, Plant, and Associated Transmission Facilities Construction

4.1 Site Preparation and Plant Construction

4.1.1 Construction Areas

4.1.1.1 Site Layout During Construction
4.1.1.2 Construction Schedule

4.1.2 Land Impact
4.1.3 Impact on Human Populations

4.1.3.1 Noise
4.1.3.2 Air Quality
4.1.3.3 Inconveniences
4.1.3.4 Housing
4.1.3.5 Transportation
4.1.3.6 Educational Facilities

4.1.4 Work Force
4.1.5 Landmarks and Sensitive Areas
4.1.6 Water Bodies and Uses
4.1.7 Mitigating Measures
4.1.8 Benefits from Construction

4.2 Special Features

4.3 Construction of Directly Associated Transmission Facilities

4.3.1 Effects on Vegetation, Wildlife, and Aquatic Life
4.3.2 Landmarks and Sensitive Areas
4.3.3 New Roads
4.3.4 Erosion
4.3.5 Land Use
4.3.6 Other Effects
4.3.7 Mitigating Measures

4.4 Resources Committed

4.5 Construction of Other Associated Facilities

TABLE OF CONTENTS (Continued)

Section Title

5 Environmental Effects of Plant Operation

5.1 Effects of Operation of Heat Dissipation System

5.1.1 Receiving Water
5.1.2 Thermal Limits
5.1.3 Aquatic Life
5.1.4 Biological Effects of Modified Circulation
5.1.5 Offstream Cooling

5.2 Effects of Chemical and Biocide Discharges

5.2.1 Industrial Wastewater Discharges
5.2.2 Leachate
5.2.3 Cooling Tower Blowdown

5.3 Effects on Water Supplies

5.3.1 Drinking Water
5.3.2 Surface Water
5.3.3 Groundwater

5.4 Sanitary and Other Waste Discharges

5.5 Air Quality Impacts

5.5.1 PSD Increment Consumption
5.5.2 Ambient Air Quality Impact
5.5.3 Non-attainment and Class I Area Impact
5.5.4 Biological Effects

5.6 Effects of Operation and Maintenance of the Directly Associated Transmission System

5.6.1 Effects of Operation and Maintenance
5.6.2 Effects of Public Access

5.7 Associated Facilities and Other Effects

5.7.1 Effects of Associated Facilities

5.7.1.1 Transportation System
5.7.1.2 Materials Handling System

5.7.2 Other Plant Operation Effects

5.7.2.1 Land Use
5.7.2.2 Noise

TABLE OF CONTENTS (Continued)

Section	Title
	5.7.2.3 Aesthetics
	5.7.2.4 Stormwater Runoff
	5.8 Resources Committed
	5.8.1 Lost Resources
	5.8.2 Changes in Species Populations
	5.9 Variances
6	Environmental Measurements and Monitoring Programs
	6.1 General
	6.2 Pre-Application Monitoring
	6.2.1 Sampling Techniques
	6.2.2 Use of Published Data
	6.2.3 Use of Reports Developed by the Applicant
	6.2.4 Surface Waters
	6.2.4.1 Physical and Chemical Parameters
	6.2.4.2 Ecological Parameters
	6.2.5 Groundwater
	6.2.6 Air Quality/Meteorology
	6.2.7 Geology
	6.2.8 Archaeology
	6.2.9 Noise
	6.2.10 Terrestrial Biota
	6.3 Construction Monitoring
	6.3.1 Sampling Techniques
	6.3.2 Modifications
	6.3.3 Surface Waters
	6.3.4 Physical and Chemical Parameters
	6.3.5 Ecological Parameters
	6.3.6 Groundwater
	6.3.7 Air Quality
	6.3.8 Geology
	6.3.9 Archaeology
7	Economic and Social Effects of Plant Construction and Operation
	7.1 Socioeconomic Costs
	7.1.1 Plant Costs
	7.1.2 External Costs

TABLE OF CONTENTS (Continued)

Section	Title
	7.1.2.1 Community Services
	7.1.2.2 Infrastructure
	7.1.2.3 Community Character and Cohesion
	7.1.2.4 Aesthetics
	7.1.2.5 Commitment of Resources
	7.2 Socioeconomic Benefits
	7.2.1 Employment
	7.2.2 Income
	7.2.3 Tax Revenues
	7.2.4 External Benefits
	7.2.4.1 Community Services
	7.2.4.2 Infrastructure
	7.2.4.3 Aesthetics
	7.2.4.4 Research and Development
	7.2.4.5 Community Character and Cohesion
8	Alternative Energy Sources and Sites
	8.1 Assessment of Alternative Sites
	8.1.1 Introduction
	8.1.2 Identification of the Study Area
	8.1.3 Screening the Study Area to Identify Candidate Sites
	8.1.4 Ranking the Candidate Sites
	8.1.5 Selecting the Preferred Site and Alternate Sites
	8.1.6 Summary
	8.1.7 Conclusion
	8.2 Alternative Fuel Analysis
	8.2.1 Introduction
	8.2.2 Geothermal
	8.2.3 Fuel Cells
	8.2.4 Hydroelectric and Pumped Storage
	8.2.5 Solar Thermal
	8.2.6 Photovoltaic Cells
	8.2.7 Municipal Solid Wastes
	8.2.8 Fuels from Biomass
	8.2.9 Wind Power
	8.2.10 Magnetohydrodynamics
	8.2.11 Coal Gasification
	8.2.12 Coal Liquefaction

TABLE OF CONTENTS (Continued)

Section Title

8.2.13 Fusion Power
8.2.14 Oil and Natural Gas
8.2.15 Nuclear (Uranium)
8.2.16 Coal
8.2.17 Possible New Developments
8.2.18 Summary
8.2.19 Conclusion

9 Plant Design Alternatives

9.1 Condenser Cooling System

9.1.1 Design Objective and Regulatory Requirements
9.1.2 Heat Dissipation System Alternatives
9.1.3 Water Source Alternatives
9.1.4 Water Use Requirements
9.1.5 Intake System Alternatives
9.1.6 Discharge System Alternatives

9.2 Plant Water Systems

9.2.1 Design Objectives and Regulatory Requirements
9.2.2 Water Use Requirements
9.2.3 Water Source Alternatives

9.3 Wastewater Treatment System

9.3.1 Design Objectives and Regulatory Requirements
9.3.2 Sources of Plant Wastewater
9.3.3 Chemical Wastewater Treatment Alternatives
9.3.4 Biocide Treatment Alternatives
9.3.5 Sanitary Waste System Alternatives

9.4 Air Pollution Control System

9.4.1 Design Objectives and Regulatory Requirements
9.4.2 Sulfur Dioxide Control Alternatives
9.4.3 Particulate Control Alternatives
9.4.4 Nitrogen Oxides Control Alternatives
9.4.5 Other Air Emissions Control Alternatives

TABLE OF CONTENTS (Continued)

Section	Title
9.5	Solid Waste Disposal Systems
9.5.1	Design Objectives and Regulatory Requirements
9.5.2	Bottom Ash Disposal Alternatives
9.5.3	Fly Ash Disposal Alternatives
9.5.4	Scrubber By-Product Disposal Alternatives
9.6	Transmission Facilities
9.6.1	Design Objectives and Regulatory Requirements
9.6.2	Existing Facilities
9.6.3	Future Requirements
9.6.4	Transmission Systems Alternatives
9.7	Plant Location and Layout at the Proposed Site
9.7.1	Design Objectives and Regulatory Requirements
9.7.2	Plant Location Alternatives
9.7.3	Plant Layout Alternatives
9.8	Coal Handling Systems
9.8.1	Design Objectives and Regulatory Requirements
9.8.2	Existing and Committed Facilities
9.8.3	Requirements for New Facilities
9.8.4	Coal Handling System Alternatives

Section 4

ENVIRONMENTAL STUDY PLANS

4.1 AIR QUALITY/METEOROLOGY

4.1.1 Introduction

All major new sources of air pollutants regulated under the Clean Air Act must be approved by the U.S. Environmental Protection Agency (EPA) under federal Prevention of Significant Deterioration (PSD) review requirements. These requirements are contained in 40 CFR 52.21 (Federal Register, August 7, 1980) and the requirements of the Clean Air Act Amendments of 1977. Since the proposed W.C. MacInnes station is a major new source, it is required to undergo the following reviews related to PSD:

1. Control technology review, including determination of Best Available Control Technology (BACT) for each applicable pollutant, and compliance with emission standards and New Source Performance Standards (NSPS) under 40 CFR 60.

2. Source impact analysis, demonstrating compliance with federal and state Ambient Air Quality Standards (AAQS) and allowable PSD increments.

3. Air quality analysis, involving continuous ambient monitoring of applicable pollutants.

4. Additional impact analyses, including assessment of impacts on soils, visibility, and vegetation; and impacts due to growth in the area of the new source.

In early 1980, the Florida Department of Environmental Regulation (FDER) received administrative and technical review authority from EPA for the federal PSD new source review program.

In addition to the review under Clean Air Act requirements, the planned generating facility will also be subject to comprehensive air quality reviews under the National Environmental Policy Act (NEPA) and the Florida Electrical Power Plant Siting Act (EPPSA). Application requirements under the Florida EPPSA are contained in FDER Form 17-1.122(72). State of Florida air quality regulations, including state PSD regulations, are contained in Chapter 17-2, Florida Administrative Code (FAC).

4.1.2 Objectives

The overall objective of the air quality/meteorology evaluation will be to adequately address all federal, state, and local air quality standards and regulations. Specifically, the scope of work is designed to address the following, where applicable:

1. Federal Prevention of Significant Deterioration regulations (40 CFR 52.21).

2. National Environmental Policy Act and Federal Environmental Information Document guidelines (Environmental Impact Assessment Guidelines for New Source Fossil Fueled Steam Electric Generating Stations, EPA-130/6-79-001, July 1979).

3. State of Florida Air Quality regulations (Chapter 17-2, FAC).

4. State of Florida Power Plant Siting Act/Application for Certification of Proposed Electrical Power Generating Plant Site [Chapter 17-17, FAC; FDER Form 17-1.122(72)].

4.1.3 Scope of Work

4.1.3.1 Literature Survey/Data Search

Meteorology

Climatological data representative of the W.C. MacInnes site will be collected and summarized. Available data characterizing both regional and local climatology and on-site dispersion meteorology will be gathered, including: temperature, precipitation, wind speed, wind direction, dew point, relative humidity, mixing heights, severe storm, inversions, stagnation, and stability data. Available information concerning land/sea breeze effects and unique dispersion meteorology will also be obtained. Sources of data will include:

1. National Climatic Center, National Oceanic and Atmospheric Administration;

2. Climatic atlases and other weather publications;

3. Tampa Electric Company (on-site data); and

4. Other public documents specific to region or site.

Air Quality

All applicable federal, state, and local air quality regulations, as they relate to power plant construction and operation, will be identified and documented. Available air quality data representative of the site will be collected. Existing literature, including state, federal, and local data banks, will be reviewed for pollutant emissions resulting from power plant construction and operation. Data already gathered at the W.C. MacInnes monitoring site will also be included. Information regarding data quality and validity will also be gathered.

An air pollutant emission inventory will be developed for major quantities of pollutant emissions resulting from power plant operation. This inventory will include emission rates and stack parameters for all existing sources, and for permitted, but not yet operating, sources located within the W.C. MacInnes station's area of influence. A list of all increment-consuming sources will also be developed.

Sources of data will include:

1. FDER Air Pollution Inventory System (APIS) forms,

2. National Emissions Data System (NEDS) forms,

3. FDER Air Quality Data summaries,

4. Local agency annual air quality reports,

5. Environmental Impact Statements (EISs), and

6. PSD applications submitted for area of interest.

Other Relevant Data

Other pertinent documents related to the air quality or meteorology of the site will be obtained and reviewed. Sources could include Development of Regional Impact (DRI) applications, regional planning council reports, port development authority reports, meteorological publications, and air quality impact studies.

4.1.3.2 Preconstruction Monitoring Program

A preconstruction ambient air and meteorological monitoring program will be conducted to supplement the existing data base and obtain background site information. Preconstruction ambient air monitoring is required under both state and federal PSD regulations for pollutants emitted in significant amounts, and causing significant impacts. The data will be used to establish background air quality levels to determine if emissions from the proposed plant will cause air quality standards to be exceeded. Meteorological data will be obtained to determine the representativeness of long-term off-site data and to aid in determining potential contributors to any high measured ambient concentrations.

All monitoring will be performed in accordance with "Ambient Monitoring Guidelines for Prevention of Significant Deterioration" (EPA-450/4-80-012, November 1980), and all required quality assurance procedures will be followed. A complete ambient air monitoring Plan of Study (POS) will be developed and submitted to the reviewing agencies.

The following parameters will be monitored in the preconstruction monitoring program:

1. Sulfur dioxide (continuously),

2. Total suspended particulate matter (once every 6 days),

3. Wind speed (continuously),

4. Wind direction (continuously),

5. Ambient temperature (continuously),

6. Dew point (continuously),

7. Solar radiation (continuously),

8. Rainfall (continuously), and

9. Barometric pressure (continuously).

All valid measured data will be digitized, summarized in proper formats, and presented in the SCA/EID.

4.1.3.3 Description of Baseline Climate/Air Quality

The collected meteorological/climatological data will be used to prepare a complete regional and local climatological assessment of the W.C. MacInnes site. The following parameters will be presented:

1. Monthly and annual means and extremes of temperature, precipitation, wind speed, wind direction, dew point, and relative humidity;

2. Annual and seasonal wind roses;

3. Morning and afternoon mixing height data;

4. Frequency of fog occurrence;

5. Severe storm occurrence;

6. Frequency of occurrence of atmospheric stability categories; and

7. Occurrence of atmospheric inversion and stagnation conditions.

The existing Tampa International Airport 5-year meteorological data base and the available on-site meteorological data base will be assessed for use in the atmospheric dispersion models. These models will be used in the impact analysis to predict proposed plant impacts. Results will be incorporated into Section 2.6 of the SCA/EID and used in Section 5.5 to predict air quality impacts.

Collected ambient air quality data will be used to develop appropriate background air quality concentrations for criteria pollutants emitted by the proposed W.C. MacInnes station. These concentrations will be developed in accordance with recommended EPA/FDER methodology, and will account for any concentrations attributable to sources of pollution not included in the point source emission inventory (i.e., area sources and distant sources). The background concentrations will also be added to the point source impacts to predict total air quality levels. Any designated nonattainment areas within 100 kilometers (km) of the W.C. MacInnes site will be identified.

All point sources within the impact area of the proposed plant will be identified, and a PSD baseline emission inventory developed. The inventory will consist of baseline emission rate, Universal Transverse Mercator (UTM) location, and stack parameters.

4.1.3.4 Description of Plant Air Quality Control Systems

A BACT determination is required for all new major sources by both EPA and FDER, pursuant to PSD regulations [CFR, Title 40, Part 52, Section 52.21(j) and Chapter 17-2.500(5)(c) FAC]. FDER requires that the source owner (or representative) evaluate the environmental, energy, and economic impacts of selected and alternative control techniques for each applicable pollutant and emission point. FDER appoints a BACT review committee to evaluate all available data and recommend BACT emission limits.

The air quality control systems employed at the proposed plant will be described and evaluated. Further, all sources of pollutant emissions, including fugitive emission sources, will be identified and quantified. The following items will be presented:

1. Boiler design parameters (BTU heat input, exhaust flow rate, gas temperature, etc.);

2. Fuel specifications (consumption and quality);

3. Applicable emission limits;

4. Discussion and justification of BACT control systems selected according to EPA/FDER requirements;

5. Emission point stack gas exit parameters, emission rates, and location;

6. Control system design specifications for all control systems (generic where detailed design information is not available); and

7. LAER determination for volatile organic compound emissions, if required.

For phased construction projects, such as the W.C. MacInnes project, EPA and FDER regulations require that BACT be reviewed prior to construction start-up in each phase. Therefore, control system design specifications will be developed for the first phase only. Emission parameters for subsequent phases will be based on NSPS and/or anticipated worst-case emissions.

4.1.3.5 Assessment of Impact of Plant Construction

Quantitative estimates of air pollutant emissions resulting from plant construction will be developed where possible, and qualitative impact assessments will be provided where quantification is not possible. Operations to be evaluated will include land clearing and grading activities, open burning, and vehicular traffic on unpaved roadways. Control measures to be employed to mitigate impacts will also be described.

4.1.3.6 Assessment of Air Quality Impacts of Plant Operation

A complete assessment of all potential air quality impacts associated with plant operation will be performed. Each phase of the project will be assessed individually to ensure compliance with all standards over the project's lifetime.

Federal PSD regulations and FDER regulations require that an atmospheric dispersion modeling analysis be conducted to assess the impact of the proposed coal-fired facility on ambient air quality. The air quality impact analysis must demonstrate that the proposed source will not cause or contribute to a violation of either the maximum allowable PSD increments or AAQS. Table 4-1 presents federal AAQS and allowable PSD increments. Impacts upon designated PSD Class I areas and nonattainment areas must also be addressed.

Atmospheric dispersion modeling will be used to estimate PSD baseline concentrations, to determine future air quality levels, to evaluate PSD increments, and to compare facility impacts with AAQS. Approved EPA/FDER models (or modifications to the approved models) will be used to project ground-level pollutant concentrations. These models include:

1. Industrial Source Complex Short-Term model (ISCST),

2. Industrial Source Complex Long-Term model (ISCLT), and

3. Oak Ridge Fog and Drift model (ORFAD) or other similar model.

The methodology for applying the atmospheric dispersion models to the project analysis will follow EPA's Guideline on Air Quality Models (EPA-450/2-78-027, April 1978) and Prevention of Significant Deterioration Workshop Manual (October 1980). These guidelines recommend the use of specific models for increment analysis and compliance with AAQS. They also outline requirements for emission inventories, meteorological data, and other model inputs. Any exceptions to the suggested models or methodologies will be documented.

The long-term model ISCLT requires annual average emissions, stack parameters, and meteorological data to calculate annual average concentrations. Annual average emissions and stack parameters for all sulfur dioxide and particulate matter sources will be developed, as described previously. The ISCLT will be used to estimate annual average ground-level concentrations, due to all sources for the PSD baseline and future air quality scenarios, and due to the proposed plant only (incremental impact).

Meteorological data for input to the ISCLT will be obtained primarily through the National Climatic Center, Asheville, North Carolina. Data are provided in the "STAR" format for input to the ISCLT, and contain the frequency of occurrence of wind direction and wind speed as a function of atmospheric stability class. On-site meteorological data may be used, if more appropriate.

A 1.0-km grid spacing will be used in the ISCLT to estimate the spatial distribution of ground-level concentrations, and to determine maximum annual-average concentrations. ISCLT predicted concentrations will not be calibrated (i.e., no adjustments to model values).

TABLE 4-1

AAQS AND PSD INCREMENTS ($\mu g/m^3$)

Pollutant	Averaging Time	EPA Primary Standard	EPA Secondary Standard	State of Florida	PSD Increment-Class I	PSD Increment-Class II	PSD Increment-Class III
Suspended Particulate Matter	Annual Geometric Mean	75	60	60	5	19	37
	24-Hour Maximum	260*	150*	150*	10	37	75
Sulfur Dioxide	Annual Arithmetic Mean	80	N/A	60	2	20	40
	24-Hour Maximum	365*	N/A	260*	5	91	182
	3-Hour Maximum	N/A	1,300*	1,300*	25	512	700
Carbon Monoxide	8-Hour Maximum	10,000*	10,000*	10,000*	-	-	-
	1-Hour Maximum	40,000*	40,000*	40,000*	-	-	-
Hydrocarbons	3-Hour Maximum (6 a.m. to 9 a.m.)	160*	160*	160*	-	-	-
Nitrogen Dioxide	Annual Arithmetic Mean	100	100	100	-	-	-
Ozone	1-Hour Maximum	235*	235*	160* 235	-	-	-
Lead	Calendar Quarter Average	1.5	1.5	- 1.5	-	-	-

* Maximum concentration not to be exceeded more than once per year.

Sources: 40 CFR, Part 50.
FAC, Chapter 17-2.300.

permitted 50

The ISCST dispersion model will be used to determine worst-case, short-term (24 hours or less) air quality impacts for criteria pollutant emissions. The model will be applied to ~~major emission~~ sources within 25 km of the plant site, and will use their annual average emissions and stack parameters. Short-term concentration ~~estimates provided~~ by the model will not be adjusted. Instead, a calibration factor of 1.0 will be employed. A minimum receptor grid spacing of 0.1 km will be used in the ISCST to estimate maximum short-term concentrations.

Information gathered through other technical evaluations will be utilized to assess effluent impacts on soils, vegetation, and visibility. With assistance from other technical disciplines, a literature search on the sensitivity of the local agricultural crops and soil media to the predicted pollutant concentration will be addressed and reported in the study results.

Impairments to visibility will be addressed, particularly with regard to Class I PSD areas. Qualitative impact assessments of other air quality topics and concerns, such as sulfur dioxide half-life, acid rain, and sulfate formation, will also be performed.

A fugitive dust analysis will be performed to assess fugitive emissions from the materials handling and storage areas and any other identified fugitive sources. Information presented will include source identification, throughput values, emission factors, types of control, control efficiencies, and controlled and uncontrolled emissions rates. Impacts will be assessed using the ISCST model.

?

A stack height optimization analysis will be performed to determine Good Engineering Practice (GEP) height for the planned facility. GEP stack height guidelines were proposed in January 1979 and reproposed in September 1981. GEP is defined as "the height necessary to ensure that emissions from the stack do not result in excessive concentrations of any air pollutant in the immediate vicinity of the source as a result of atmospheric downwash, eddies, and wakes which may be created by the source itself, nearby structures or nearby terrain obstacles" (Federal Register, January 1979). Based on the planned facility dimensions, GEP stack height will be calculated and used in the modeling impact study.

4.1.3.7 Assessment of Cooling System Impacts

Air quality impacts of cooling tower operation will be assessed through available modeling techniques. The fogging potential from cooling towers will be assessed with the ORFAD model, developed at Oak Ridge National Laboratory, or a similar model. Model calculations generate a forecast of where and when fog is likely to develop in the vicinity of the towers. Visibility is assessed downwind of the towers, with the incorporation of a Gaussian plume dispersion algorithm. The ORFAD model (or similar model) will also be used to evaluate salt drift and particulate deposition, due to operation of the on-site cooling towers. Both annual and 24-hour impacts will be assessed for compliance with PSD increments and AAQS. Results of the salt and particulate deposition evaluations will be provided to the terrestrial ecology discipline for use in the evaluation of air emissions on the site ecology.

4.1.3.8 Evaluation of Environmental Aspects of Plant Design, Fuel, and Site Alternatives

The air quality effects of alternatives in plant design, fuel use, and alternative plant sites will be evaluated. Only viable alternatives from economic and engineering standpoints will be assessed.

The following aspects will be discussed:

1. BACT evaluation of alternative emission control systems and/or alternative control levels. Effects of the alternatives on ambient concentrations will also be assessed.

2. Effect on air quality (and compliance with applicable standards) of using alternative fuels.

3. Effects of alternative plant cooling system design.

4. Alternative sites as they relate to compliance with AAQS, PSD increments, and nonattainment area requirements.

5. Alternative fuel delivery methods and comparative air quality impacts.

4.1.4 Use of Results

The information developed for air quality/meteorology will be used in the appropriate sections of the SCA/EID, and will address all applicable air quality regulations and related issues of special significance. Specifically, the following SCA/EID sections will be affected: 2.6, 2.7, Site Meteorology and Air Quality; 3.7, Plant Emissions; 4.1, 5.5, 5.7, Air Quality Impacts; 6.2, 6.3, Monitoring Programs; and 8.1, 8.2, 9.4, Alternatives.

Results of the air quality/meteorology evaluations will also be utilized by other disciplines, such as terrestrial ecology and surface water hydrology, in performing technical tasks described elsewhere in this document.

4.2 SURFACE WATER QUALITY/HYDROLOGY

4.2.1 Introduction

All new sources are required to have an NPDES permit, at the federal level. The regional administrator of EPA has the issuing authority, granted in the Clean Water Act, Public Law 92-500, as amended by Public Law 95-217 and Public Law 95-576.33 U.S.C. 1251 et seq. Further, the plant must be in compliance with the effluent guidelines and standards for the Steam Electric Power Generating Point Source Category (40 CFR 423), as promulgated in the October 8, 1974 Federal Register; and with proposed guideline revisions published in the October 14, 1980 Federal Register, for plant chemical wastes.

At the state level, any power plant discharge must comply with all applicable provisions of Chapters 17-3 and 17-4, FAC, and 40 CFR 423 identified above. Further, water quality is addressed in the Florida Electrical Power Plant Siting Act; Florida Statutes Chapter 403, pages 501-517; and FDER rules FAC 17-17. Additionally, data required in the SCA/EID (FAC 17-1) will be utilized as guidance.

Numerous investigations have been conducted in Tampa Bay regarding both hydrology and water quality. Bay-wide modeling studies have been conducted to better understand the dynamics of the estuary, and to better assess man-made modifications. Further, there have been several site-specific studies conducted in the vicinity of both proposed and existing power plants, and these data are available.

Water quality investigations conducted by federal, state and local agencies, in addition to those conducted by universities and various industries, are also available for the bay. It has been found that water quality is best near the entrance to the bay, and decreases to the north. It has also been found that water quality criteria for several parameters are exceeded under existing conditions in the northern portion of the bay. These data have been utilized as the basis of the proposed baseline surface water quality/hydrology evaluations.

4.2.2 Objectives

The objectives of the surface water quality/hydrology evaluations are to:

1. Review existing source information pertinent to the surface water quality and hydrology of Tampa Bay in the area potentially affected by the W. C. MacInnes facility.

2. Design and implement surface water quality and hydrology monitoring programs to supplement the existing data base for Tampa Bay, and other inland water bodies, in order to characterize ambient conditions at the site.

3. Analyze the results of water quality and hydrology monitoring programs, in relation to design and location of the heat dissipation system.

4. Incorporate the above data into a model of the W. C. MacInnes facility's thermal and chemical discharge, and areal influence of the intake structure.

5. Assess the potential impacts of plant construction and operation on the water quality of affected water bodies.

6. Assess the potential impacts regarding alternative designs of the cooling water intake and discharge systems.

7. Utilize the results of these monitoring efforts to design a pre-operational/construction phase water quality monitoring program for the W. C. MacInnes facility.

4.2.3 Scope of Work

4.2.3.1 Literature Review/Data Search

Existing data and information regarding surface waters that may be affected by the construction and operation of the W. C. MacInnes facility will be collected and summarized. More specifically, this review will compile historical water quality data and current regulatory requirements applicable to the principal surface water bodies on and adjacent to the site. These data will be as reviewed with respect to: plant operation requirements; federal, state, and local water quality standards and effluent limitations/guidelines; and physical and chemical variables significant to the aquatic environment. Available hydrologic information specific to Tampa Bay will also be obtained to determine potential impacts.

Sources of data will include studies and documents prepared by:

1. U. S. Environmental Protection Agency

2. Florida Department of Environmental Regulation

3. United States Geological Survey

4. United States Army Corps of Engineers

5. Hillsborough County Environmental Protection Commission

6. Florida Department of Natural Resources

7. City of Tampa Public Works Department

8. Tampa Bay Regional Planning Council

9. Manatee County Pollution Control Department

10. Manatee County Planning Department

11. University of South Florida.

12. Southwest Florida Water Management District.

Additional groups or data sources identified during the course of this survey will be added to this list.

All current regulations at the federal, state, and local levels will be identified and documented. Further federal, state, and local data banks will be reviewed concerning the discharges resulting from existing and proposed power plants during both construction and operation.

4.2.3.2 Baseline Monitoring Program

Surface Water Hydrology

Three levels of thermal modeling are proposed for this study. They are:

1. Large scale; Tampa Bay.

2. Far field; approximately a three mile zone around the proposed discharge.

3. Near field; dispersion modeling of the thermal plume.

The studies defined below will be utilized to calibrate these models.

A substantial data base already exists which describes the hydrology of Tampa Bay. Numerous studies conducted by the University of South Florida and the U.S. Geological Survey (USGS) provide a good overall picture of the Bay's behavior. However, it is necessary to obtain site-specific data on a finer scale in support of hydrothermal, water quality, and ecological requirements. For this purpose, the surface water hydrology program has been designed to collect information on tidal variability, currents, temperature, depth, and dispersive characteristics for surface waters in the vicinity of the site. These data will be acquired during the first six months of the baseline program. They will be used to define baseline conditions, and to assess construction and operational impacts of the W. C. MacInnes facility.

One tide height recorder will be installed and operated for six months. It will be located in, or near, Port Manatee. The gage will be installed in a stilling well, and will be registered to the National Geodetic Vertical Datum.

Fathometric and point soundings will be made along north-south and east-west transects in the study area (see Figure 4-1). Measurements will be reconciled to the tide gage described above. Transects will be located about one mile apart, with additional measurements being taken in areas of rapid change, or where irregularities are indicated. An additional transect will be located along the Port Manatee channel. All measurements will be taken during maximum high tides, to facilitate access to shallow water.

Instantaneous current meter measurements will be taken at eight locations in the far field area, at two hour intervals, for a 24-hour period on two occasions. Measurements of current speed and direction, depth, temperature, salinity, dissolved oxygen, and pH will be collected at the surface, and at middle and bottom levels.

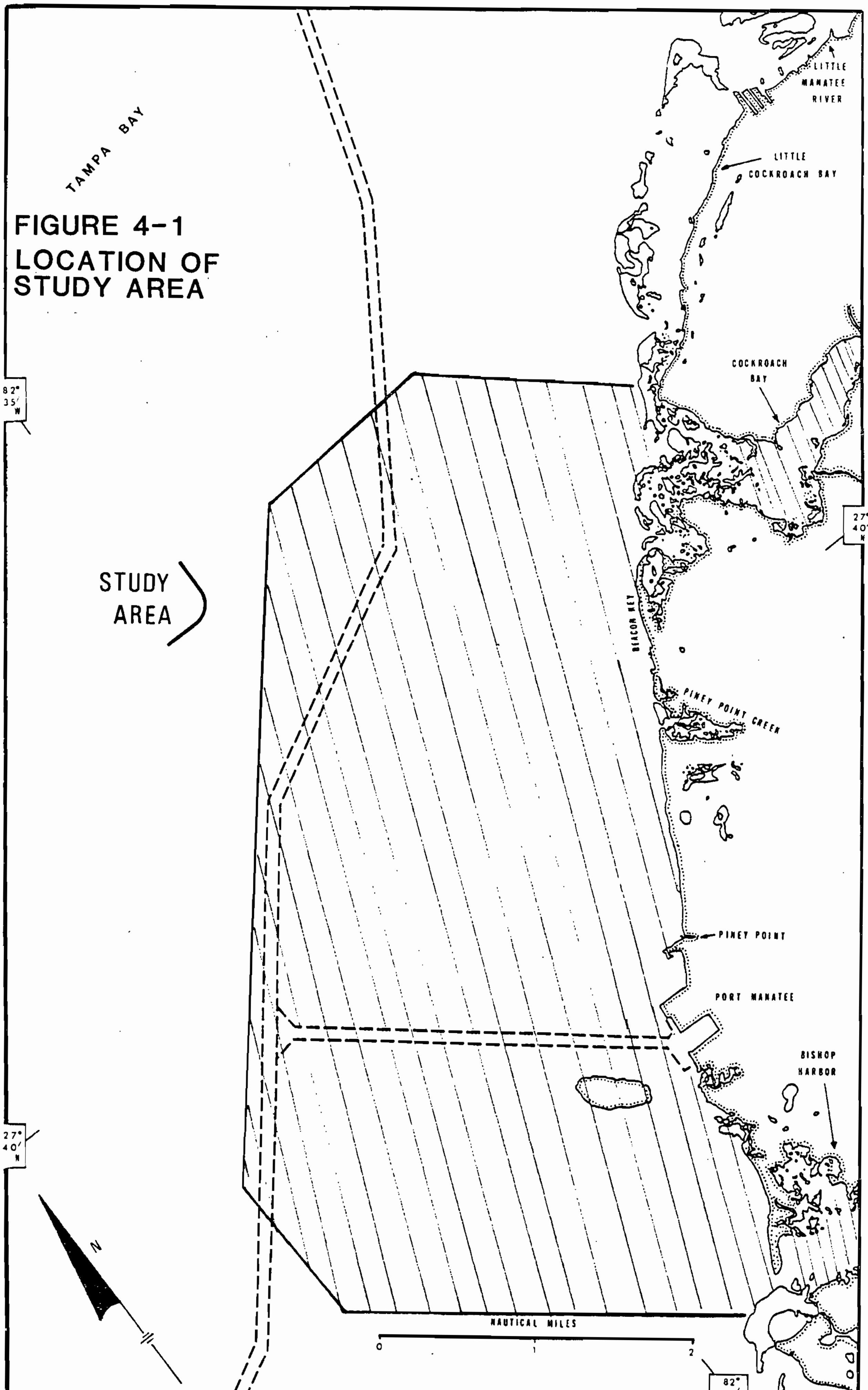


FIGURE 4-1
LOCATION OF STUDY AREA

Stations will be selected to provide overall geographic coverage of the far field area. In addition, preliminary runs of the far field model will be used to locate points where current data are desired. Three of the points will be selected to coincide with proposed discharge points.

A dye study will be conducted at the proposed discharge point, during a current meter study. Times of travel and dispersion rates of Rhodamine WT dye will be determined. A dye release will be made before dawn, and monitored by fluorometry and aerial surveillance for 12 hours.

Surface Water Quality

A surface water quality monitoring program will be implemented to define the ambient water quality characteristics of surface waters on and adjacent to the W. C. MacInnes site. This encompasses both Tampa Bay waters, and inland water bodies in the immediate site area. The program will also provide baseline data for assessing potential effects of plant construction and operation.

Field sample collection in Tampa Bay will be conducted monthly from January through December 1982. There will be 11 sampling locations within the existing aquatic biological study area (Figure 4-1). Three sampling locations will be established along each of two transects, extending in a northwesterly direction from shore outward, to the shipping channel. Each transect will originate approximately 1.5 miles from Port Manatee Harbor, one to the north and one to the south. Inshore sampling locations will be along the 1.5 meter depth contour; middle locations will be along the 4.5 meter depth contour; and offshore locations will be along the 7.5 meter depth contour. Two sampling locations will be established in the Port Manatee Harbor area, and three additional locations will be established as follows: one offshore of Cockroach Bay, along the 1.5 meter depth contour; one within Cockroach Bay; and one within Bishop Harbor.

Water quality monitoring will also be conducted at two inland water body locations on the W. C. MacInnes site. One location will be established on Piney Point Creek and one on Cockroach Creek. Each of these inland locations will be sampled on a quarterly basis.

During each sampling event, three duplicate samples will be collected. At inshore locations (1.5 meters), samples will be collected from the mid-point in the water column. At middle locations (4.5 meters), samples will be collected from one meter below the surface, and one meter above the bottom. At offshore locations (7.5 meters), samples will be collected from one meter below the surface, mid-point in the water column, and one meter above the bottom. Depth of sample collection at several locations will depend on water depths encountered. Inland locations will be sampled at the mid-point in the water column. Water column profiles of temperature, dissolved oxygen, pH, and salinity will be measured in situ at one-meter intervals, at all locations.

Concentrations of other parameters will be determined, according to accepted procedures. A list of Class II and III water quality parameters to be monitored during the baseline studies is presented in Table 4-2. In addition,

TABLE 4-2

WATER QUALITY PARAMETERS TO BE MONITORED
DURING BASELINE STUDIES AT THE W. C. MACINNES SITE

Parameter	Tampa Bay Locations		Inland Stream Locations
	Monitoring Frequency	Number of Determinations Per Episode	Monitoring Frequency*
Temperature (°F)	Monthly	11 Profiles	Quarterly
Dissolved Oxygen	Monthly	11 Profiles	Quarterly
pH	Monthly	11 Profiles	Quarterly
Salinity/Specific Conductance	Monthly	11 Profiles	Quarterly
Chlorine (Total Residual)	Semiannually	11	Semiannually
Alkalinity	Monthly	25	Quarterly
Bacteria, Total Coliform	Monthly	25	Quarterly
Bacteria, Fecal Coliform	Monthly	25	Quarterly
Bacteria, Fecal Strep	Monthly	25	Quarterly
BOD-5 day	Monthly	25	Quarterly
COD	Monthly	25	Quarterly
Color	Monthly	25	Quarterly
Bromide	Monthly	25	Quarterly
Bromine	Monthly	25	Quarterly
Chloride	Monthly	25	Quarterly
Cyanide	Monthly	25	Quarterly
Detergent	Monthly	25	Quarterly
Fluoride	Monthly	25	Quarterly
Hardness, Total	Monthly	25	Quarterly
Carbonate	Monthly	25	Quarterly
Bicarbonate	Monthly	25	Quarterly
Nitrate	Monthly	25	Quarterly
Nitrite	Monthly	25	Quarterly
Ammonia	Monthly	25	Quarterly
Kjeldahl Nitrogen	Monthly	25	Quarterly
Oil and Grease	Monthly	25	Quarterly
Phenols	Monthly	25	Quarterly
Total Phosphate	Monthly	25	Quarterly
Orthophosphate	Monthly	25	Quarterly
Total Suspended Solids	Monthly	25	Quarterly
Total Dissolved Solids	Monthly	25	Quarterly
Total Organic Carbon	Monthly	25	Quarterly
Turbidity	Monthly	25	Quarterly
Sulfate	Monthly	25	Quarterly
Sulfide	Monthly	25	Quarterly
Silica	Monthly	25	Quarterly
Aluminum	Monthly	25	Quarterly
Antimony	Monthly	25	Quarterly

*Two determinations per episode

TABLE 4-2 (Continued)

Parameter	Tampa Bay Locations: Monitoring Frequency	Tampa Bay Locations: Number of Determinations Per Episode	Inland Stream Locations: Monitoring Frequency*
Arsenic	Monthly	25	Quarterly
Beryllium	Monthly	25	Quarterly
Boron	Monthly	25	Quarterly
Cadmium	Monthly	25	Quarterly
Calcium	Monthly	25	Quarterly
Chromium	Monthly	25	Quarterly
Copper	Monthly	25	Quarterly
Iron	Monthly	25	Quarterly
Lead	Monthly	25	Quarterly
Magnesium	Monthly	25	Quarterly
Manganese	Monthly	25	Quarterly
Mercury	Monthly	25	Quarterly
Nickel	Monthly	25	Quarterly
Potassium	Monthly	25	Quarterly
Sodium	Monthly	25	Quarterly
Selenium	Monthly	25	Quarterly
Silver	Monthly	25	Quarterly
Zinc	Monthly	25	Quarterly
Thallium	Monthly	25	Quarterly
Titanium	Monthly	25	Quarterly
Vanadium	Monthly	25	Quarterly
Radioactivity			
Gross alpha	Monthly	25	Quarterly
Gross beta	Monthly	25	Quarterly
Radium - 226/228	Monthly	25	Quarterly
Organics	Semiannually	3	Annually

* Two determinations per episode

concentrations of organic pesticides and herbicides will be determined from samples collected at three bay and two inland sampling locations. Samples will be collected twice during the monitoring period from the bay locations, and once from the inland locations.

4.2.3.3 Assessment of Impact of Plant Construction

During the construction phase, numerous site preparation and excavation activities will alter the site's surface characteristics. Possible impacts on surface water quality may result, due to altered drainage patterns and runoff. Construction of the facility's intake and discharge structures may also impact the water quality of Tampa Bay.

This task will specifically address the short-term and long-term effects of plant construction regarding water quality of on-site water bodies, as well as Tampa Bay waters. Erosion and sedimentation control plans for active construction areas will provide treatment to meet state and federal water quality criteria. Finally, the impact of intake and discharge facility construction activities on Tampa Bay water quality will be assessed using control plans, site-specific water quality data, and reported results from similar type operations.

4.2.3.4 Assessment of Impact of Plant Operation

A review of the applicable hydrologic models that could be used to assess the design and operation of the W. C. MacInnes facility has been conducted. This review resulted in the selection of three existing models, which will be used in the assessment sections of the SCA. These models are:

1. <u>The Ross Model</u>, developed by Dr. Bernard E. Ross at the University of South Florida. This model will be utilized for both large scale and far field levels of modeling. It is a finite difference model, which has been calibrated specifically for Tampa Bay.

2. <u>The Koh and Fam Model</u>, developed for EPA. This model will be used for near field modeling. It includes all the features necessary for the W. C. MacInnes facility, and has been widely accepted by the engineering profession.

3. <u>The Sink Effect Model</u>, developed by Satija and Dai. The Sink Effect Model is based on potential flow and simulates a circular line sink with a diameter equal to that of the intake structure. The solution allows for the determination of approach velocity vectors throughout the flow field. The model will be utilized to determine the field of influence where biological organisms could be entrained by the W.C. MacInnes cooling water intake.

Potential impacts of plant operation on Tampa Bay water quality will be quantified for both long-term and short-term effects. Operation of the W. C. MacInnes facility may impact the surface water quality of Tampa Bay through discharges from the condenser cooling system and from waste treatment systems. Design of the various plant process systems will determine the quantity and quality of these point source discharges.

Assessing the potential impacts of these discharge systems will be accomplished by comparing the chemical concentrations of waste treatment discharges with ambient water quality data. The thermal and chemical components of the plant's condenser cooling discharge will be used in the computerized hydrologic models previously described to predict the nature and areal extent of the plant's discharge plume.

The predicted configuration and area of the plant's chemical and thermal plumes will be graphically illustrated using both maximum and most probable impact scenarios. These illustrations will depict various thermal and chemical values above and below ambient conditions, in order to define the areal extent of the mixing zone. In addition, compliance with federal, state and local effluent limitations regarding facility discharge at the edge of an acceptable mixing zone will also be demonstrated. Results of these modeling efforts will also be compared to state water quality criteria.

4.2.3.5 Assessment of Impacts of Design Alternatives

This task will address construction and operational impacts for alternative designs of the proposed facility. Each alternative will be evaluated and compared with impact assessments of the preferred design specifications. Of particular importance regarding impacts on surface water quality are placement and design of cooling water intake and discharge structures, mode of plant operation, type of coal, ash disposal systems, and air quality control systems.

4.2.4 Use of Results

4.2.4.1 Surface Water Hydrology

The results of the literature review will be utilized in the preparation of SCA/EID Section 2.5 (Hydrology and Water Quality), as part of the description of ambient surface water hydrology. In addition, the results will provide input to Section 4.1, Site Preparation and Plant Construction, and 5.1, Effects of Operation of Heat Dissipation System. Further, they will be utilized as input to the impact assessment on surface water hydrology.

The baseline monitoring data will also be utilized in Sections 2.5 and 4.1, as described above. This data will also be utilized in Sections 2.8, Aquatic Ecology; 3.4, Heat Dissipation System; 4.1.5, Landmarks and Sensitive Areas; 4.1.6, Water Bodies and Uses; 4.3.1, Effects on Vegetation, Wildlife, and Aquatic Life; 4.3.2, Landmarks and Sensitive Areas; 4.3.7, Mitigative Measures; 5.1 through 5.4, Effects of Operation of Heat Dissipation System, Effects of Chemical Biocide Discharges, Effects on Water Supplies, and Sanitary and Other Waste Discharges; 6.2, Pre-application Monitoring; 6.3, Construction Monitoring; and 9.1 through 9.3, Condenser Cooling System, Plant Water Systems, and Wastewater Treatment Systems.

4.2.4.2 Surface Water Quality

The literature review information will be used in part to prepare Section 2.5 of the SCA/EID. The monitoring results will be utilized in Sections 3.3 through 3.6, Plant Water Use, Heat Dissipation System, Chemical and Biocide

Wastes, and Sanitary and Other Wastes; and in Section 3.10, On-site Drainage Systems. The effects of plant construction will be addressed in Sections 4.1, 4.3 (if necessary), and 4.4. Plant operation and discharges will be addressed in detail in Section 5.1, and in Section 9.0, Plant Design Alternatives.

4.3 HYDROGEOLOGY

4.3.1 Introduction

This plan of study to conduct soils and hydrogeologic testing, water quality sampling, and reporting has been developed in response to the mandates of the National Environmental Protection Act (NEPA), and, in particular, to the U.S. Environmental Protection Agency (EPA), Southwest Florida Water Management District (SWFWMD), and Florida Department of Environmental Regulation (FDER) environmental study requirements. All field efforts will be coordinated with concurrent ecological, thermal and surface water programs.

4.3.2 Objectives

The objectives of the proposed hydrogeologic investigations are:

1. To understand the hydraulic and chemical characteristics of the groundwater regime. This will allow for a more reasonable and accurate assessment of groundwater impacts resulting from the proposed facilities, in addition to formulating and implementing design alternatives to minimize any environmental impacts.

2. To provide a description of the physiography, regional geology, (i.e., stratigraphy and structural geology), regional seismic history, and general soil and rock characteristics of the site and site region.

4.3.3 Scope of Work

4.3.3.1 Literature Survey/Data Search

Data will be collected primarily from available maps, technical papers, and other documents. Sources utilized will include federal and state agencies and university libraries. Published and open file reports and files from agencies, organizations, and institutions will be researched to obtain regional and site-specific groundwater and geologic information. These groups include:

1. U.S. Geological Survey

2. U.S. Army Corps of Engineers

3. Environmental Protection Agency

4. U.S. Soil Conservation Service

5. Florida Department of Natural Resources, Bureau of Geology

6. Department of Environmental Regulation

7. Hillsborough County Environmental Protection Commission

8. Southwest Florida Water Management District

9. Florida Universities and Colleges
10. Electric utilities
11. Florida Department of Transportation
12. Florida Resources and Environmental Analysis Center
13. U.S. Department of Agriculture (Salt Lake City, Utah)
14. EROS Data Center
15. National Technical Information Center
16. Tampa area aerial photography vendors
17. Manatee County Pollution Control Department
18. Any other agencies, organizations, or institutions with information pertinent to this study.

Information sought will include general topography and geology framework; description of aquifer systems and characteristics, including their name, thickness, depth, stratigraphy, and areal extent; groundwater levels, rate, and direction of flow; aquifer hydraulic properties, including permeability, transmissivity, and storativity; location of aquifer recharge and discharge areas; groundwater quality; potential for sinkhole or cavern development; and domestic, industrial, and municipal groundwater well distribution and characteristics. Long- and short-term regional and site-specific data (within approximately five miles of the site) will also be sought.

The data acquired through survey and review of the literature will form the basis for planning both geological field reconnaissance efforts and subsurface investigations. These investigations will be conducted to collect site-specific data to establish a data base against which potential impacts may be compared.

Information collected will comprise the data base for subsequent groundwater activities. Information pertaining to surface water hydrology, geology, and soils will also be used to better define the regional and site-specific regime, and to direct the subsurface investigation programs. Pertinent data will be summarized in tabular and/or graphic format.

4.3.3.2 Groundwater

Subsurface Investigation

To better understand the physical and chemical characteristics of the groundwater regime, implementation of a drilling/remote sensing/sampling/testing program is required. Borehole drilling, soil/rock and water sampling, and field/laboratory testing are basic elements of the subsurface investigation. Based on an evaluation of groundwater, geology, and soils data gathered in the literature survey, and in consideration of the requirements of other disciplines (such as geology, soils engineering and surface water hydrology), selected locations will be chosen for borehole drilling, sampling, and testing.

An inventory of the principal groundwater wells and springs (including physical and chemical characteristics) and groundwater users within a five-mile radius of the proposed plant site will be prepared. Borehole geophysical logs will be run in at least ten existing wells, both on and in the vicinity of the plant site. At least five suites of geophysical logs will be run on Floridan aquifer test boreholes. These logs will include, but not be limited to caliper, gamma, resistivity, and fluid velocity/temperature. These data will be used to correlate the location, depth, thickness and other properties of the geologic and geohydrologic units underlying the property.

Surface geophysical traverses will be conducted over the property. The number and locations of the traverses will be determined after the data review and site reconnaissance. However, there will be at least four surveys conducted, including one resistivity survey to determine stratigraphic and water quality interfaces from the coast eastward toward U.S. 301, and three electromagnetic surveys to verify extent and depth of the water table aquifer on the plant site.

Approximately 40 boreholes will be drilled to the top of the upper Floridan aquifer (Hawthorn formation) for the purpose of evaluating the water table aquifer. Borehole cuttings and water quality will be characterized. Average depth is expected to be about 50 feet. These boreholes will provide information on the soil characteristics and water-bearing properties of the water table and hydraulic relationship between the water table and Hawthorn formation. Two water table aquifer pumping tests and a selected number of additional hydraulic tests will be performed on the plant site to characterize hydraulic characteristics of the aquifer (such as vertical and horizontal permeability and storativity).

Two Floridan aquifer test wells and associated monitor wells will be drilled, sampled, and logged to conduct "long-term" aquifer tests on the Floridan aquifer. One test well will be drilled on the plant site for the purpose of evaluating the Floridan aquifer and underlying units. The aquifer will be evaluated for its potential to supply freshwater for plant makeup and process needs. The well will also be utilized to evaluate the potential for units beneath the Floridan to receive and contain industrial or effluent wastewaters from the plant processes. The second test well and associated monitor wells will be drilled along one of the transmission line corridors toward the east to evaluate the aquifer's potential to supply plant makeup and process waters.

The test well and monitor wells will be drilled in stages to coordinate findings and perform selected aquifer pumping tests. The test drilling activities will be coordinated with SWFWMD and FDER to assure that well construction and test results will satisfy testing requirements for the Consumptive Use Permit (CUP) and the Underground Injection Control (UIC) Class I well stipulations.

Observation wells (piezometers) will be installed for the pumping tests; and if possible, existing groundwater wells will be used to replace or supplement the installed observation wells. These wells will be used to observe and record groundwater levels during the pumping test. Water samples will be obtained from the installed and existing wells, and will be field and laboratory tested for chemical constituents. The frequency and duration of groundwater sampling and analysis will also be determined at this time.

Accumulated data will be assessed as part of the data reduction and evaluation program, and will be used to describe existing conditions. Results of the geophysical surveys will be used to support and refine the results of the boring and drilling program.

Data Reduction and Evaluation

Information obtained from the subsurface investigation program will be used to develop a conceptual groundwater model of the site area. This model will be used to describe existing groundwater conditions from a water quality and quantity standpoint, and will allow for an evaluation of the effects on the system as a result of the proposed action. Maps and exhibits will be prepared from these data for inclusion in the SCA/EID.

The groundwater conceptual model will be explained both narratively (text and tabulations) and graphically (maps, cross-sections, columnar diagrams, data plots, hydrographs, etc.). Specific aspects of the groundwater regime expected to be defined are:

1. Aquifer stratigraphy;

2. Aquifer hydraulic characteristics, including permeability, transmissivity, storativity, and leakance;

3. Historic groundwater levels (both water table and potentiometric levels, to the extent available), their relationship to each other, and their seasonal variations;

4. Rate and direction of groundwater flow;

5. Aquifer recharge and discharge areas;

6. Groundwater availability and use within a five-mile radius of the proposed site;

7. Groundwater quality (chemical and physical characteristics);

8. Soil characteristics relative to percolation and infiltration rates;

9. Hydrologic potential for sinkhole/cavern development; and

10. Potential for saltwater intrusion.

These data and evaluation results will in turn be used to evaluate the existing groundwater quality and quantity; the impacts of the proposed action on the system; and potential design alternatives.

Description of Plant Facilities and Operations Affecting Groundwater

Construction and operation design information will be used to evaluate the impacts of these activities on the groundwater regime. This evaluation will also provide text, figures, and tables to define consumptive use in relation to other existing and proposed consumptive use and the competition for all uses. Specifically, the following will be described:

1. The plant water use system (if its source is groundwater);

2. Dewatering requirements during construction;

3. Description and locations of ash and scrubber by-product disposal areas, levels, and disposal rates;

4. Method of disposal of chemical wastes and sanitary wastes, together with design capacity and anticipated load; and

5. Material storage areas.

Initial Impact Evaluation

The groundwater impact evaluation will include the use of groundwater by the plant; the environmental effects of lowering water levels or aquifer pressures; and changes in water quality, or effects on rock/deposits caused by possible leachate seepage from waste disposal areas. The potential impacts identified will be evaluated in light of their magnitude and importance. Analog or digital models will be used (where appropriate) to simulate the effects of alternate schemes for groundwater withdrawals on the local environment; seepage and leachate movement in the groundwater system; and artificial recharge and other water management techniques on the groundwater system. The results of this activity will provide information necessary to assess conceptual design alternatives.

Assessment of Design Alternatives

By early identification of stresses that might affect the natural systems, steps can be taken to minimize the impacts, or alleviate them to an acceptable degree. Conceptual design alternatives will be identified and evaluated to include:

1. Maintaining groundwater levels at selected elevations;

2. Preparation/treatment of land surface for preventing contamination of groundwater or surface water by leachates or other potential contaminants;

3. Preparation/treatment of land surface to contain any contaminated groundwater;

4. Alternate means of ash handling and disposal, such as dry ash disposal; and

5. Deep well disposal or recharge of cooling and wastewater.

Design and Implementation of Preconstruction Monitoring Program

The design of the monitoring system will occur simultaneously with the drilling program, because the boreholes drilled during the course of this study will potentially constitute the network of monitor wells used. Monitoring criteria (dissolved solids in the water, and other parameters) and measurement procedures and frequency will be determined after the studies described in previous tasks are completed.

Groundwater levels in selected monitor wells will be recorded continuously. Groundwater will be sampled and analyzed for approximately six months. Evaluation of the results will permit an understanding of preconstruction conditions against which projected impacts can be compared. Although the exact number of wells monitored and frequency of sampling cannot be defined at this time, it is anticipated that ten groundwater sites will be evaluated on a monthly basis for the six month period. These sites will be located to provide adequate groundwater monitoring throughout the site. Water quality samples will be tested for a large number of major cations and anions, plus a full range of trace substances that are indicative of natural and man-induced hydrogeologic conditions (see Table 5-1).

Final Impact Evaluation

Using the initial impact evaluation and the selected design, a final evaluation will be made of the construction and operational effects of the proposed plant and ancillary facilities on the natural environmental systems. Essentially the same approach described in the initial impact evaluation task will be used, relating to plant construction and operational activities.

4.3.3.3 Geology/Soils

Remote Sensing Analysis and Interpretation

This task, to be performed concurrently with the groundwater evaluations, is designed to provide supplementary information on location of regional and local structures, occurrence of sinkholes, and occurrence of anomalous hydrologic conditions. Aerial photo mosaics and/or available ERTS imagery will be used along with aerial photographs to facilitate the regional assessment of structures, lineaments, and sinkholes. Information acquired through analysis and interpretation of remote sensing imagery will be used, both to guide organization of the field investigative efforts (i.e., surface and subsurface investigations), and to provide basic supplementary data to aid in the evaluation of potential plant and directly associated transmission line corridor impacts.

Surface and Subsurface Field Investigations

Site-specific data will be collected and integrated with the existing data base to aid in the assessment of critical issues, such as liquefaction potential of soils, ability of soils to attenuate wastes, lithologic character of bedrock, sinkhole formation and potential for foundation failure, location of main aquifers and yield, anomalous hydrologic conditions, and the nature of surface and subsurface structural features.

A preliminary data base of geological and geotechnical conditions will be prepared to facilitate development of a conceptual plant layout and directly associated transmission line corridor layouts, and to assist in assessing the potential environmental impacts of plant construction and operation. A preliminary evaluation of foundation support requirements will also be conducted. The ability of the soils at the site to retain or neutralize potential surface water or groundwater contaminants will be assessed.

Soil and rock materials will be logged in the field, Standard Penetration Tests will be performed, and selected samples will be taken, as needed, for laboratory analysis. Field permeability tests will be conducted utilizing standard methods at selected drill holes. Surface and borehole geophysical surveys will be conducted to define geologic and water quality interfaces, and to confirm the continuity of the interface underlying the site.

Materials Testing

Laboratory tests on soil and rock materials will be performed in accordance with published standards such as those established by the American Society for Testing and Materials (ASTM). Results of laboratory tests will be used to edit and refine the soil and rock descriptions and classifications determined in the field. Information from this task, in combination with information from the surface and subsurface field investigations, will be utilized to evaluate conceptual plant layout, to analyze foundation support requirements and possible seepage from disposal areas, to assess potential environmental impacts of plant construction and operation, and to aid in evaluation of design alternatives.

4.3.4 Use of Results

The results of this hydrogeologic task will be joined with those of previous tasks to evaluate the geological consequences of alternative plant and transmission corridor layouts. Plant construction and operation conditions will be evaluated for impact on geologic, hydrologic, and soil characteristics, and the results will be used to aid in assessment of design and layout alternatives.

Results of the hydrogeology evaluations will provide data and text for SCA/EID Sections 2.4, Geology and Soils; 3.4, Heat Dissipation Systems; 3.5, Chemical and Biocide Waste; 3.6, Sanitary and Other Wastes; 3.10, On-Site Drainage Systems; 4.1, Site Preparation and Plant Construction; 4.3, Construction of Directly Associated Transmission Facilities; 6.2, Pre-application Monitoring; and 6.3, Construction and Operational Monitoring.

4.4 TERRESTRIAL ECOLOGY

4.4.1 Introduction

The terrestrial ecology program is designed to collect and analyze the information necessary to characterize the terrestrial and wetland ecosystems of the site and the surrounding areas. This information will be used to assess the effects of construction and operation of the W. C. MacInnes generating station. The program was prepared in response to requirements of the FDER for preparation of a Site Certification Application (SCA) and of the National Environmental Policy Act for the completion of an Environmental Information Document.

The program consists of a literature review phase; field data collection studies for vegetation, wildlife, and endangered species; special surveys for pre-existing stresses on agricultural and natural resources; surveys of potential transmission corridors; and data analysis and impact evaluation.

4.4.2 Objectives

Literature review and field sampling studies will: document the distribution of species and communities in the vicinity of the site and transmission corridors; survey for the presence of threatened or endangered species; characterize the structure, successional status, and habitat potentials; evaluate the relationship of species and communities to environmental conditions on the site; and evaluate the relationship of the vegetation to wetlands systems within and outside the project area. The objectives also include the identification of breeding areas, habitats, migratory patterns, and food chains for important species. Existing stress on natural and crop resources will be evaluated. The studies will be directed to producing terrestrial ecology baseline and impact analyses sections for the SCA/EID.

4.4.3 Scope of Work

4.4.3.1 Literature Survey/Data Search

This task consists of literature search and agency contacts to collect and evaluate available information useful for planning further studies, characterizing the environment of the site, and predicting the effects of plant construction and operation. Data relating to the ecological resources and pre-existing stresses of the site will be identified along with sensitive areas, issues, and concerns.

A survey will be conducted of the scientific literature, government reports and literature [e.g., Florida Game and Freshwater Fish Commission, Tampa Bay Regional Planning Council, Southwest Florida Water Management District (SWFWMD), and Soil Conservation Service (SCS)], maps and aerial photographs, the federal listing of threatened and endangered species (United States Department of Interior, Federal Register, December 1980, and subsequent updates), and various state or local lists of threatened and endangered species (Florida Game and Freshwater Fish Commission, August 1, 1979; Florida Committee on Rare and Endangered Plants and Animals, 1979). When applicable and useful, computerized literature searches available through DIALOG and NTIS will be used. Contact will be made with FDER, Florida Department of Natural Resources, Florida Game and Freshwater Fish Commission, SWFWMD, Corps of Engineers (COE), U.S. Fish and Wildlife Service (FWS), Hillsborough Community College, the University of South Florida (USF) herbarium, Florida State Museum, and other organizations to identify site-specific important species.

Older aerial photographs will be reviewed to give information on past history and successional processes on the site. SCS surveys will also be reviewed for supplemental information. County agricultural records and individuals and organizations conducting agricultural operations in the vicinity will be contacted to obtain information regarding crops, cultivation practices, yields, and any recently observed stresses.

4.4.3.2 Vegetation Field Studies

Qualitative Vegetation Surveys

Ecosystems of the site will be characterized by major vegetation types during a preliminary qualitative survey. Vegetation types will be delineated by aerial photographic interpretation and ground-truthed to establish the limits of each vegetative type to develop preliminary vegetation maps of the site and surrounding areas. Community type areas will be selected for more detailed analysis in homogeneous stands which are representative of the site and of surrounding lands.

Suitable habitat types will be surveyed for the presence of threatened or endangered plant species. The survey will cover the species and habitats identified in the literature search as probably occurring on site and will be done concurrently with the vegetation characterization. Areas of occurrence and distribution will be mapped. Taxonomic identification of species and update and verification of the species list will be performed. Characteristics of the vegetation sampling program are shown in Table 4-3.

Transect Studies

A total of four plant association analysis line transects will be established across the W.C. MacInnes site running from the wetlands zones into and across the uplands as far as the agricultural lands. At a minimum, the transects will traverse mangrove, mangrove-Brazilian pepper, interior sand flats, saline or fresh ponds, hardwood hammock, and disturbed upland communities. Location of transects will be determined following the first qualitative survey to correspond to location of wildlife survey transects and routes. Recorded along the transect will be vegetation characteristics (stratification, cover, diversity, canopy height, and species presence), characteristics of standing water (depth, salinity, and pH), and substrate characteristics (soil type, litter type, and thickness). Locations of boundaries of community assemblages will be plotted on the basis of observed changes in species presence and stratification of vegetation.

Quantitative Studies

Three study sites or stands will be selected for each of the major community types (mangrove, interior sand flat, pond or marsh, hammock, and disturbed

TABLE 4-3

TERRESTRIAL ECOLOGY VEGETATION SAMPLING PROGRAM

Activity	Method	Frequency or Season	Number of Stations per Community Type	Parameters
Qualitative Surveys	Species inventory	Quarterly	Whole site	Presence
Transect Studies	Association analysis Line transect	Late Spring	4 (total site)	Presence, height, cover
Quadrat Studies	Trees--5-m x 10-m or 100-m^2 circular quadrats	Summer	18	Density, cover, height, dbh
	Shrubs--4-m x 4-m quadrats	Summer	72	Density, cover, height
	Herbs--0.12- or 0.25-m^2 quadrats	Summer, autumn	72	Density, cover
Plant Stress Survey	Visual observation	Spring,* autumn	3	Symptoms, percent damaged tissue
	Leaf tissue analysis	Spring,* autumn	3	Na, Cl, F, S

* Sampling periods will be selected to be most representative of dry season (spring) and wet season (autumn) conditions as well as spring and autumn vegetable growing seasons.

upland) in the site area. Stands will include at least one stand representative of the community on the site, one stand previously sampled by USF in 1974 (where applicable), and one stand representative of the same major community type in an undisturbed area off-site, such as Cockroach Bay and/or Bishop Harbor. At least three sets of paired quadrats will be sampled in each stand for overstory vegetation. Shrub and herbaceous vegetation will be sampled in quadrats nested within each overstory quadrat. A minimum of 300 m^2 for overstory, 192 m^2 for shrubs, and 3 m^2 for herbaceous strata will be sampled in each stand. Basal area values for trees will be calculated by determining trunk diameter (dbh) for all stems over 4 centimeters (cm) dbh in each quadrat.

Wetlands and Tributaries Functional Analysis

Each of the drainages and tributaries crossing the property will be walked over from the coastal wetlands to the most landward extent of the property. Species list and qualitative estimates of dominance (based on cover) will be made for each obviously discrete segment of each tributary on the site. The estimated percent dominance of species on the FDER Chapter 17-4 list of wetland indicator species will be determined. Average channel bottom profiles, extent of functional floodplain (if any), and substrate characteristics will be noted at two points for each segment. Evaluation of food chain organisms and water characteristics will be made during the dry season and the wet season.

4.4.3.3 Wildlife Field Studies

Quarterly studies will be conducted to identify the important fauna, including threatened and endangered animals, which occur in the vicinity of the site, and important breeding and feeding areas, migratory patterns, habitat preferences, and food chains for important species. Up to eight separate sampling events, depending on the parameter sampled, will occur in each quarter.

Specific activities, as well as areas to be sampled, will be determined according to season-specific survey needs. Detailed activities for each field effort will be identified on the basis of the preliminary information developed during reconnaissance trips. The habitat, methods, frequency, and number of stations for each quarterly wildlife survey are shown in Table 4-4.

Bird Surveys

Birds on the site will be observed with the aid of binoculars or a spotting scope and auditory calls. Best estimate numbers of each species, according to the habitat type, will be recorded. Counts will be made during early morning for most upland habitats. In aquatic and other wetland habitats, surveys will be conducted to coincide with both high and low tidal activities. Point counts will also be conducted in the evening to determine location of potential roosting sites. The methods and frequency are shown in Table 4-4.

Aerial surveys will be conducted over adjacent flats and seagrass beds for the site and two surrounding areas, including the Piney Point mangrove system to describe wading birds, shorebirds, and waterfowl resources of the study

TABLE 4-4

WILDLIFE SAMPLING PROGRAM

Habitat	Methods	Number per Quarter	Number of Transects or Areas
Coastal Scrub			
Birds	Transects	8	1
Mammals	Small mammal trapping	5 nights	1
Mammals/Herps	Transect (track counts and random search)	4	1
Mangrove			
Birds	Transects/point count Aerial flyover	8 2	2
Mammals	Small mammal trapping	5 nights	1
Mammals/Herps	Transect (track counts and random searches)	4	2
Interior Sand Flats			
Birds	Transects/spot mapping	8	2
Mammals	Small mammal trapping including edge of saltwater ponds	5 nights	1
Mammals/Herps	Transect (track counts and random searches)	4	2
Ponds (Saline and Fresh)			
Birds	Whole area counts (canoe and observation point)	12	3
Upland Forest			
Birds	Transects	8	2
Mammals	Small mammal trapping	5 nights	1
Mammals/Herps	Transects (track counts and random searches)	4	2
Estuaries (Nearshore Flats and Grass Beds)			
Birds	Aerial Transects	2	1
	Transects (on-site)/spot mapping	8	1
	Evening/morning point counts	6	2

area and their relationship to on-site systems. Eight aerial helicopter surveys from November 1981 through November 1982 will use methods outlined by the U.S. Fish and Wildlife Service (1964). Area of survey will include approximately one-quarter mile coverage along each transect. Information will give estimated density, species diversity, and species richness. Following determination of estimated density from ground surveys, a correlation will be developed to correct biases from aerial surveys.

Mammal Surveys

Small mammal trapping will be conducted on one line transect (trap line) in each habitat as outlined in Table 4-4. Each line transect will consist of 10 stations with two traps (Sherman live trap and snap trap) per station. During each quarterly sampling effort, five lines will be trapped for five consecutive nights. Qualitative surveys will be made for signs of mammal activity including tracks, scat, trails, and burrows.

Reptile and Amphibian Surveys

Line transects from track counts and observation of the herpetofauna will be conducted as indicated. These activities will be used to develop estimates of relative abundance for mammals and herptiles. Incidental observations made during other activities will be noted.

Food Web Bioaccumulation Studies

These studies will provide baseline information on food webs supporting endangered and threatened species and commercially and recreationally important species associated with the site. Primary food web relationships for these important species will be developed utilizing existing information supplemented by field observations during the study. Background levels of pollutants already existing in the study area and in potential power plant emissions will be analyzed in key food web species. This sampling program is not designed to quantify the exact relationship of biomagnification from one trophic level to the next, but to use present knowledge and limited analyses to predict potential problems, and to make a predictive assessment of the possible accumulation in aquatic and terrestrial food chains.

Threatened and Endangered Species Methodology

A list of threatened and endangered plants and animals, designated by the United States Department of Interior (Federal Register, December 1980, and subsequent updates) and the Florida Game and Freshwater Fish Commission, which potentially may occur within the project area will be prepared. An endangered and threatened species analysis will then be used to describe the potential for occurrence, methods to be employed, and a suggested plan of study for further survey work, if needed, of species on the federal list. Discussions will be held with appropriate state and federal agencies to review the list of potentially affected endangered and threatened species and to obtain comments and agreement to the level of effort and method sufficient to support a biological assessment of such species as may be significantly affected by the project. After discussions with appropriate federal agencies, a "biological assessment" following FWS format will be prepared for species with a high likelihood of occurrence and high probability of influence by the proposed project.

A large portion of the information concerning endangered and threatened species will be obtained from surveys conducted for other aspects of the wildlife community. Included in these surveys will be point counts for forested habitats, transects for aquatic and wetland communities, and qualitative random searches in likely habitats.

Data will be analyzed to correlate wildlife usage to various habitats and identify breeding areas, feeding grounds, and food chains of important species. The Endangered Species Methodology Report will be used to identify any further species-specific surveys that may be necessary.

4.4.3.4 Pre-Existing Stress Surveys

The stress surveys will identify pre-existing stresses on vegetation, crop resources, and wildlife which may be affected by the proposed action. Evaluations of the type of stress and extent will be conducted to indicate possible existing sources of stress. Two surveys will be undertaken to note and quantify signs of pre-existing injury to crop plants and to important native plant species. For citrus and vegetable plants, the survey will include evaluation at each of three stations. The percentage of plants, leaves, and leaf area with injuries will be computed. The symptoms of each injury will be observed and evaluated for evidence of specific causes. General observations of signs of other stress (such as fire, wind, etc.) will be noted throughout field surveys. Evaluation will be made of yield trends and cultural practices for crop resources. County crop report records and owners and operators of farming operations within a five-mile radius will be consulted to evaluate yield trends from recent years. Note will be made of any reports of recent stresses or catastrophic events.

Leaf tissue samples will be collected during the dry (spring) and wet (autumn) seasons for indications of possibly elevated levels of certain elements indicative of air quality stresses. Replicate samples from three citrus, native vegetation, and vegetable crop stations will be analyzed for sodium, chloride, fluoride, and sulfur content. Data from the quadrat and wildlife studies will also be used to evaluate stress indicators such as changes in successional patterns, increase in invader and exotic species, and variations in cover or biomass of natural systems.

4.4.3.5 Proposed Corridors and Associated Facilities Surveys

These surveys will evaluate ecological sensitivity of areas along corridors or associated facilities. Proposed transmission corridors and barge delivery facilities associated with the project will be qualitatively surveyed one time by a low-altitude aerial survey to identify general vegetation and habitat types, and to locate areas which may pose environmental constraints or provide habitat for important species.

Two supplemental surveys will be made by helicopter and, access permitting, from the ground to allow a qualitative descriptive analysis. Data gathered will include: (1) a visual assessment of vegetative species dominance, diversity, and age; (2) animals seen and habitat value; (3) existing stresses; (4) successional patterns; and (5) slopes, standing water, and wetland indicator species. These surveys will cover only areas of specific concern (important wetlands, stream crossings, suspected habitat for endangered or threatened species, and other sensitive areas).

4.4.3.6 Data Analysis, Site Description, and Impact Assessment

Data Reduction and Analysis

Vegetation will be mapped by black and white and infrared aerial photographs and supplementary maps. Acreages will be estimated using an Electronic Compensating Polar Planimeter. Graphic presentation of plant communities distribution and dominance along gradients from wetlands to uplands will be prepared. Quantitative data will be used to determine density, cover, dominance, and frequency of each species, as well as species diversity in each stratum. Plant communities will be assessed for variation in community structure by direct ordination to environmental factors or by indirect ordination using quantitative indices of dissimilarity to better define the environmental factors affecting habitat succession and species distribution.

Lists of all wildlife species known or thought to occur on the site will be developed for each habitat type and will be used to calculate species diversity and species richness (species number) for each community type. Seasonal abundance values will be directly determined from inventory data where applicable and will be estimated for situations in which collection of unbiased quantitative data is not feasible. Maps of major concentrations of feeding animals, rookery and breeding areas, and sightings of threatened and endangered species will be updated continuously during the study.

Baseline Characterization

The baseline environment will be described from an ecosystem perspective. Such information will include identification of important flora and fauna, including threatened and endangered species expected to occur, their habitats, and area usage. The ecological description will also include key species/environmental relationships, key conditions including existing stresses, key food chain relationships and life histories for important species, and a functional characterization of the major terrestrial systems potentially influenced by the project. Species occurrence and composition will be displayed in graphic and tabular form. Final vegetation and agricultural resources maps will be presented for the region within a five-mile radius. Classification will be based on Florida Land Use and Cover Classification System Level III. Transmission corridors will be analyzed by a 1,000-foot-wide strip and mapped.

The baseline evaluation of wildlife resources will compare patterns of site usage to that of other areas in the vicinity, particularly along the coastal stand. Rookery/breeding areas within a five-mile radius of the site will be shown. The value of on-site habitats relative to nearby areas such as Cockroach Bay will be addressed. Food chain diagrams and delineation of major feeding areas for important species will be presented where these are important for impact assessment. Probability of occurrence and site usage by endangered and threatened species will be discussed.

Impact Analysis

Impact analysis of site preparation, plant construction, and corridor construction will focus on direct impacts on vegetative composition, productivity, wildlife habitat, sensitive areas, and populations of endangered and threatened species. Overlays of major terrestrial resources will be compared to proposed construction activities. Acreages affected will be determined by planimetry of the vegetation map.

Direct impacts on wildlife and endangered species will be determined by evaluating the changes in habitat quality and wildlife utilization of the affected areas. Population changes of important animals will be estimated based upon acreage changes of each habitat type. Indirect impacts will be identified by using the food chain and ecosystems analysis diagrams to locate points of potential interaction. Estimation of impact magnitude will be based largely upon literature research and values developed in earlier tasks.

Potential impacts of the heat dissipation system will be identified, including the potential for migratory birds striking transmission lines and towers. Area utilization by these species and probabilities of impact will be estimated. Effects of salt drift from cooling towers on surrounding plant communities, commercially important vegetation, and endangered and threatened species will be evaluated. Isopleth diagrams of salt deposition rates from cooling towers under normal and peak operating conditions will be compared to known tolerances of species in the major impact areas. Potential areas of impact and estimated effects will be predicted.

Potential for impacts on soils, vegetation, and terrestrial wildlife due to sulfur dioxide (SO_2), nitrogen oxides (NO_x), acid rain, and trace metals emissions from the stacks will be assessed. Particular emphasis will be placed on commercially important vegetation, endangered and threatened species, and other important wildlife. The assessment will rely on modeling outputs for SO_2 and on literature values for estimates of the other potential emissions. The values obtained will be compared to literature values for possible injury levels or other indirect effects. Chronic, long-term exposures will be evaluated as well as short-term (3-hour, 24-hour) levels. The analysis will focus on species-specific effects rather than on an ecosystem approach due to the limitations of the existing data base and the considerable effort required for ecosystem simulation modeling studies. Estimation of effects on commercial vegetation will be based primarily on published literature values on tolerances of specific crops. Ambient levels will be compared to tolerance levels as published in the literature.

Potential operational impacts of transmission, road, and rail corridors which will be addressed include, but are not limited to, bird collisions, maintenance clearing, pesticide use, traffic access, noise, induced currents, ozone production, drainage, and road maintenance. Inputs will be baseline data and literature reports.

Qualitative assessments of operational effects other than those associated with air and cooling tower emissions and transmission corridors will be performed. Effects of operation of the coal unloading facility at Port Manatee, including offloading, barge traffic, dredging, and dredge spoil deposition, will be evaluated. Effects of other potential impacts resulting from coal pile and ash pond runoff or leachate will be evaluated. Potential impacts of changes in groundwater flow or subsidy will be addressed if the hydrology studies indicate that significant effects may occur.

4.4.4 Use of Results

Terrestrial ecology results will be used to prepare baseline Section 2.9, Terrestrial Ecology, of the SCA/EID, as well as input into impact Sections 4.1, Site Preparation and Plant Construction; 4.3, Construction of Directly Associated Transmission Facilities; 4.4, Resources Committed; 4.5 Construction of other Associated Facilities; 5.5, Air Quality Impacts; 5.6, Effects of Operation and Maintenance of the Directly Associated Transmission System; 5.7 Associated Facilities and Other Effects; 5.8, Resources Committed; and 6.0, Environmental Measurements and Monitoring Programs. Input will be made to Sections 4.2, Special Features; 5.1, Effects of Operation of Heat Dissipation System; 5.2, Effects of Chemical and Biocide Discharges; and 5.9, Variances; as needed.

The terrestrial ecology evaluation will utilize data from several other environmental studies to include seagrass distribution and abundance of fish and invertebrates important in terrestrial food chains; tidal and current information from the aquatic ecology and surface water quality/hydrology disciplines for evaluation of the source of these food resources; and data from mangrove transect and productivity studies for correlation with terrestrial ecology studies. Modeling outputs for cooling tower salt deposition and stack particulate, sulfur dioxide, and nitrogen oxide emissions will be used to evaluate air impacts. Evaluation of other elements in cooling tower emissions, and in leachates, will depend on the levels found in water and sediment samples analyzed by the surface water quality/hydrology discipline.

Terrestrial ecology outputs will be coordinated with aquatic ecology and socioeconomics data for land use analyses and acreage determinations. Determination of the extent of possible crop injury or loss will provide a basis for land use and economic projections in the socioeconomics evaluations. Information on location of endangered species and other sensitive resources will be considered in the facility layout design.

4.5. AQUATIC ECOLOGY

4.5.1 Introduction

The aquatic environs in the vicinity of the proposed W.C. MacInnes Station include lower Tampa Bay (estuarine - shallow/deep), Bishop Harbor (estuarine - shallow/channelized), Cockroach Bay (estuarine - shallow), shell pits (brackish - shallow) and Piney Point Creek (estuarine - shallow). The shoreline is fringed with mangroves, tidal marshes, and salt barren areas. Extensive mangrove forests exist in the shallow reaches of Cockroach Bay and Bishop Harbor. Patchy seagrass beds occur in the shallow areas of lower Tampa Bay. Previous aquatic ecological studies in lower Tampa Bay have indicated the presence of diverse faunal assemblages.

The aquatic ecology evaluations to be conducted are designed to describe and characterize the major faunal and floral components of the aquatic environs in the vicinity of the proposed W.C. MacInnes Station. In designing the study plan, both temporal and spatial variations were taken into consideration. Site-specific literature searches and reconnaissance surveys were conducted to choose station locations and field methodologies. Ecological components considered important for the study are: phytoplankton (and primary productivity), zooplankton, ichthyoplankton, invertebrate meroplankton, benthic fauna (and sediments), fisheries, and emergent and submergent wetland vegetation.

Spatial intensity of sampling varies for the different study components (listed above). A lesser number of stations will be sampled for the planktonic components in comparison to the number of stations for the benthic components. Substratum heterogeneity in the study area is the reason for the greater number of benthic sampling stations. However, for each study component, an adequate number of stations were chosen to address spatial variations. Aspects which were taken into consideration for the selection of stations are: coverage of the entire study area; representation of a majority of the habitats in the study area; relevance to plant construction and operation effects; reconnaissance information; background literature information; accessibility; and ability to mark locations clearly.

Temporal intensity of sampling also varies for the different study components. The planktonic components will be sampled more frequently than the benthic components. The short life span of planktonic components necessitates more frequent sampling. To address annual variations, the period October through December will be sampled twice (once in 1981 and again in 1982). Aspects which were considered prior to the selection of temporal intensity are: (1) background literature information, and (2) importance to the evaluation of plant construction and operation effects.

As feasible, the study components will be sampled synoptically and at common locations. This will allow a selected analysis of interrelationships between the various ecological components in the study area.

4.5.2. Objectives

The overall objective of the study is to describe the aquatic fauna and flora in the vicinity of the proposed W.C. MacInnes electric power generation facility, and to assess the potential impacts of its construction and operation. Seasonal and spatial variations of the ecological components (within the realm of influence of the proposed facility) will also to be addressed.

Therefore, specific study objectives at the site are:

1. Temporally and spatially describe and characterize the phytoplankton communities in terms of species composition, abundance, species richness, diversity, biomass and productivity; also, qualitatively relate abiotic parameters to phytoplankton characteristics.

2. Temporally and spatially describe and characterize the zooplankton (holoplankton) communities in terms of species composition, abundance, species richness and diversity; also, qualitatively relate abiotic parameters to zooplankton characteristics.

3. Temporally and spatially describe and characterize the ichthyoplankton (fish eggs and larvae) populations in terms of species composition, abundance and spawning; similarly, describe *Menippe* (stone crab) and *Penaeus* (pink shrimp) larval populations. (*Penaeus* and *Menippe* are included in this program because of their importance to commercial fisheries of the area.) Also, qualitatively relate abiotic parameters to ichthyoplankton, *Menippe* and *Penaeus* distribution.

4. Qualitatively describe and characterize invertebrate meroplankton populations in terms of species composition, relative abundance and spawning seasons.

5. Temporally and spatially describe and characterize the benthic faunal assemblages in terms of species composition, density, species richness and diversity; also, qualitatively relate sediment and other abiotic parameters to faunal distribution.

6. Temporally and spatially describe and characterize the fish and macroinvertebrate communities in terms of species composition, relative abundance and biomass, species richness and diversity. Whenever feasible, identify nursery areas; also, qualitatively relate abiotic parameters to the distribution of fishes and macroinvertebrates.

7. Map the distribution of emergent and submergent wetland vegetation; temporally and spatially describe and characterize the species composition, biomass and/or productivity, species richness and associated fauna and flora of submergent and emergent wetland vegetation; also, qualitatively relate meteorological and water quality parameters to the distribution of seagrasses, mangroves and salt marshes.

8. Temporally and spatially describe and characterize the phytoplankton, zooplankton, benthic fauna, fishes and macroinvertebrates at Piney Point Creek and the shell pits.

9. Record and summarize incidental observations of manatees during the field effort of the above tasks.

4.5.3. Scope of Work

4.5.3.1 Literature Survey/Data Search

A literature search will be conducted to obtain background information on the effects of power plant construction and operation (dredge/fill effects, thermal effects, impingement, and entrainment), and ecological information available from past studies in Tampa Bay. Computer searches of relevant data bases will provide all published literature. Unpublished literature will be obtained from local sources (universities, laboratories, and consulting firms) and other power companies through letter requests and personal contacts.

Some site-specific unpublished ecological data are available from previous studies (1975-77) in the area. These data will be summarized and qualitatively compared to the information obtained from the present study. Tampa Electric Company's studies at the Big Bend Generating Station constitute a large ecological data base and will also be utilized for comparative purposes.

4.5.3.2 Ecological Studies

The study area for the aquatic ecology program (shown in Figure 4-1) extends from Cockroach Bay to Bishop Harbor along the coastline and approximately three miles into the Bay slightly beyond the Tampa Harbor Channel. It encompasses several types of habitats. Descriptions of sampling frequency, intensity, and methodology for the various study components are provided below and summarized in Table 4-5.

Phytoplankton and Primary Productivity

The phytoplankton community of Tampa Bay in the vicinity of the proposed W.C. MacInnes Station will be characterized from measurements of taxonomic composition, abundance, biomass, and productivity, as well as seasonal variations.

Samples for taxonomic composition, abundance, and biomass (chlorophyll *a*) will be collected on a biweekly basis for 15 months from seven stations. The stations were chosen to provide adequate spatial coverage of the area expected to be influenced by the construction and operation of the plant and adjacent uninfluenced areas that could be utilized as future control locations.

TABLE 4-5

SUMMARY OF SALIENT FEATURES OF EACH STUDY COMPONENT OF THE W.C. MACINNES AQUATIC ECOLOGY PROGRAM

Study Component	Number of Stations	Number of Replicates	Number of Vertical Samplings	Frequency of Samplings	Number of Sampling Trips	Total Number of Samples	Total Sampling Duration
1. Phytoplankton	7	1	2 (S,B)	Biweekly	32	448	15 months
2. Primary Productivity	2	4	4 (S,B,I)	Biweekly	32	1,024	15 months
3. Zooplankton	6	3	1 (O)	Monthly (two net sizes)	15	540	15 months
4. Ichthyoplankton	6	3	1 (O)	Biweekly (day and night)	32	1,152	15 months
5. Invertebrate Meroplankton	6	1	1 (O)	Monthly (day and night)	15	180	15 months
6. Benthic Fauna	14	8	1 (B)	Quarterly	5	560	15 months
	10	8	1 (B)	Six weeks	10	800	
7. Sediments	24	2	1 (B)	Quarterly	5	240	15 months
8. Fisheries - trawls	6	7	1 (B)	Monthly	15	630	15 months
- seines	6	2	1 (B)	Monthly	15	180	15 months
- nets	5	var.	1 (B)	Quarterly	5	var.	15 months
9. Wetland Vegetation							
Habitat Maps	>30	var.	1 (B)	Once	2	>30	2 weeks
Emergent Production	8	25	1 (B)	Monthly	12	2400	12 months
Submergent Vegetation	9	10	1 (B)	Quarterly	5	450	15 months

S = Surface; B = Bottom; I = 1 m intervals; O = Oblique.

Different depths and habitats are included in these seven stations to adequately address spatial variations. Previous studies in Tampa Bay have shown that biweekly sampling will be adequate to address temporal variations.

Phytoplankton taxonomic samples will be collected with a Niskin sampler from near the surface and bottom of each station. Identification will be carried to the species level for large cells and to the lowest practical level for small diatoms and phytoflagellates. Phytoplankton biomass will be estimated from chlorophyll a concentrations. Samples (2 liters) will be collected just below the surface and just above the bottom at the seven stations, and an additional eight depth-related samples will be taken in conjunction with the collection of the primary productivity samples at two stations. Chlorophyll a and phaeopigments concentrations will be measured utilizing the aqueous acetone extraction method. Productivity measurements will be made at one-meter depth intervals at two stations utilizing *in situ* Carbon-14 technique.

Temperature, salinity, and transparency (Secchi disc) will be measured *in situ* during the collection of the water samples. Dissolved organic nutrients (orthophosphate, nitrates, nitrites, and silicates), total carbonate, dissolved organic carbon, and dissolved total Kjeldahl nitrogen will also be analyzed. These abiotic parameters will be useful in explaining spatial and temporal variations of phytoplankton communities in the study area.

Phytoplankton taxonomic data will be tabulated as species lists for each sampling period. Specific data analyses will include density (cells per cubic centimeter), species richness (number of species per station), species diversity (Shannon-Weaver index), equitability (Pielou's index), and faunal similarity (Morisita's index).

The above parameters will be utilized for discerning spatial and temporal changes in phytoplankton communities at the study site. Biomass and productivity data will be tabulated and compared to the taxonomic information. Seasonal and spatial differences will be discerned. Abiotic parameters will be compared to the biomass, productivity, and community information to explain seasonal and spatial variations.

Zooplankton

Zooplankton samples will be collected monthly at six stations to provide adequate spatial and temporal coverage. Two 0.5 meter mouth diameter conical plankton nets -- one constructed of 64 micrometer nylon mesh, the other of 202 micrometer nylon mesh -- will be used to sample the larger microzooplankton and small mesozooplankton, respectively. Each net will be equipped with a flowmeter so that the water volume filtered can be calculated. Plankton tows will be oblique. Three replicate tows will be made with each net at each station. Upon retrieval, plankton will be washed into the cod end container and preserved in 5 percent buffered formalin. Water temperature, salinity, and dissolved oxygen will be measured at the surface, mid-depth, and bottom at each sampling station with a Hydrolab physico-chemical monitor.

In the laboratory, samples will be split into countable aliquots using a Motoda box. Aliquots will be poured into a gridded petri dish and sorted for abundant holoplankton. When 100 or more specimens of abundant species have been counted, the number of that species in the entire sample will be calculated on the basis of aliquot volume needed to find 100 specimens. In the event that fewer than 100 individuals of dominant species are counted in an aliquot, additional aliquots will be withdrawn and sorted. The entire aliquot will be sorted for rare species. All zooplanktonic organisms except meroplankton will be identified to the lowest possible taxonomic level and counted in the first replicate sample. The second and third replicates will be sorted only for individuals of the two or three most abundant species found in the first replicate. Zooplankton densities will be calculated for each station and standardized to the number of individuals per cubic meter.

Zooplankton taxonomic data will be tabulated as species lists for each sampling period. Specific data analyses will include density (number of organisms per cubic meter), density of dominant species, species richness (number of species per station), species diversity and equitability, and faunal similarity.

The above parameters will be utilized for discerning spatial and temporal changes in zooplankton communities at the study site.

Ichthyoplankton

Six stations will be sampled for ichthyoplankton at 2-week intervals. Station locations were chosen to provide comprehensive coverage of the study area and to encompass a range of depths and bottom types. In addition, all stations are within 50 meters of fixed navigational markers to facilitate locating them at night and to ensure reproducibility of sampling location. Samples will be collected during both the day and at night on each sampling date. Samples will be collected with a pair of 1 meter mouth diameter, 505 micrometer mesh plankton nets towed simultaneously. Each net will be equipped with a flowmeter so that water volumes filtered can be calculated. Two consecutive oblique tows will be made at each station. Tow duration and speed will be optimized to filter at least 100 cubic meters. Upon recovery, plankton adhering to the nets will be washed into the 1-liter cod-end containers, and the samples will be immediately preserved by adding a measured amount of buffered formalin to give a final concentration of 5 percent.

In the laboratory three of the four replicates collected at each station will be sorted for ichthyoplankton. The fourth replicate will serve as a back-up sample. The volume of each sample will be measured and a series of aliquots will be withdrawn from each well-mixed sample and sorted under dissecting microscopes for abundant fish eggs and zoea of the stone crab, <u>Menippe mercenaria</u>. When 100 or more specimens of a species have been found, the number of that species in the entire sample will be calculated on the basis of aliquot volume needed to find 100 specimens. All larval fish and postlarvae of the pink shrimp, <u>Penaeus duorarum</u> in each sample will be counted. Fish larvae will be identifed to the lowest possible taxon and classified to the development stage.

Data analysis for the ichthyoplankton studies will consists of preparing species lists, the calculation of total abundance (number per cubic meter), and the abundance of individual species. Seasonal and spatial comparisons of species composition and abundance will be made to determine spawning seasons and locations.

Invertebrate Meroplankton

Samples that have been sorted for ichthyoplankton will be utilized for the analysis of invertebrate meroplankton (primarily decapod larvae, because of the large mesh size). One sample of each of the stations (day and night) from every other ichthyoplankton collection will be sorted for invertebrate meroplankton (i.e., a total of 12 samples every month).

Ten milliliter subsamples (aliquots) will be drawn from each sample. All invertebrate meroplankton in the aliquot will be enumerated and identified to the lowest practical taxonomic level. Aliquots will be taken and sorted until at least 200 larvae are counted. All aliquots taken will be completely sorted. If fewer than 200 larvae are found, the entire sample will be sorted. Analyses of the invertebrate meroplankton data will be similar to that of ichthyoplankton.

Benthic Fauna and Sediments

Twenty-four subtidal stations (based on bathymetric differences) located on six transects will be sampled for benthic fauna and sediments. Based on previous studies in Tampa Bay, the total number of stations chosen is considered adequate to address the spatial variations in the study area.

Benthic infaunal samples will be collected with 12.5 centimeter by 12.5 centimeter by 10 centimeter deep, diver-operated cores (0.016 cubic meter surface area). Diver-operated sampling gear is preferable to remotely-operated gear because the diver can ensure consistent and accurate core penetration and can make visual observations of sediment type and macrofaunal associations. All 24 stations will be sampled on a quarterly basis. The benthic communities of Tampa Bay are known to undergo pronounced seasonality in species composition and faunal densities. Therefore, 10 of the 24 stations will be sampled at six-week intervals. Ten replicate core samples will be collected at each station. Eight of these replicates will be analyzed, and the remaining two will serve as insurance against loss of sample and/or inadequate species saturation. For quantitative benthic studies, a sample size of 0.1 to 0.2 square meter is generally believed to be adequate. However, the construction of species area curves is a more precise method of determining proper sample size. Based on previous studies in Tampa Bay, it appears that analysis of eight replicate samples (0.125 square meter) will adequately describe the benthic community at each station.

Collected samples will be washed through a 0.5 millimeter sieve in the field, narcotized with a 10 percent solution of magnesium sulfate, stained with rose bengal, and preserved in 10 percent buffered formalin.

Samples will remain in formalin for 48 hours to ensure thorough fixation and will then be preserved in 70 percent isopropyl alcohol. The initial phase of the processing procedure will consist of decanting a sample into light (majority of fauna and detritus) and heavy (molluscs and coarse sediments) fractions. The light fraction will be sorted with the aid of a binocular microscope. The heavy fraction will be sorted with the unaided eye in a white background enamel pan. Taxonomic identifications to the lowest practical taxonomic level will be performed under various powers of a binocular microscope (7-90X) augmented by a Nikon Labophot compound microsope (40-1000X).

Sediment samples for grain size analysis and total organic carbon (TOC) determinations will be obtained with 3.7 centimeter diameter PVC (polyvinylchloride) cores to a depth of 10 centimeters at each station. The samples will be placed on ice, returned to the laboratory, and frozen until analyzed. Sediment samples will be obtained at all stations on a quarterly basis. One sample from each station will be utilized for grain size and TOC analyses. The second sample will serve as a backup. Silt/clay fractions will be determined by wet sieving the sample through a 0.063 millimeter sieve, drying the material retained for 72 hours at 100°C, and weighing. The sand fractions will be determined by drying the sample at 100°C for 24 hours and sieving through a nest of sieves (Wentworth classification scale; one-phi intervals ranging from 2.0 millimeter to 0.063 millimeter sieve sizes) utilizing a mechanical shaker. TOC will be determined by the persulfate oxidation method. In situ measurements of temperature, conductivity, and dissolved oxygen content will be taken at each station during the collection of core samples.

Data analyses of infaunal samples will consist of preparing species lists and computing faunal density, species richness, species diversity, and equitability. A faunal similarity analysis utilizing Morisita's index will be used to discern spatial and temporal variations.

Data analyses of sediment samples will consist of determining grain size distribution and computing mean grain size, sorting coefficient, skewness, kurtosis, percent silt/clay, and percent TOC. Species composition and numerical indices (listed previously) will be utilized to quantitatively describe the seasonal and spatial variations of benthic communities at the study site. Sediment information will be utilized to interpret these variations.

Fisheries

Primary sampling for fishes and macroinvertebrates in the study area will be conducted with otter trawls (3 meters, 3.8 centimeter stretch mesh, 0.6 centimeter cod end) and seines (45.7 by 1.8 meter bag seine, 1.9 centimeter stretch mesh, 1.3 centimeter bag). Auxiliary information will be collected with trammel nets, smaller seines, and dip nets. Seven 2-minute trawls will be collected on a monthly basis at six locations during the night. Duplicate seine samples will be collected at three stations on a monthly basis during daylight hours. Utilizing block and seine techniques, three additional stations will be sampled on a monthly basis during daylight hours. Auxiliary sampling with trammel nets, smaller seines, and dip nets (grass beds) will be conducted on a quarterly basis. This multi-gear approach will provide a reasonably complete inventory of the fish and macroinvertebrate species in the study area.

Fishes in the mangrove areas will be collected with a small seine and the macroinvertebrates with cores and dip nets. A qualitative analysis of the fauna associated with the mangroves will be conducted to produce species inventories. All fauna collected in any of the seagrass and algae samples will be identified and enumerated.

The field collections will be preserved in 10 percent buffered formalin. In the laboratory, all animals will be sorted, identified to the lowest practical taxon, and enumerated. The number and identity of each species will be recorded for each seine and trawl replicate so that intra-station variation can be assessed. All replicates from an individual station will be combined for further analyses. Up to 100 individuals of a species from each station will be weighed and measured (standard length). The remaining individuals of that species will be counted and weighed as a group. The average lengths and weights of each species collected at each station can be determined from this information. Invertebrates will be analyzed in a similar manner except that carapace length will be recorded for shrimp, and carapace width will be recorded for crabs.

Because of the qualitative nature of fisheries information, data analyses will be limited to the preparation of species lists, relative abundance estimates, relative species richness, relative biomass, and species diversity. Temporal and spatial comparisons will be made but will be qualified by sampling gear limitations. Marked seasonal and spatial changes will, however, be obvious.

Emergent and Submergent Wetland Vegetation

Habitat maps will be prepared from existing true color and infrared aerial photographs and U.S. Geological Survey (U.S.G.S.) topographic maps for the study area (Cockroach Bay to Bishop Harbor). The habitat maps will clearly describe and locate all dominant emergent and submergent wetland vegetation in the study area by ground truthing. No less than 20 transects for emergent vegetation and 10 transects for submergent vegetation will be sampled for the ground truthing. Wetland acreages in the study area will be determined from the habitat maps using a Lasico 40 automatic planimeter. Detailed species lists, canopy heights, and basal area determinations will be made for the emergent vegetation (primarily mangroves) at the 20 transects. Detailed species lists will be prepared for the seagrasses and macroalgae at the 10 submergent vegetation transects.

For emergent vegetation, litterfall production will be measured at three transects on a monthly basis for 12 months. Litterfall collection bags will be randomly placed (twenty-five 0.25 square meter bags) at each station and collected monthly. The bags will be left in the field for 1 or 2 weeks depending upon initial results. All collected leaf litter will be sorted according to species, dried at 60°C for 24 hours, and weighed. Monthly phenological data will be recorded to determine the reproductive status and cycle for each of the mangrove species observed.

Submergent vegetation will be sampled along three transects. Along each of the three transects, three stations will be established. At each station, five 12.5 square centimeter screened box core samples will be collected (quarterly) and sieved through a 500 micron sieve in the field. Sorting will involve separation of seagrass by species, macroalgae, and associated fauna. All seagrasses will be washed with diluted hydrochloric acid to remove attached epiphytes. Seagrass shoots will be counted by species, and the 10 longest shoots of each species will be measured. All shoots and roots (nonphotosynthetic component) will be separated, dried at 60°C for 24 hours, and weighed. Macroalgae collected in the seagrass will be identified and dry weights, (biomass) determined. A 0.25 square meter covered quadrat of seagrass will also be collected at each station. The screen-covered square will be placed over the seagrass. The grass will be cropped at the sediment surface, removed, and preserved. From these samples, a qualitative and quantitative survey of both plant and animal epiphytes will be conducted. Along each of the three transects, three additional stations will be established. At each station, five 0.25 square meter screen-covered quadrats will be collected quarterly for macroalgae and associated epiphyte organisms. Sorting will involve separation of macroalgae and associated fauna by species.

Manatee Sightings

An earlier study conducted by Tampa Electric Company in 1979-80 described the presence of manatees in the study area. Opportunistic sightings during all field activities (described in the preceding pages) will be recorded in a standard format. The information will be assembled to provide a general overview of manatee presence in the study area on a temporal basis.

4.5.3.3 Thermal Tolerance Criteria

Selective indigenous species will be identified in the ecological studies (discussed above) on the basis of commercial importance, forage value, or dominance. Thermal tolerance criteria will be developed for these species from literature and site-specific experimental studies. Literature searches will be limited to tropical habitats, because information on species from other areas will not be applicable to the site.

4.5.4. Use of Results

Results obtained from the aquatic ecology program will be utilized to describe the baseline conditions in the vicinity of the proposed W.C. MacInnes site.

Specifically, the results will provide input to the SCA/EID in terms of describing the fauna and flora in the aquatic environs of the study site. Potentially, construction and operation of the power station will impart four primary types of ecological effects: dredge/fill, thermal/chemical, entrainment, and impingement.

To address dredge/fill effects, wetland vegetation studies will be conducted. To address potential thermal effects, quantitative benthic faunal and floral studies will be conducted on an intensive spatial and temporal scale. To address potential entrainment effects, emphasis will be placed on ichthyoplankton populations. Data will also be collected on invertebrate meroplankton, zooplankton, and phytoplankton populations of the study area to address this aspect. To address potential impingement effects, data will be collected on the fishes and large macroinvertebrates of the study area. Synoptically analyzed, all the above data should provide a basic understanding of the potential ecological effects that can be anticipated from the construction and operation of the proposed power station.

Data collected by the surface water quality and hydrology program (see Section 4.2) will be utilized to interpret spatial and temporal variations of the aquatic communities in the study area. For example: (1) information on circulation patterns will be used to interpret plankton data; (2) information on nutrient distribution will be used to interpret primary productivity and phytoplankton data; and (3) information on temperature, salinity and DO will be used to discern optimum spawning conditions for the fisheries of the area.

The aquatic ecology information gathered by this program will be utilized in the preparation of SCA/EID Sections 2.8, Aquatic Ecology; 4.3.1, Effects on Vegetation, Wildlife, and Aquatic Life; and 5.1.3, Aquatic Life. Specifically, the data will be utilized to assess the impacts of plant construction, plant operations, and plant design alternatives.

4.6 SOCIOECONOMICS/LAND USE/DEMOGRAPHY

4.6.1 Introduction

The purpose of this section of the study is to identify and evaluate impacts which may result from the construction and operation of the proposed W.C. MacInnes station on the population, economy, community facilities and services, land use, and visual environment within the following geographic areas:

1. The plant site;
2. The local area within a five-mile radius centered on the site; and
3. The region (Hillsborough, Manatee, and Pinellas Counties)

The magnitude and duration of both positive and negative impacts will be considered. Findings will be used as a basis for identifying and evaluating strategies that could be incorporated into construction and operating plans in order to mitigate adverse impacts and to reinforce beneficial effects of the project.

4.6.2 Objectives

The socioeconomic/land use impact study is designed to assess land use, demographic, and socioeconomic changes resulting from the W.C. MacInnes power plant development. Study objectives are to:

1. Identify the types and extent of employment, expenditure, and land use characteristics associated with the proposed W.C. MacInnes station throughout both construction and operating phases;
2. Determine the magnitude and significance of changes these characteristics will create in the demography, economy, land use, and demand for future facilities and services within surrounding geographic areas;
3. Assess the impact on public fiscal programs that will result from the project's effects on the region's population, economic conditions, and community service/infrastructure needs; and
4. Identify and evaluate potential actions that may be incorporated into project planning to reduce potential adverse impacts and maximize beneficial effects of the W.C. MacInnes station.

4.6.3 Scope of Work

4.6.3.1 Literature Survey/Data Search

The objective of this study phase is to assemble and evaluate existing data and to identify new data needs.

Reports, studies, maps, and other pertinent information will be solicited from public agencies and private sources, in order to describe existing and projected future characteristics of the study areas. Entities to be contacted include:

1. U.S. Department of Commerce, Bureau of the Census
2. U.S. Department of Commerce, Bureau of Economic Analysis
3. OBERS data base
4. U.S. Department of Labor
5. U.S. Department of Agriculture
6. U.S. Soil Conservation Service
7. U.S. Army Corps of Engineers
8. Florida Department of Natural Resources
9. Florida Office of Planning and Budgeting
10. Florida Department of Commerce
11. Florida Department of Transportation
12. Regional Planning Councils - Tampa Bay and Southwest Florida
13. County Planning Commissions - Hillsborough, Manatee, Pinellas
14. City Planning Departments - Palmetto, Bradenton, Tampa (Revenue and Finance Department)
15. City and County Engineering and Public Works Departments - Hillsborough, Manatee, Palmetto
16. City and County Finance Departments - Hillsborough, Manatee, Tampa, Palmetto
17. Hillsborough County Metropolitan Planning Organization
18. Tampa Port Authority
19. Manatee Port Authority
20. Economic Development Councils (Hillsborough, Manatee, Pinellas)
21. Utilities
22. Universities and Libraries
23. Other public and private sources

Information obtained or developed in other phases of the overall Plan of Study will also be reviewed for use where appropriate.

Library searches, telephone contacts, and personal interviews will be the principal means for investigating data availability. Public sources will be used whenever possible to ensure maximum consistency between the data used for this study and data used by various public agencies in their planning activities. Other sources including original file searches, surveys, and/or field investigations will be used when available information is found to be insufficient to support an adequate analysis of significant project impacts.

4.6.3.2 Prepare Baseline Description of Study Areas

The objective of this task is to describe land use, demographic, and socioeconomic characteristics expected to result from normal growth and development in the geographic study areas under a "no project" situation. These area profiles will then serve as a baseline against which impacts of the W.C. MacInnes station will be evaluated.

Characteristics to be projected through a future period paralleling the construction and operating phases of the W.C. MacInnes station include land use; demography; employment, labor force, and income; community facilities, infrastructure, and services; and public fiscal programs.

The baseline study area descriptions will establish values for key variables that can be used to assess the level of impact expected to result from additional increments of growth. After specific characteristics of the W.C. MacInnes station construction and operation are determined, these unit values will be used to determine the level and significance of changes that would be produced in the baseline situation. The baseline descriptions will be structured to permit analysis of impacts in each geographic study area.

4.6.3.3 Identify Project Characteristics

The objective of this task is to identify the type and extent of characteristics associated with the W.C. MacInnes station which may produce significant positive or negative impacts on key characteristics described under the baseline situation. Categories of construction and operating phase characteristics to be investigated include labor force; employee demographic and socioeconomic characteristics; types and levels of expenditures for materials and services; and physical, site development, and land use characteristics.

Key variables associated with project employment, expenditures and site development will be allocated to geographic study areas using assumptions derived from the baseline description or, where appropriate, from detailed analysis of project-specific characteristics. The manner of distribution will permit later evaluation of actions to mitigate adverse development impacts and strengthen beneficial effects.

4.6.3.4 Evaluate Project Impacts

The purpose of this task is to identify significant impacts which occur in each geographic study area as a result of project-imposed changes in baseline conditions.

Socioeconomic impacts will result primarily from employment generated by the project and from expenditures for materials and equipment during the construction and operating phases. These will in turn produce secondary employment and income in the regional economy; demands for housing, roads, utilities, and other community facilities and services; and new revenues for area governments. Physical impacts will include alteration of urban development patterns, natural communities, and the visual environment.

The analysis will consider the positive and negative aspects of primary and secondary impacts. Project characteristics will be applied to unit values established for each geographic study area in the baseline descriptions to determine the presence or absence of significant impacts on unemployment, economic structure, income levels, public fiscal programs, economic value of natural resources, and related characteristics.

The W.C. MacInnes station's planned reliance on Port Manatee for importing coal can be expected to have a significant effect on the port's future development. To ascertain the nature and extent of these impacts, the analysis within the five-mile radius of the W.C. MacInnes Station site will separately consider impacts at Port Manatee in a manner similar to that used for assessing site-specific development impacts.

4.6.3.5 Identify Mitigative Measures

The purpose of this task is to evaluate the potential effectiveness of measures that may be taken to mitigate impacts that have been identified for the project. Strategies considered appropriate for consideration will be evaluated for potential effectiveness by testing their influence on baseline plus station characteristics in affected geographic areas.

4.6.4 Use of Results

The data collection, profile development, and impact assessment tasks described above will be used to prepare the following sections of the SCA/EID: 2.2.1, Land Use; 2.3, Socioeconomics; 2.10, Other Environmental Features; 3.8, Directly Associated Transmission Lines; 3.9, Directly Associated Facilities; 4.1.2, Land Impact; 4.1.3, Impact on Human Populations; 4.3, Construction of Directly Associated Transmission Facilities; 4.5, Construction of Other Associated Facilities; 5.6, Effects of Operation and Maintenance of Directly Associated Transmission System; 5.7.1, Effects of Associated Facilities; 5.7.2, Other Plant Operation Effects; 5.8, Resources Committed; and 7.0, Economic and Social Effects of Plant Construction and Operation.

4.7 ARCHAEOLOGY

4.7.1 Introduction

An inventory of historical and archaeological resources on the project site and within a five-mile radius will be prepared. The significance of these resources will be evaluated against potential impacts of plant construction and operation. In the event that significant resources are located within project construction or operation impact areas, mitigative measures will be investigated; including but not limited to excavation, recovery, and construction design alternatives.

4.7.2 Objectives

The principal objective is to prevent an irretrievable loss of historical and archaeological resources, due to project construction and operation. This will be accomplished by (1) a thorough review of existing sources of information identifying historical and archaeological resources on the site and within a five mile radius; (2) field studies designed to reveal any previously unknown resources on the project site; (3) assessment of the significance of existing and previously unknown resources; and (4) project impact evaluation.

4.7.3 Scope of Work

4.7.3.1 Literature Survey/Data Search

The literature survey and data search will include a review of all pertinent archaeological and historical literature, records, and other data relative to the plant site and surrounding area. A general inventory of recorded historical and archaeological sites within a five mile radius of the project site will be compiled through coordination with the State Historic Preservation Officer. Previously published reports regarding cultural resources surveys and excavations in the vicinity will be examined. Pertinent histories, general archaeological studies, documents and other archival materials will also be examined to determine general patterns of pre- and post-historic cultural activities. Relevant environmental factors (both past and present) known to be associated with recorded sites in the vicinity of the survey area will be analyzed to determine the cultural relevance of environmental characteristics. Analysis and evaluation of these data will provide a field research design based on predictive environmental characteristics. This will permit a scientific field investigation with a very high probability of locating previously unknown resources, if they exist on the project site.

4.7.3.2 Field Survey Methodology

The project site encompasses approximately 3,200 acres of land. The planned power plant facility will occupy approximately 600 acres. Land under this designation will be subject to a systematic pedestrian reconnaissance survey. This effort will be designed to locate any previously unknown cultural resources. The tentative predictive model formulated from the literature and records search will permit an intensive, non-random survey in settings where a higher probability of archaeological site occurrence might be expected. Systematic non-random subsurface testing will be carried out by digging small shovel holes at intervals appropriate to the specific locale. Particular attention will be given to locales designated for intensive development, such as the location of the power plant, access roads, and transmission tower locations, when known.

4.7.3.3 Evaluation of Field Survey Results

Data obtained from the field survey will be evaluated to identify sites which may warrant further investigation. In the event that significant sites are located, additional field studies will be conducted as necessary to fully define the extent and nature of such sites.

4.7.3.4 Determination of Construction and Operations Impacts on Historical and Archaeological Resources

Evaluation results will be compared with specific site locations to determine plant construction and operation impacts. Alternative courses of action will then be considered; including excavation and recovery of archaeological resources, physical removal of historical resources, and plant construction and design alternatives which would reduce or eliminate impacts. A preferred alternative will be identified in each case.

4.7.4 Use of Results

Results of the evaluations outlined in this section will appear in SCA/EID Sections 2.2, Land and Water Use; 4.1, Site Preparation and Plant Construction; 4.3, Construction of Directly Associated Transmission Facilities; and 5.7, Associated Facilities and Other Effects.

4.8 NOISE

4.8.1 Introduction

The site certification process for construction and operation of electrical generation facilities requires an assessment of noise emissions and their potential impact on the surrounding environment. The facility must comply with federal, state, and local government regulations which specify levels of sound intensity for various land uses. In determining a plan of study that will comply with certification requirements and indicate whether noise mitigation measures might be required, a preliminary estimate of probable noise emissions and potential impacts associated with the project will be prepared. The following plan of study addresses the particular circumstances presented by power generation at the W.C. MacInnes site.

4.8.2 Objectives

The objectives of the noise evaluation are: (1) to accurately measure ambient noise levels at and surrounding the W.C. MacInnes site; (2) to predict noise levels due to plant construction and operation; (3) to project impacts of on-site noise to potential noise-sensitive land uses surrounding the project site; and (4) to evaluate these impacts within the context of federal, state, and local guidelines and standards for noise.

4.8.3 Scope of Work

4.8.3.1 Literature Survey/Data Search

All applicable federal, state, and local noise standards and guidelines will be identified and reviewed. The availability of existing noise monitoring data at the project site and surrounding area will be investigated. Monitoring data on plant construction and operation at the Big Bend station will be acquired, as will other published literature on noise impacts related to construction and operation of coal-fired electrical power generating stations.

4.8.3.2 Site Survey for Noise-Sensitive Areas

In addition to information obtained from the socioeconomics tasks, aerial photographs, topographic maps and local government land use maps will be used to establish locations of noise-sensitive land uses surrounding the project site. Compilation of these data will be followed by aerial reconnaissance and ground truthing to confirm noise-sensitive areas and to identify any newly constructed facilities not shown on published maps.

4.8.3.3 Ambient Noise Survey

Four ambient noise monitoring stations will be established on the W.C. MacInnes site: one at the plant location, and the other three arrayed from north to south on the east side of the plant (between the noise emission source and points of noise impact). One 24-hour set of measurements will be taken at each monitoring station for baseline purposes. Monitoring will be scheduled for cool, calm conditions in order to maximize noise intensity measurements. Rainy periods and high wind speed conditions will be avoided.

Two continuous level sound analyzers, with wind screens and omni-directional microphones, will be deployed simultaneously to obtain additional data for quality control. At the end of each 24-hour monitoring period, statistical noise levels (L_{eq}, L_i, L_{10}, L_{50} and L_{90}) will be compiled for hourly and diurnal measurements.

Data will be analyzed graphically for each monitoring location. Additional monitoring and analysis will be performed if variation is in excess of expected levels, and any unusually high noise levels will be investigated to determine probable origin. Summary data will be presented in a tabular format, with indices of variability presented by the five statistical noise levels listed above.

4.8.3.4 Acquisition of Construction Schedule and Noise Level Data on Construction Equipment

Data previously collected on the Big Bend site will be used to predict construction and operation noise levels. These data will be supported by data from other published studies of electric generation facilities.

4.8.3.5 Evaluation of Noise Impact

A logarithmic calculation of noise dispersion will be used to project expected construction and operation noise levels over the baseline conditions established during ambient monitoring. This dispersion calculation technique will assume hemispheric propagation and atmospheric absorption under average site-specific atmospheric conditions. Periods of maximum noise impact will be examined in greatest detail, and noise projections will be extended as far as necessary to include the nearest noise-sensitive land uses.

4.8.3.6 Comparison of Construction and Operation Noise, Plus Ambient, With Standards or Guidelines

Noise levels at the plant site, at the site boundary, and at the nearest noise-sensitive land uses will be compared with federal, state, and local standards and guidelines. For any location at which noise level standards or guidelines would be exceeded, mitigative measures will be recommended.

4.8.4 <u>Use of Results</u>

Field monitoring results, data analysis, and comparison with applicable standards and guidelines will be documented in SCA/EID Sections 2.10, Other Environmental Features; 4.1, Site Preparation and Plant Construction; 5.7, Associated Facilities and Other Effects; 6.2, Pre-application Monitoring; and 7.1, Socioeconomic Costs.

Section 5

ANALYTICAL LABORATORY SERVICES

5.1 INTRODUCTION

Prior to the construction of the proposed W. C. MacInnes electric power generation facility, Tampa Electric Company will be required to obtain environmental permits from various state, local, regional, and federal agencies. This permitting process will require gathering an extensive data base for parameters in water and other media to document existing baseline conditions at the proposed site, and potential impacts. Independent analytical services will be provided to the terrestrial ecology, air quality/meteorology, aquatic ecology, hydrogeology, and surface water quality/hydrology evaluations by Environmental Science & Engineering, Inc., of Gainesville, Florida. The following sections describe the analytical methods, quality assurance/quality control (QA/QC) procedures, chain-of-custody procedures, and data management procedures that will be used in this project to provide analytical services of the highest quality.

5.2 ANALYTICAL PROGRAM

5.2.1 Sample Kits

Sample kits will be provided to each of the individual sampling teams. These kits will contain prelabeled containers, preservatives, chain-of-custody forms, and instructions for use.

5.2.2 Specific Analytical Methods

Table 5-1 lists the specific methods that will be used throughout the study. These analyses will be conducted with the appropriate QC samples, as described in Section 5.3. Metals analyses will be conducted by the cold vapor technique (atomic absorption) for mercury and by inductively coupled argon plasma (ICAP) for all other metals. The matrix for all parameters (classical, water related; metals; radiological; and herbicides and pesticides) will be water.

5.3 ANALYTICAL QA/QC REQUIREMENTS

5.3.1 Notebooks and Logbooks

All information concerning analyses performed in the laboratory will be recorded for permanent record in the instrument logbook and analytical notebooks. All notebooks and logbooks are assigned a sequential number by the laboratory. Completed notebooks are maintained in a central file.

Logbooks are maintained for all major instruments, and typically include the following information:

1. Date of analysis;

2. Project name and number;

TABLE 5-1

SUMMARY LIST OF SPECIFIC ANALYTICAL METHODS PROPOSED FOR USE IN THE W.C. MacINNES STATION PERMITTING EFFORT

Parameter	Discipline*	Reference
Classical, Water Related		
Alkalinity	H	U.S. Environmental Protection Agency. 1979, Methods for Chemical Analysis of Water/ Wastes, EPA-600/4-49-20.
BOD		
Bromide		
COD		
Chloride	TH	
Color		
Cyanide	H	
Fluoride	TH	
Hardness		
MBAS (Detergents)	H	
NH_3	H	
Oil and Grease		
pH	H	
Phenols		
Dissolved Solids	H	
Suspended Solids		
Conductance		
Sulfate	TH	
Sulfide		
Turbidity		
TKN	A	
Acidity		
TOC	A	
Nitrate/Nitrite	AH	
Nitrite	AH	
Ortho-Phosphate	AH	
Total-Phosphate	AH	
Silica	A	
Bromine	H	The Chemistry and Control of Modern Chlorination, A.T. Palin, 1973.
Bicarbonate		Standard Methods, 15th Ed., 1980.
Fecal Coliform		
Total Coliform		
Fecal Strep		
D.O.		
Total Carbonate	A	
Metals		
Aluminum	H	U.S. Environmental Protection Agency. 1979. Methods for Chemical Analysis of Water/ Wastes, EPA-600/4-49-20.
Antimony	H	
Arsenic	H	
Beryllium		
Boron		or
Cadmium	H	
Calcium		Inductively Coupled Argon Plasma (ICAP). Federal Register 44 (233) December 3, 1979, and Federal Register 44 (244) December 18, 1979.
Chromium	H	
Copper	H	
Iron	H	
Lead	H	

TABLE 5-1 (Continued)

Parameter	Discipline*	Reference
Magnesium		U.S. Environmental Protection Agency. 1979. Methods for Chemical Analysis of Water/ Wastes, EPA-600/4-49-20. or Inductively Coupled Argon Plasma (ICAP). Federal Register 44 (233) December 3, 1979, and Federal Register 44 (244) December 18, 1979.
Manganese	H	
Mercury	H	
Nickel	H	
Potassium		
Selenium	H	
Silver	H	
Sodium	TH	
Thallium		
Titanium		
Vanadium		
Zinc	H	
<u>Radiological</u>		
Gross alpha	H	U.S. Environmental Protection Agency. 1980. Prescribed Procedures for Measurement of Radioactivity in Drinking Water, EPA-600/4-80-032.
Gross beta		
Radium - 226/228		
<u>Pesticides and Herbicides</u>		
Aldrin	H	Federal Register, Method 8.
α- BHC		
β- BHC		
δ- BHC		
γ- BHC (Lindane)		
Chlordane	H	
p,p'DDD		
p,p'DDE		
p,p'DDT	H	
Dieldrin	H	
Endosulfan I	H	
Endosulfan II		
Endosulfan Sulfate		
Endrin	H	
Endrin Aldehyde		
Heptachlor	H	
Heptachlor Epoxide		
Toxaphene	H	
PCB-1016	H	
PCB-1242	H	
PCB-1248	H	
PCB-1254	H	
PCB-1260	H	
Methoxychlor	H	
Guthion	H	
Demeton	H	
Malathion	H	
Parathion	H	
Mirex	H	
2,4-D	H	Federal Register, Method 615.
2,4-DB		
2,4,5-T		
2,4,5-TP	H	

*T = Terrestrial Ecology
A = Aquatic Ecology
H = Hydrogeology
(All parameters will be used by Surface Water Quality/Hydrology discipline.)

3. Number of samples analyzed, type of sample, batch number;

4. Time spent on analysis (start to finish);

5. Preventive maintenance performed, if any;

6. Time spent on preventive maintenance;

7. Instrument calibration performed, if any; and

8. Name of analyst.

The instrument logbook itself consists of a bound notebook containing the preventive maintenance schedule, the analytical QC charts, and, as a reference, the calibration procedures. Additional notes are made in the instrument logs when required, particularly to record any abnormal instrument or analytical performance. It is the responsibility of the analyst to ensure that instrument logs are properly maintained.

5.3.2 Instrument Calibration

Each laboratory instrument used in the study is calibrated according to a calibration plan, which includes the following elements:

1. Designation of satisfactory calibration sources;

2. Calibration intervals;

3. A listing of all necessary calibration standards, including proper nomenclature and identification numbers;

4. The method that establishes the origin of calibration standards;

5. The relevant environmental conditions (temperature, humidity, barometric pressure, etc.) that must be controlled and recorded when calibrations are performed; and

6. Written calibration procedures for all analytical and measurement equipment and standards.

Written procedures for the operation and calibration of instrumentation and standards are provided to the analyst to minimize possible measurement inconsistencies due to differing techniques, conditions, and choice of standards. The procedures include the following information:

1. The specific instrument (or group of instruments) and analysis for which the procedure is applicable;

2. An explanation of theoretical considerations pertinent to the understanding of both the calibration procedure and the analysis;

3. Fundamental calibration specifications;

4. A list of requisite standards and equipment for the procedure; and

5. Complete presentation of the procedure in a clear, step-by-step manner.

5.3.3 Method Blank

A method blank is determined for each set of samples analyzed, and whenever a new source (new container) of reagent or solvent is introduced into the analytical scheme. The method blank is determined by taking a quantity of reagents equivalent to that used in the analysis of the sample, and performing the entire analytical procedure, including use of all glassware and other materials that come into contact with the sample. Reagents having background levels that interfere with the compounds to be determined are purified and shown to be acceptable, or replaced with acceptable reagents prior to proceeding with the analyses.

5.3.4 Specific Automated QC Checks

Prior to the analysis of samples, a standard curve spanning the entire working range of the method is prepared with at least five standards, including one near the upper limit of the concentration range, and one near the lower limit of the concentration range. All analyses using a standard curve as the computation basis must meet the following criteria:

1. The curve must be prepared using at least one blank.

2. The curve must be prepared using at least five standards.

3. The coefficient of correlation for the standard curve must exceed a preset level (dependent on the parameter).

4. The y-intercept must not deviate from zero by more than a preset level (dependent on the parameter).

5. The number of replicates must be greater than, or equal to, 10 percent of the number of samples.

6. The number of spikes must be greater than, or equal to, 5 percent of the number of samples.

7. The difference between replicate concentrations must not exceed the upper control limit (set at three standard deviations above the mean) for that analysis.

8. The percent recovery on spikes must fall within a preset range, which is equal to the three-standard-deviation upper or lower control limit of the QC chart for that analysis.

QC criteria are applied to other types of analyses, such as standard addition methods of quantification, multi-peak gas chromatograph (GC) patterns, and the use of internal standards and relative response ratios in gas chromatography/ mass spectroscopy (GC/MS) analyses. All QC procedures are documented in applications manuals, which are available for review upon request.

5.4 CHAIN OF CUSTODY

The sample management program has a chain-of-custody protocol, which allows for precise accounting of the location and status of samples through the sampling and analysis process by a computer-controlled management program. Prior to field sampling, the laboratory coordinator will coordinate with the field sampling contractor to obtain information on sample stations, sample fractions, trip itinerary, personnel, and analyses to be performed. These data will then be entered in the computerized data management system to provide a log of the samples to be received, and generate labels for attachment to the samples upon their arrival in the laboratory. Upon receipt, samples are unpacked, and their appearance noted. If they have been broken, or their seals have been tampered with, these facts will be recorded.

After the samples have arrived, the identification parameters for the samples received are logged into the computer system. Those samples which were originally projected to be received, but were not, are deleted; likewise, unscheduled samples which are received are also logged in. Samples requiring cold storage are stored at 40 degrees Fahrenheit; samples requiring secure storage are held in a locked room, where access is controlled by one individual.

To acquire samples for processing and analysis, the chemist requests a computer list of sample numbers organized by parameter(s) to be analyzed. As samples are taken from storage, they are signed out; then signed in again when replaced. Upon completion of analyses, data reported to the computer is compiled with the historical data describing sampling, handling, and QA.

The process of sample collection, log in, analysis, and data reporting is centralized in the data system. Documentation of sample handling is a routine procedure, allowing easy access to any phase of the process. Individuals responsible for each phase of sample management ensure the security of samples and the integrity of data.

5.5 DATA MANAGEMENT/REPORTING OF DATA

Data are managed by a computerized data management system, which provides for complete tracking of samples from time of arrival to final data entry. Completed analytical results are stored by parameter on disk or magnetic tape for easy retrieval and data manipulation. The chain-of-custody procedures prevent tampering with the final analytical results, once they have been approved.

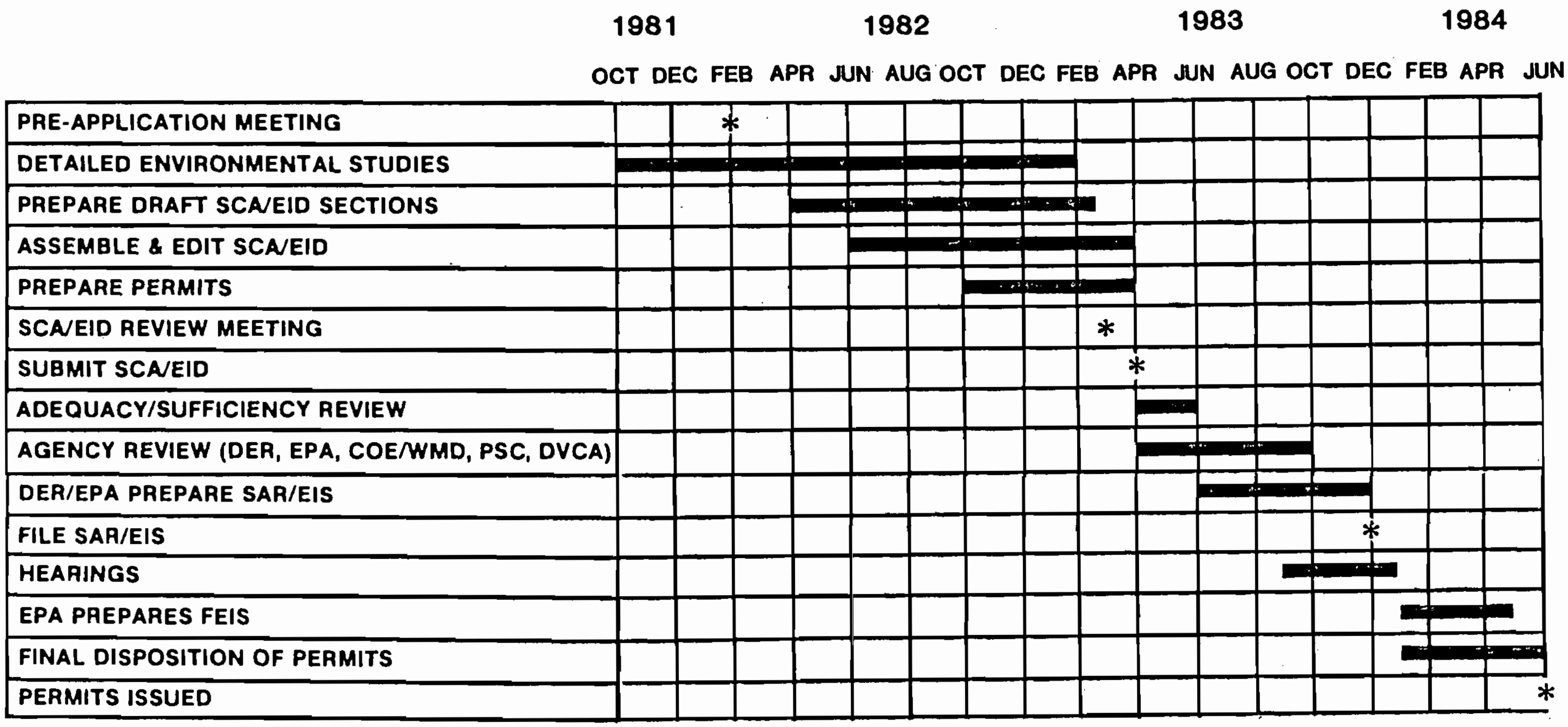
Analytical results are released only when they have been certified by the Project Manager and QA Supervisor for proper QC and internal consistency. Data transmittal is accomplished by direct written data reports.

Section 6

PROJECT SCHEDULE

Figure 6-1 depicts the project schedule for the W.C. MacInnes permitting effort.

During the first 18 months, the detailed environmental studies will be completed, and the SCA/EID and permit applications will be drafted and submitted. During the subsequent 8 months, the FDER, EPA, and other agencies will circulate and review the SCA/EID and develop the draft Staff Analysis Report/Environmental Impact Statement (SAR/EIS). Hearings are expected to occur during the last months of 1983, and all permits and approvals are expected by June 1984.



SCHEDULE

FIGURE 6-1

Section 7

PROJECT TEAM AND CONTACTS

Tampa Electric Company has elected to conduct the environmental studies utilizing a project management consultant and several specialized consultants to conduct the technical evaluations required for each discipline. The project organization is shown in Figure 7-1.

Addresses and telephone numbers for key Tampa Electric Company personnel are as follows:

Contacts: J.L. Williams, Director Environmental Planning
John Ramil, Supervisor - New Permits

Address: P. O. Box 111
Tampa, Florida 33601

Telephone: (813) 228-4111

W.C. MacInnes Station Power Plant

ENVIRONMENTAL PERMITTING ORGANIZATIONAL CHART

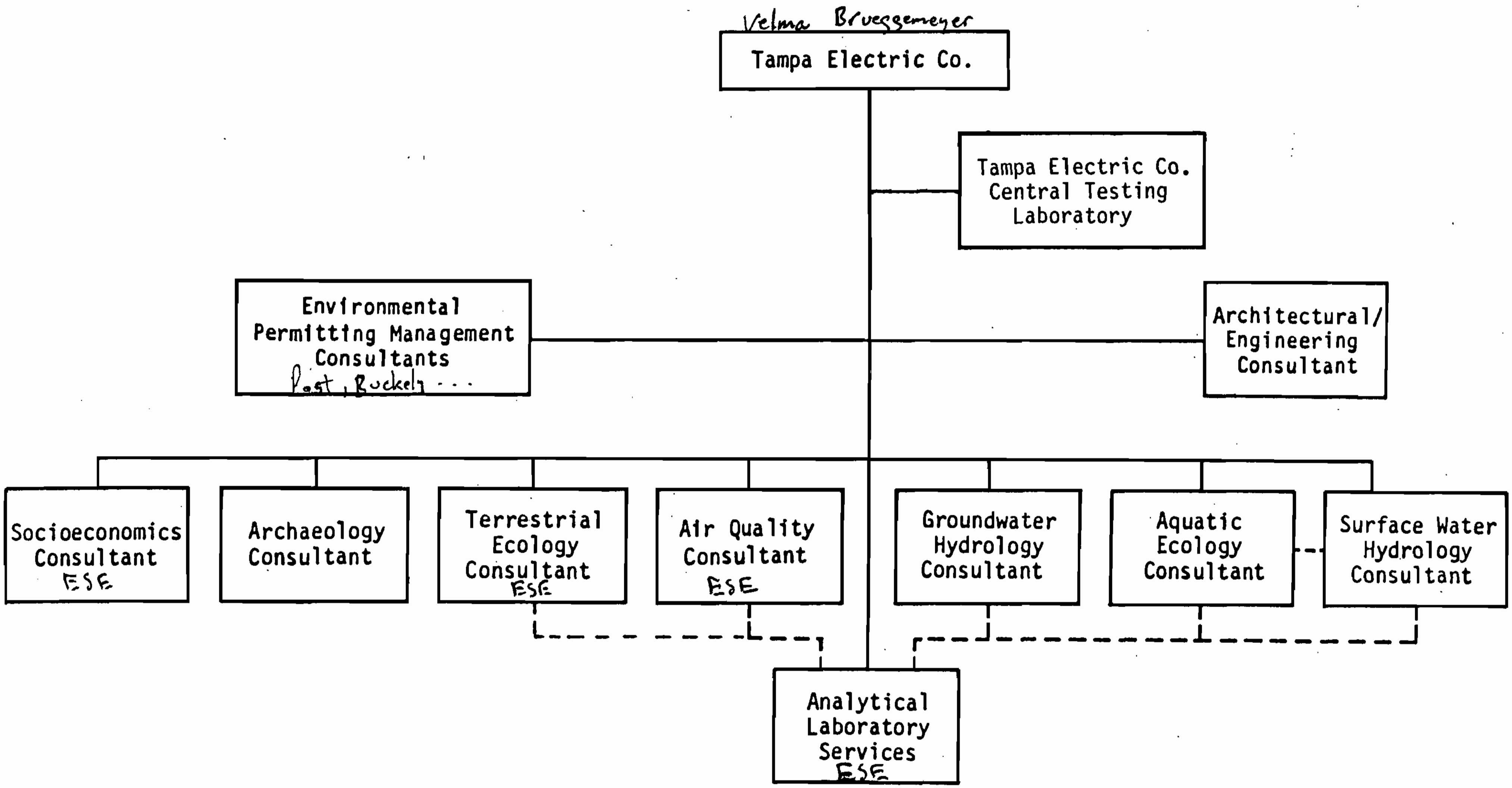


Figure 7-1

TAMPA ELECTRIC
A TECO ENERGY COMPANY

00005

PSD AMBIENT AIR MONITORING PLAN OF STUDY

For the

Tampa Electric Company

W.C. MacInnes Site

Submitted by:

TAMPA ELECTRIC COMPANY
Tampa, Florida

FEBRUARY 1982

PSD AMBIENT AIR MONITORING PLAN OF STUDY

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TABLE OF CONTENTS

Section		Page
1.0	INTRODUCTION	1-1
2.0	SOURCE APPLICABILITY	2-1
3.0	SOURCE ENVIRONMENT DESCRIPTION	3-1
	3.1 SITE LOCATION	3-1
	3.2 LAND USE DESCRIPTION	3-1
	3.3 TOPOGRAPHICAL DESCRIPTION	3-5
	3.4 CLIMATOLOGICAL DESCRIPTION	3-5
4.0	SAMPLING PROGRAM DESCRIPTION	4-1
	4.1 REQUIREMENTS	4-1
	4.2 EXISTING AMBIENT AIR QUALITY DATA	4-2
	4.2.1 Description of Data	4-2
	4.2.2 Dispersion Modeling Evaluation	4-8
	4.3 NETWORK DESIGN	4-10
5.0	MONITOR SITE DESCRIPTION	5-1
6.0	DESCRIPTION OF MONITORS	6-1
	6.1 SO_2 AND METEOROLOGICAL MONITORS	6-1
	6.2 TSP MONITOR	6-15
7.0	DATA REPORTING AND QUALITY ASSURANCE PROGRAM	7-1

APPENDICES

APPENDIX A—ESTIMATED EMISSIONS OF REGULATED POLLUTANTS

APPENDIX B—ISC MODEL OUTPUT COMPUTER PRINTOUTS

LIST OF TABLES

Table		Page
2-1	Comparison of Estimated Emissions of Regulated Pollutants from Proposed Tampa Electric Company W.C. MacInnes Station and Significant Emission Rates	2-2
2-2	Comparison of Air Quality Impacts from the Proposed Tampa Electric Company W.C. MacInnes Station and Air Quality Impact <u>De</u> <u>Minimis</u> Levels	2-5
3-1	Normals, Means, and Extremes of Climatological Parameters, Tampa Airport Weather Station	3-9
3-2	Diurnal Relative Humidity at Tampa International Airport	3-10
3-3	Annual Relative Wind Speed and Direction Frequency Distribution at Tampa International Airport, Tampa, Florida (1970 to 1974)	3-14
3-4	Stability Classes for Studying Dispersion Conditions	3-16
3-5	Relative Frequency Distribution of Stability Classes and Wind Speeds for December, January, and February at Tampa International Airport, Tampa, Florida (1970 to 1974)	3-17
3-6	Relative Frequency Distribution of Stability Classes and Wind Speeds for March, April, and May at Tampa International Airport, Tampa, Florida (1970 to 1974)	3-18
3-7	Relative Frequency Distribution of Stability Classes and Wind Speeds for June, July, and August at Tampa International Airport, Tampa, Florida (1970 to 1974)	3-19
3-8	Relative Frequency Distribution of Stability Classes and Wind Speeds for September, October, and November at Tampa International Airport, Tampa, Florida (1970 to 1974)	3-20
3-9	Five-Year Averaged Mixing Depths for Tampa, Florida, 1960 to 1964	3-21
4-1	Summary of Ambient TSP Data in the Vicinity of the Proposed W.C. MacInnes Station Site	4-4
4-2	Summary of Ambient SO_2 Data in the Vicinity of the Proposed W.C. MacInnes Station Site	4-6

LIST OF TABLES
(Continued, Page 2 of 2)

Table		Page
4-3	Frequency Distribution of SO_2 Concentrations Measured at the W.C. MacInnes (TMO/TM)	4-7
5-1	TM MacInnes Monitoring Site Siting Parameters	5-2
6-1	Description of Sulfur Dioxide and Meteorological Monitoring Equipment	6-2
6-2	Meteorological and SO_2 Equipment Specifications	6-12
6-3	Meteorological Sensor Specifications	6-13

LIST OF FIGURES

Figure		Page
1-1	Regional Site Location Map	1-2
3-1	Local Site Location Map	3-2
3-2	Location of Major Air Pollution Sources	3-6
3-3	Five-Year Average Annual Wind Rose	3-12
3-4	Five-Year Seasonal Wind Roses	3-13
4-1	Locations of Monitoring Stations Within 15 km of the MacInnes Site	4-3
4-2	Annual Average SO_2 Impacts Due to Existing Sources	4-12
4-3	Maximum 24-Hour SO_2 Impacts Due to Existing Sources	4-13
4-4	Maximum 3-Hour SO_2 Impacts Due to Existing Sources	4-14
4-5	Annual Average SO_2 Impacts Due to MacInnes Plant Only	4-15
4-6	Maximum 24-Hour SO_2 Impacts Due to MacInnes Plant Only	4-16
4-7	Maximum 3-Hour SO_2 Impacts Due to MacInnes Plant Only	4-17
4-8	Annual Average SO_2 Impacts Due to Future Sources	4-18
4-9	Maximum 24-Hour SO_2 Impacts Due to Future Sources	4-19
4-10	Maximum 3-Hour SO_2 Impacts Due to Future Sources	4-20
6-1	Assembled Sampler and Shelter with Exploded View of the Filter Holder	6-14

1.0 INTRODUCTION

Tampa Electric Company of Tampa, Florida, is proposing to construct and operate a coal-fired electric power generation facility at its W.C. MacInnes site, located in extreme southwestern Hillsborough County (see Figure 1-1). The site will accommodate an ultimate gross capacity of 3,200 megawatts (MW).

Prior to beginning construction of the plant, air pollution construction permits, including a federal Prevention of Significant Deterioration (PSD) permit, must be obtained. It is anticipated that preconstruction ambient air monitoring will be required under PSD regulations. This document presents a proposed ambient monitoring Plan of Study (POS) for the MacInnes Station for purposes of fulfilling preconstruction PSD monitoring requirements. The POS contains the following items:

1. Source applicability determination,
2. Source environment description,
3. Sampling program description,
4. Monitor sites and equipment description, and
5. Data reporting and quality assurance program.

According to current plans, four units would be phased in over a period of 20 years or more. The units could range in size from 450 to 900 MW gross capacity, with construction of the first unit commencing in early 1985 and the second unit commencing in 1989. Operations would begin in 1990 and 1994 for the first two units, respectively. This preliminary schedule is subject to considerable change due to economic conditions, load growth, and other factors. For purposes of this POS, it was assumed that the first two units would be of 500 MW gross capacity, and the third and fourth units would be of 900 MW gross capacity. ?

2x500 + 2x900 ≠ 3200 MW

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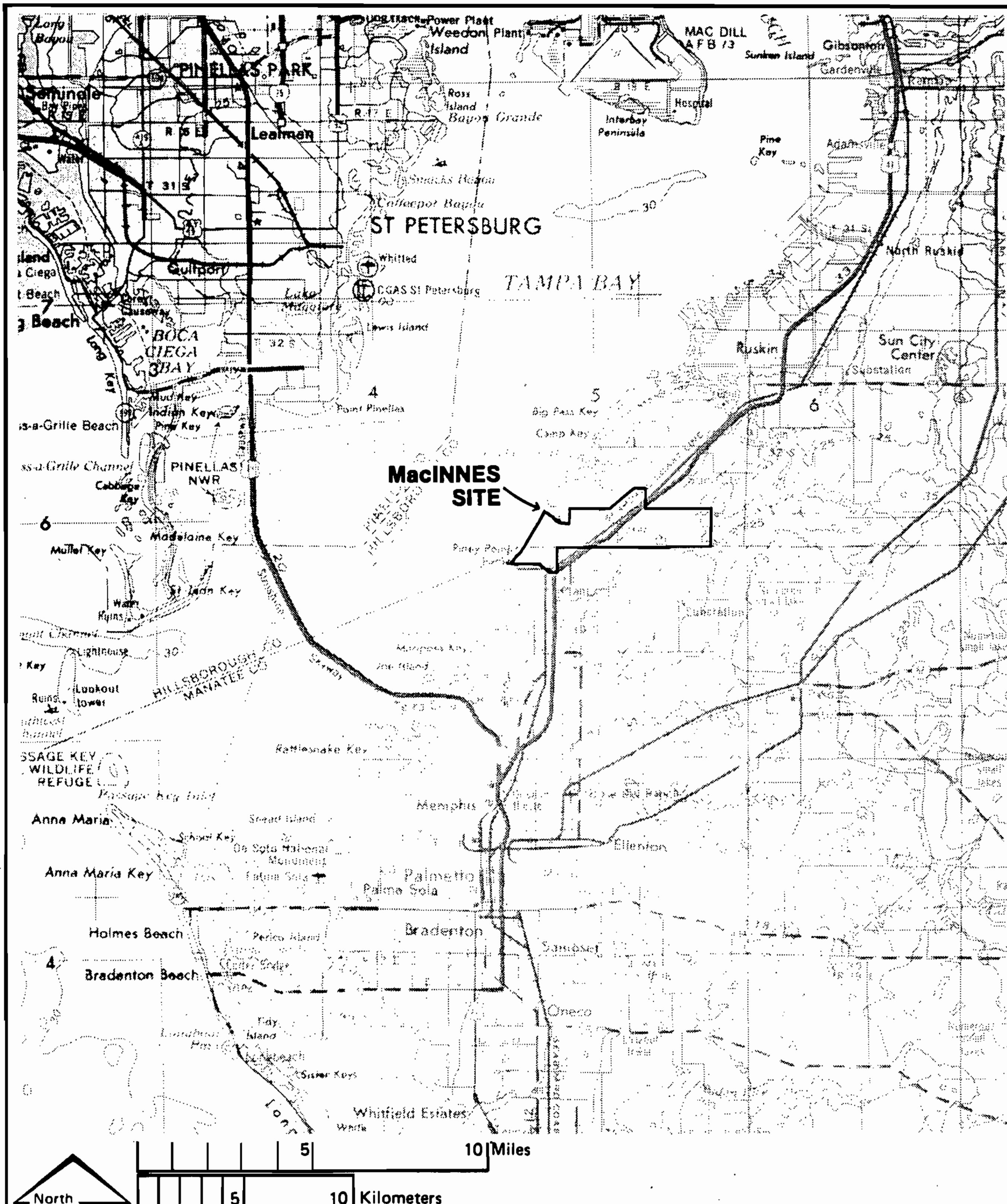

Figure 1-1
REGIONAL SITE LOCATION MAP

Tampa Electric Company
AIR PLAN OF STUDY
W.C. MacInnes Site

SOURCES: USGS, 1972.
ESE, 1981.

2.0 SOURCE APPLICABILITY

This section presents the applicability of the current state and federal PSD regulations and ambient air monitoring requirements to the proposed Tampa Electric Company W.C. MacInnes ultimate 3,200-MW coal fired facilities. The Florida Department of Environmental Regulation (DER) has adopted PSD regulations which differ from the United States Environmental Protection Agency (EPA) PSD regulations. Florida DER PSD regulations do not specifically require the collection of ambient air monitoring data as a preconstruction review requirement. EPA regulations require preconstruction air monitoring for PSD purposes, as discussed in the following paragraphs.

Revised EPA PSD regulations, promulgated in the Federal Register on August 7, 1980, and incorporated into the Code of Federal Regulations, Title 40, Part 52, are applicable to the proposed Tampa Electric Company W.C. MacInnes facility. A "major stationary source" is defined under the regulations as "any of the following stationary sources of air pollutants which emits, or has the potential to emit, 100 tons per year or more of any pollutant subject to regulation under the Act: Fossil fuel-fired steam electric plants of more than 250 million British thermal units per hour heat input...". The proposed W.C. MacInnes Station is classified as a "major stationary source" because emissions of several pollutants will exceed 100 tons per year (see Table 2-1).

Table 2-1 presents the estimated maximum annual emissions for all regulated pollutants due to operation of the proposed plants. Emissions of particulate matter and nitrogen oxides (NO_x) are based on New Source Performance Standards (NSPS). For sulfur dioxide (SO_2), a 0.8 pound per million Btu ($lb/10^6$ Btu) emission rate was assumed based upon preliminary plant information. Emissions of all other pollutants are maximum rates based on maximum coal consumption and available emission factors (see Appendix A).

Table 2-1. Comparison of Estimated Emissions of Regulated Pollutants from Proposed Tampa Electric Company W.C. MacInnes Station and Significant Emission Rates

Pollutant	Maximum Annual Emission Rate (tons/year)	Significant Emission Rate (tons/year)
Sulfur Dioxide	88,133	40
Particulate Matter	3,305*	25
Nitrogen Oxides	66,099	40
Carbon Monoxide	5,510	100
Volatile Organic Compounds†	55-584 ?	40
Lead	0.2-9.9	0.6
Sulfuric Acid Mist	16.25	7
Total Fluorides	0.1-210	3
Total Reduced Sulfur	--	10
Reduced Sulfur Compounds	--	10
Hydrogen Sulfide	--	10
Asbestos	Negligible	0.007
Beryllium	0.0011-0.57	0.0004
Mercury	0.001-2.01	0.1
Vinyl Chloride	Negligible	1
Benzene	--	0
Radionuclides	0.043	0
Inorganic Arsenic	0.02-1.45	0

* Does not include fugitive dust emissions due to coal and limestone handling; represents boiler stack emissions only.

† MacInnes site is located in ozone nonattainment area; therefore, volatile organic compounds emissions are not subject to PSD review.

Sources: ESE, 1981.
Federal Register, August 7, 1980.

Significant emission rates for PSD review have been defined by EPA (see Table 2-1). PSD review is required for the W.C. MacInnes Station for each pollutant emitted at greater than the significant rate, unless specifically exempted by regulation. Since the W.C. MacInnes Station is located in an area which is classified as nonattainment for ozone, the plant is not subject to PSD review for volatile organic compounds (VOC).

The components of PSD review are:

1. Control Technology Review,
2. Source Impact Analysis,
3. Air Quality Analysis, and
4. Additional Impact Analysis.

Requirements for the Air Quality Analysis (ambient monitoring) review are discussed in the following paragraphs as they apply to the proposed Tampa Electric Company W.C. MacInnes Station.

An analysis of ambient air quality in the proposed site area is required for each pollutant for which there is a significant net emissions increase from a new major source [40 CFR 52.21(m)]. Thus, this requirement is applicable for the following pollutants:

Sulfur Dioxide
Particulate Matter
Nitrogen Oxides
Carbon Monoxide
Lead*
Sulfuric Acid Mist
Total Fluorides*
Beryllium
Mercury*
Radionuclides
Inorganic Arsenic

Those pollutants marked with an asterisk (*) may or may not exceed the significant emission rate, since emission factors span a wide range.

EPA may exempt a new major stationary source from the requirements of monitoring for a particular pollutant if the emissions increase of the pollutant from the source would cause, in any area, air quality impacts less than the de minimis air quality impact levels defined in 40 CFR 52.21(i)(8). Table 2-2 presents the de minimis impact levels and the predicted air quality impacts for each pollutant for which monitoring may be required. These impacts were determined with the Industrial Source Complex (ISC) model, using 5 years (1970 to 1974) of Tampa, Florida meteorological data (see Appendix B for supportive computer model printouts).

As shown in Table 2-2, the de minimis impact levels are exceeded for SO_2 only. The de minimis level may also be exceeded for particulate matter due to fugitive coal and limestone emissions. Because maximum impacts of nitrogen dioxide (NO_2), carbon monoxide, beryllium, mercury, fluorides, and lead are below de minimis impact levels, EPA may exempt these pollutants from the monitoring requirements.

?

?

Table 2-2. Comparison of Air Quality Impacts from the Proposed Tampa Electric Company W.C. MacInnes Station and Air Quality Impact *De Minimis* Levels (all data in ug/m^3 unless otherwise noted)

Pollutant For Which Monitoring May Be Required	Averaging Time	*De Minimis* Impact Level	Maximum Predicted Impact*
Sulfur Dioxide	24 hours	13	69
Particulate Matter	24 hours	10	2.6†
Nitrogen Dioxide	Annual	14	5.8
Carbon Monoxide	8 hours	575	24**
Beryllium	24 hours	0.001	<0.00045
Mercury	24 hours	0.25	<0.002
Radionuclides	--	††	--
Inorganic Arsenic	--	††	--
Lead	Calendar quarter	0.1	<0.008
Sulfuric Acid Mist	--	††	--
Total Fluorides	24 hours	0.25	<0.17

* Based on highest, second-highest predicted concentration for short-term averaging times (24 hours or less).

† Does not include impacts due to fugitive dust emissions.

** Represents highest, second-highest 3-hour impact.

†† Because no standard ambient measurement techniques have been adopted for these pollutants, no *de minimis* levels have been determined; and no monitoring is required.

Sources: ESE, 1981.
Federal Register, August 7, 1981.
Lutz, D. 1981. Personal Communication. EPA, Research Triangle Park, North Carolina.

3.0 SOURCE ENVIRONMENT DESCRIPTION

3.1 SITE LOCATION

The proposed W.C. MacInnes Station site is located 10 miles southwest of Ruskin, Hillsborough County, Florida, on the eastern shore of Tampa Bay and the southern shore of Cockroach Bay. Cockroach Bay is a small eastern extension of Tampa Bay about 20 miles from Egmont Key, which is located at the entrance to Tampa Bay from the Gulf of Mexico. The site is about 25 miles south of the City of Tampa and about 12 miles southeast of St. Petersburg, across Tampa Bay.

The site is generally located west of U.S. Highway 41 and north of the Hillsborough-Manatee County Line Road. A small portion lies just south of County Line Road, and a transmission line corridor extends east of U.S. Highway 41. Figure 3-1 shows the site location and its contiguous areas.

The site comprises approximately 2,500 acres of nearly level land, owned or under option by Tampa Electric Company. The ultimate land area for the site is anticipated to contain approximately 3,200 acres. The maximum elevation is along the eastern edge of the site with the elevation reaching a maximum of 10 feet.

3.2 LAND USE DESCRIPTION

The general characteristics of the plant site area are those of a sparsely developed, agriculturally oriented region with industrial development pressures increasing yearly. Specifically, the location of the W.C. MacInnes Station site is in line with existing and projected industrial growth in the area as identified on local agency land use plans.

Manatee County has actively developed several industrial tracts within the Piney Point plant site area, namely chemical processing (particularly AMAX Phosphate, Inc.), Port Manatee, and a new power plant siting. Coincidentally, Hillsborough County has designated a large area of the

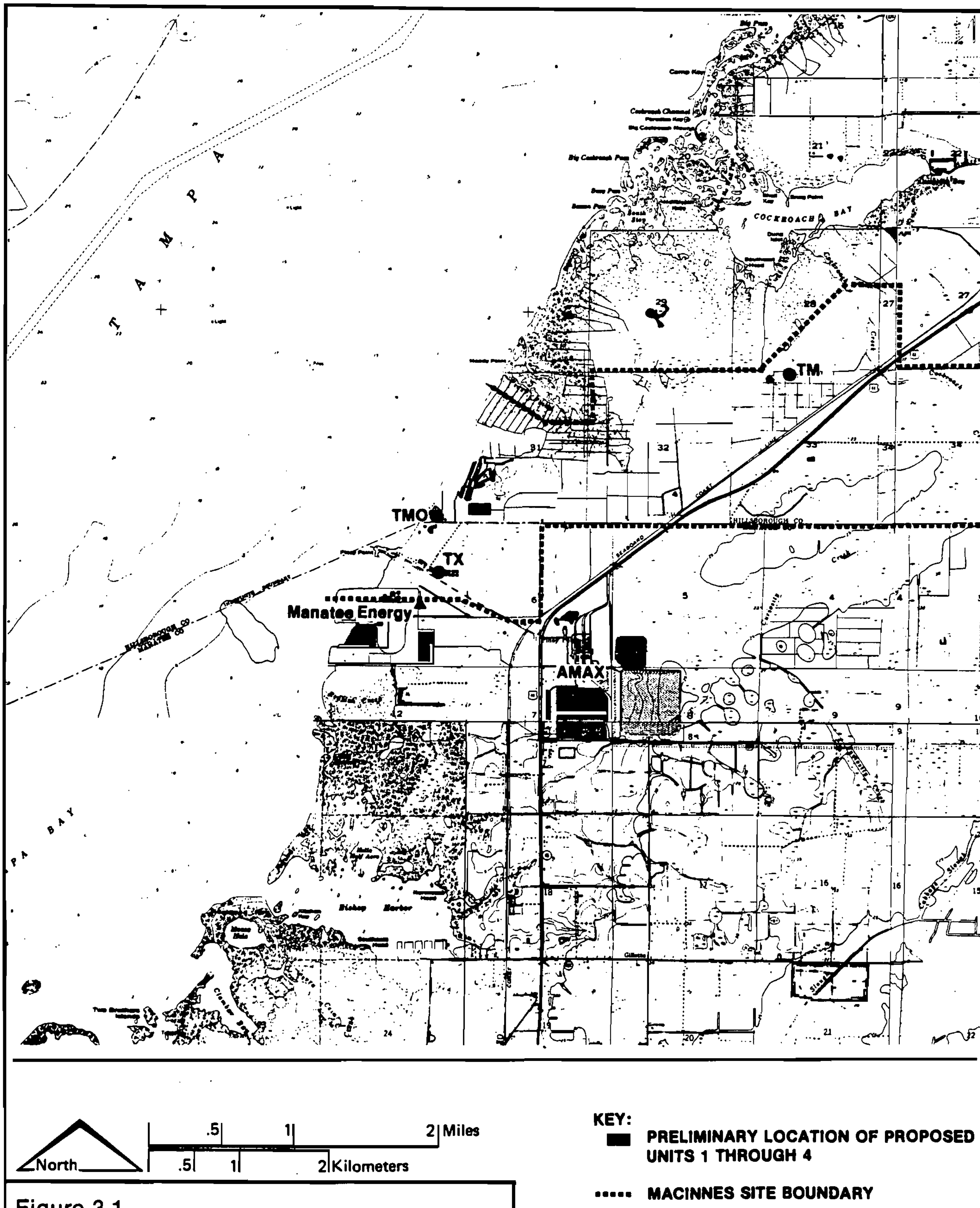

Figure 3-1
LOCAL SITE LOCATION MAP

Tampa Electric Company
AIR PLAN OF STUDY
W.C. MacInnes Site

SOURCES: USGS, 1969, 1973.
ESE, 1981.

U.S. 41 Corridor adjacent to the Manatee County Line for future industrial usage.

Agricultural land uses are currently extensive in the area with principal crops being strawberries, fresh flowers, tomatoes, and various row crops, such as vegetables. Citrus groves are prominent in the Manatee County area immediately south and east of the site, as well as cattle ranching on small acreage tracts of improved pasture.

The area has considerable constraints to future uncontrolled development, principally residential and thus, is generally conceded to provide an area for future industrial development for both counties.

There are currently five parks or recreational open space areas designated within or adjacent to the 5-mile area around the W.C. MacInnes site. Four of these sites are in Hillsborough County, and the fifth is in Manatee County. There are no major regional recreational parks or state parks within the area of influence. No additional parks are proposed in the area around the plant site; however, the future land use plans for both Hillsborough and Manatee Counties have identified several coastal areas that are classified as conservation or open space areas. One of these tracts includes the land below the mean high tide line in the vicinity of Cockroach Bay that has been proposed as the Cockroach Bay Aquatic Preserve. According to the Comprehensive Plan for Manatee County, conservation or open space land use can include parks, playgrounds, sports or other recreational lands, green undeveloped open space, special green buffers, and vacant public tracts. The Comprehensive Plan further identifies these conservation areas as being "used to enhance, protect, and emphasize the County's various waterfront locations and to indicate the potential for large inland areas of open space as a natural relief from development."

An undeveloped 20-acre tract of mangrove forest and associated upland forest on the eastern end of Cockroach Bay is administered by

Hillsborough Community College as a public environmental education center. This tract was formerly part of the W.C. MacInnes power plant site, but it was deeded by Tampa Electric Company to Hillsborough Community College in 1973. There are no other public school facilities currently within a 5-mile area of the W.C. MacInnes site. Two elementary school sites are within a 7-mile distance, however. Palm View Elementary is located at Palm View Road and Old U.S. 41 approximately 6.5 miles south of the site in Manatee County. Ruskin Elementary is located approximately 7 miles northeast of the site just east of U.S. 41 in Hillsborough County.

Additionally, the Manatee County School Board has identified a 10- to 20-acre tract of land that has been reserved for a future school site should residential developments envisioned for the Terra Ceia area proceed in the next 5 to 10 years.

The W.C. MacInnes site is currently served by water, rail, and major highway access. Port Manatee, immediately south of the site, is a major regional port with a 40-foot by 400-foot channel to Ship Channel A leading to the Gulf of Mexico via Mullet Key. Thus, all major forms of transport for heavy and light industrial activity are present on site or immediately adjacent thereto.

All railroad lines in the area are owned and operated by Seaboard Coast Line Railroad and are predominantly involved in carrying freight. Rail lines currently pass through the site, and a spur from this line serves Port Manatee.

Principal highways in the area include:

1. U.S. 41 (SR 45)--A 4-lane, divided high design arterial facility which traverses the plant site area north and south.
2. U.S. 19 (SR 55)--A 4-lane, divided arterial highway which crosses Tampa Bay from St. Petersburg and proceeds south of the Port Manatee area to Bradenton.

3. Interstate 75 (Eastern Route)--A 4-lane, planned facility scheduled for construction to the east of the site approximately 6 miles. I-75 will have an interchange with U.S. 19 near Gillette, south of the site.

3.3 TOPOGRAPHICAL DESCRIPTION

Topography in the vicinity of the site exhibits characteristics typical of Western Florida coastal patterns within the Terraced Coastal lowlands. The terrain is a generally low-lying marine plain dissected by poorly defined natural drainage channels, resulting in extensive mangrove swampland and numerous ponds discharging by small meandering creeks through salt flats to the coast. Much of the drainage has been artificially supplemented by manmade canals.

The site is located on Tampa Bay, centered on a relatively high section of coastline extending some 2 miles between coastal wetlands to the north and south. The site is elevated approximately 4 feet above mean sea level (MSL) with drainage both to Tampa Bay and the northern coastal swamp. Elevations east of the site typically vary from 4 to 9 feet above sea level for 1 mile inland to the Seaboard Coast Line Railroad, rising to a maximum of 30 feet above sea level at a distance of 2 miles, where an escarpment breaks the marine plain.

There are various air pollution point sources in Hillsborough, Pinellas, and Manatee Counties. The locations of major pollution sources in these counties within about 25 kilometers (km) of the MacInnes site are shown in Figure 3-2. Major air pollution sources potentially influencing the site include Tampa Electric Company's Big Bend power plant, Florida Power & Light Company's (FPL) Manatee power plant, and AMAX Phosphate's fertilizer plant.

3.4 CLIMATOLOGICAL DESCRIPTION

Atmospheric characteristics of the project area and of the areas surrounding the site are the most important parameters affecting the dispersion of the air pollutants released into the atmosphere. The following sections discuss these parameters as they relate to the proposed project area.

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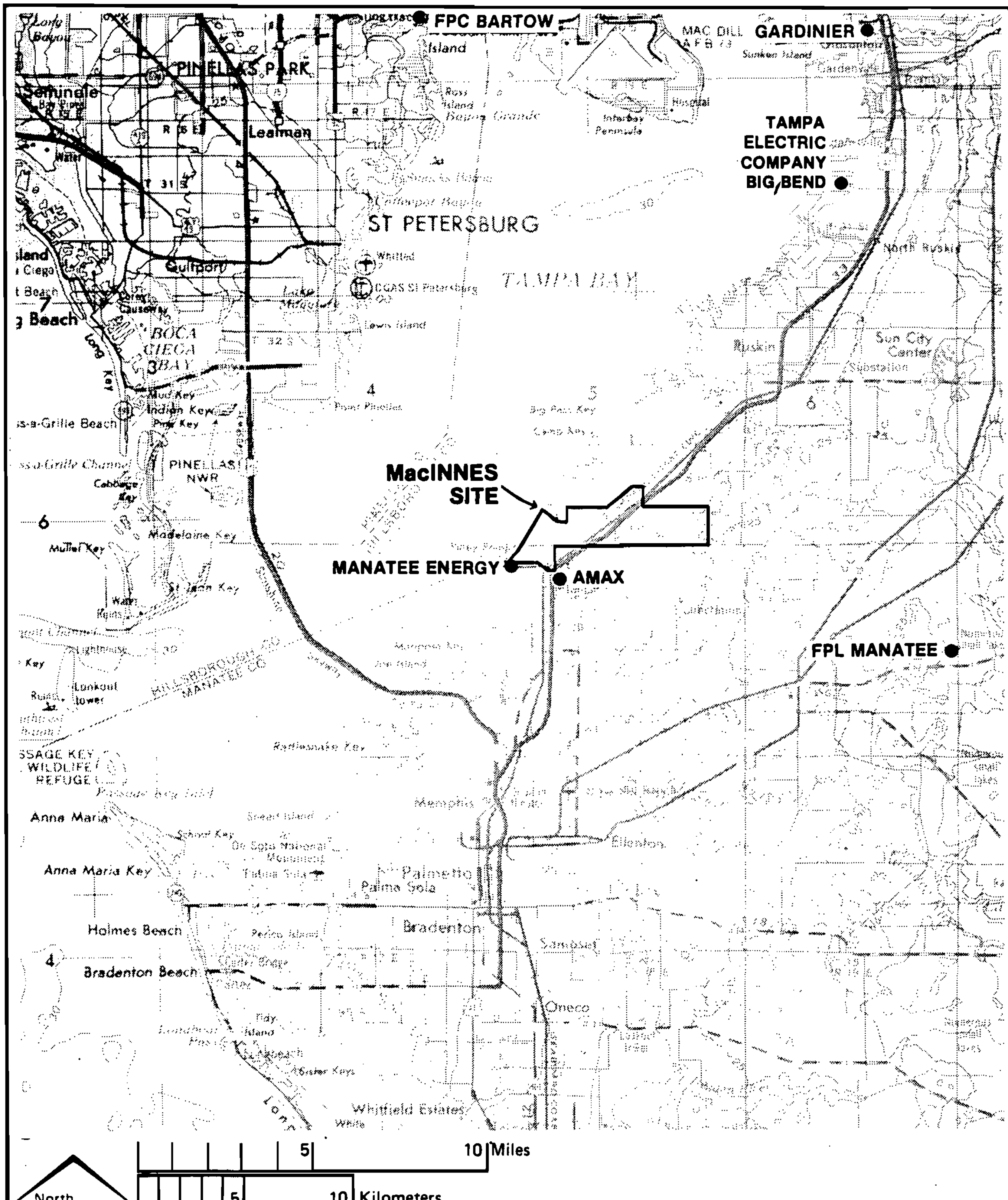


Figure 3-2
LOCATION OF MAJOR AIR POLLUTION
SOURCES

SOURCES: USGS, 1972.
ESE, 1981.

Tampa Electric Company
AIR PLAN OF STUDY
W.C. MacInnes Site

The capacity of ambient air to assimilate wastes without adverse effect depends on the atmospheric dilutive capacity. This capacity can vary over a wide range with time and location; therefore, it is highly desirable that meteorological conditions be specified when estimating the relationship between atmospheric emissions and their resulting ambient concentrations.

Four principal meteorological variables affect air quality:

1. Wind Speed is important because the more air that moves past an emissions source, the lower the concentration (mass/volume) of pollutants.
2. Wind Direction is important in estimating the location of pollutant concentration relative to the location of emission sources.
3. Atmospheric Stability is a composite variable describing the turbulence, and therefore the dispersion rate, of the atmosphere. The lapse rate (the rate of temperature change with height) is an important indicator of stability.
4. Mixing Height is defined as the height above the surface through which relatively vigorous vertical mixing occurs. It is commonly identified as a layer of the atmosphere with a temperature lapse rate conducive to strong mixing, capped by a temperature inversion (temperature increasing with height) which restricts such mixing. A low mixing height restricts the volume of air throughout which emissions within the layer may be dispersed. It is often associated with high ground-level pollutant concentrations.

Several other meteorological variables are of interest in special circumstances. Temperature can affect air quality indirectly by influencing the rate of emissions resulting from the demand for space heating or air conditioning. Humidity and solar radiation intensity are important to the rates of certain atmospheric reactions (e.g., formation of oxidants, sulfates, aerosols).

The Tampa Bay area experiences a modified climate throughout the year because of its proximity to the waters of the Gulf and Bay. An outstanding feature of Tampa's climate is the summer thundershower season. On the average, the Tampa Airport Weather Station records 91 days with thundershowers occurring mostly in the late afternoons of June, July, August, and September. These storms result in sudden drops in temperature from about 90°F to 70°F. Between a dry spring and a dry fall, some 30 inches of rain (about 60 percent of the annual) falls during the 4 summer months. Table 3-1 summarizes the meteorological data collected at Tampa Airport Weather Station between 1931 and 1972. This table shows monthly and annual normals and extremes of temperature, monthly and annual normals and extremes of precipitation, and annual and monthly mean wind speed and prevailing direction.

Because of the flat terrain, night ground fog occurs frequently during the cool weather season. Temperatures throughout the year are modified by the waters of the Gulf and bays. The average daily temperatures range from 82.0°F in August to 61.2°F in January, with a mean annual temperature of 72.2°F. This characterizes a subtropical climate. Table 3-1 presents the temperature means and extremes recorded at Tampa International Airport between 1931 and 1972.

Relative humidities remain reasonably constant throughout the year, with a daytime reading close to 57 percent and a nighttime reading near 84 percent as the annual averages. Average monthly humidity (percent) for 1964 to 1973 at Tampa Airport Weather Station is shown in Table 3-2.

The driest month of the year is November, with a normal 1.46 inches of precipitation. During the year, an average of 51.57 inches of precipitation occurs of which nearly 65 percent occurs over the 4 summer months in the form of heavy, convective-type thundershowers. Table 3-1

Table 3-1. Normals, Means, and Extremes of Climatological Parameters, Tampa Airport Weather Station

	Temperature (°F)							Precipitation (inches)							Wind (mph)	
	Normal			Extremes 1963-1972												
Month	Daily Max.	Daily Min.	Monthly	Record High	Year	Record Low	Year	Normal Total	Max. Monthly	Year	Min. Monthly	Year	Max. in 24 Hrs.	Year	Mean Speed	Prevailing Direction
(a)	(b)	(b)	(b)	9		9		(b)	26		26		26		26	14
J	71.3	51.0	61.2	84	1971	23	1971	2.13	8.02	1948	T*	1950	3.29	1953	9.1	N
F	72.8	52.6	62.7	88	1971	27	1967	2.84	7.95	1963	0.21	1950	3.25	1963	9.7	E
M	76.0	56.0	66.0	87	1965	35	1971	3.75	12.64	1959	0.06	1956	5.20	1960	10.0	S
A	81.4	61.3	71.4	92	1970	40	1971	2.84	6.59	1957	T	1967	3.70	1951	9.7	ENE
M	87.0	66.6	76.8	96	1967	49	1971	2.85	7.55	1959	0.47	1953	3.97	1971	9.2	E
J	89.4	71.7	80.6	97	1964	61	1972	7.28	11.11	1957	1.86	1951	4.31	1957	8.5	E
J	89.7	73.4	81.6	97	1964	63	1970	8.52	20.59	1960	2.31	1962	12.11	1960	7.7	E
A	90.3	73.7	82.0	97	1970	68	1969	8.24	18.59	1949	2.35	1952	3.57	1949	7.4	ENE
S	88.7	72.3	80.5	96	1972	64	1972	6.39	13.04	1947	1.28	1972	4.67	1950	8.5	ENE
O	83.8	65.6	74.7	93	1971	40	1964	2.78	7.36	1952	0.25	1961	2.54	1968	9.1	NNE
N	76.8	56.8	66.8	90	1970	23	1970	1.46	6.12	1963	T	1960	4.22	1963	8.9	NNE
D	72.5	52.1	62.3	86	1972	27	1968	1.89	6.66	1950	0.21	1956	3.28	1969	8.9	N
Year	81.6	62.8	72.2	97	Aug 1970	23	Jan 1971	51.57	20.59	July 1960	T	Apr 1967	12.11	July 1960	8.9	E

Extremes: Highest Temperature: 97°F in June 1964, July 1964, and August 1970; Lowest Temperature: 23°F in November 1970, and January 1971.
Maximum Precipitation in 24 hours: 12.11 inches July 1960; Minimum Precipitation Monthly: 0.06 inch March 1956.
Fastest Wind: 84 Miles Per Hour September 1935.

(a) Length of record, years, based on January data. Other months may be for more or fewer years if there have been breaks in the record.
(b) Climatological standard normals (1931-1960).

* T = Trace, an amount too small to measure. Below zero temperatures are preceded by a minus sign. The prevailing direction for wind in the Normals, Means, and Extremes column is from records through 1962.

Source: National Oceanic and Atmospheric Administration, Environmental Data Service.
Data collected between 1963 and 1972 at National Airport, Tampa, Florida.

Table 3-2. Diurnal Relative Humidity* at Tampa International Airport

Month	Relative Humidity (Percent) Daytime	Relative Humidity (Percent) Nighttime
January	50	84
February	54	81
March	54	81
April	49	80
May	51	83
June	59	84
July	62	84
August	63	86
September	61	85
October	56	84
November	55	84
December	57	83
Annual	57	83

* 14-year averaged data, Tampa International Airport (1964-1977).

Source: National Oceanic and Atmospheric Administration.

shows the precipitation data for 1972, and means and extremes during the period of 1931 through 1972.

The risk of a hurricane moving in from the Gulf of Mexico is greatest in June and October. A tropical storm of July 28-29, 1960, brought Tampa's heaviest rain, 12.11 inches, in 24 hours. The Gulf hurricane of September 25, 1971, brought Tampa Bay's most destructive and highest tide, 10.5 feet above mean low water.

As Hillsborough County lies entirely within the trade wind belt (i.e., below 30°N latitude), annually averaged winds predominate from the east. However, because of the marine environment, moderate to strong late afternoon seabreezes occur on days in which strong land heating occurs, so that winds will be locally onshore at these times. The yearly averaged wind speed is 7.7 knots, with highest speeds occurring in spring, and lowest speeds occurring in summer (1 knot equals approximately 1.15 miles per hour).

Table 3-1 and Figures 3-3 and 3-4 show the prevailing wind directions and speeds at Tampa International Airport. The wind data shown in Figure 3-3 indicate that the proposed MacInnes site experiences predominant winds from the east and west on an annual basis. Seasonally, winds predominate from the east and west during the spring and summer, the east and northeast during the fall, and the east during the winter (Figure 3-4).

Table 3-3 shows the annual relative wind speed and direction frequency distribution at Tampa International Airport for the period 1970 through 1974.

In studying dispersion conditions in the region, monitoring data for the period 1970 through 1974 were processed using the National Climatic Center's STAR program. This program output includes:

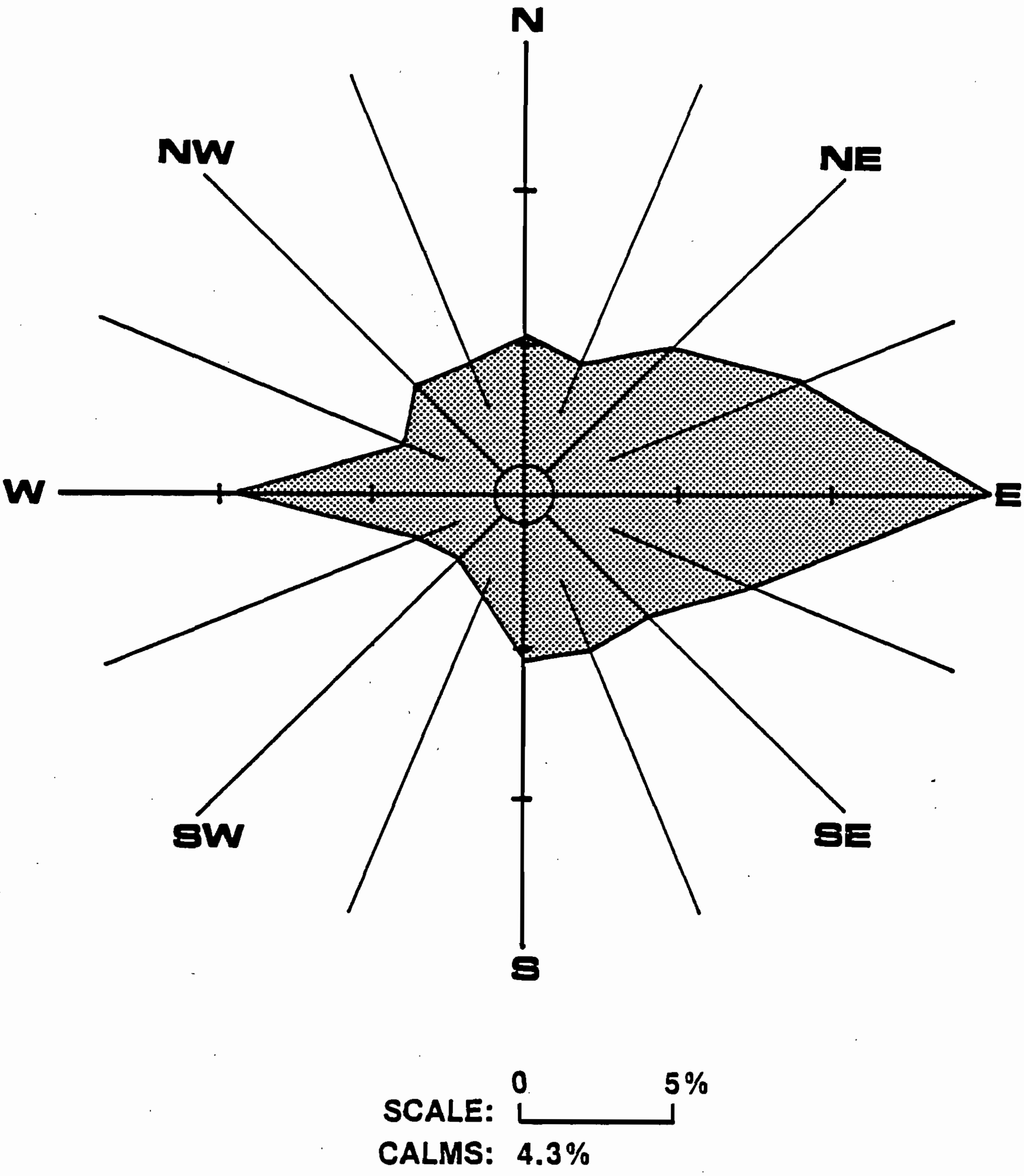


Figure 3-3
FIVE-YEAR AVERAGE ANNUAL WIND ROSE

SOURCE: ESE, 1981.

Tampa Electric Company
AIR PLAN OF STUDY
W.C. MacInnes Site

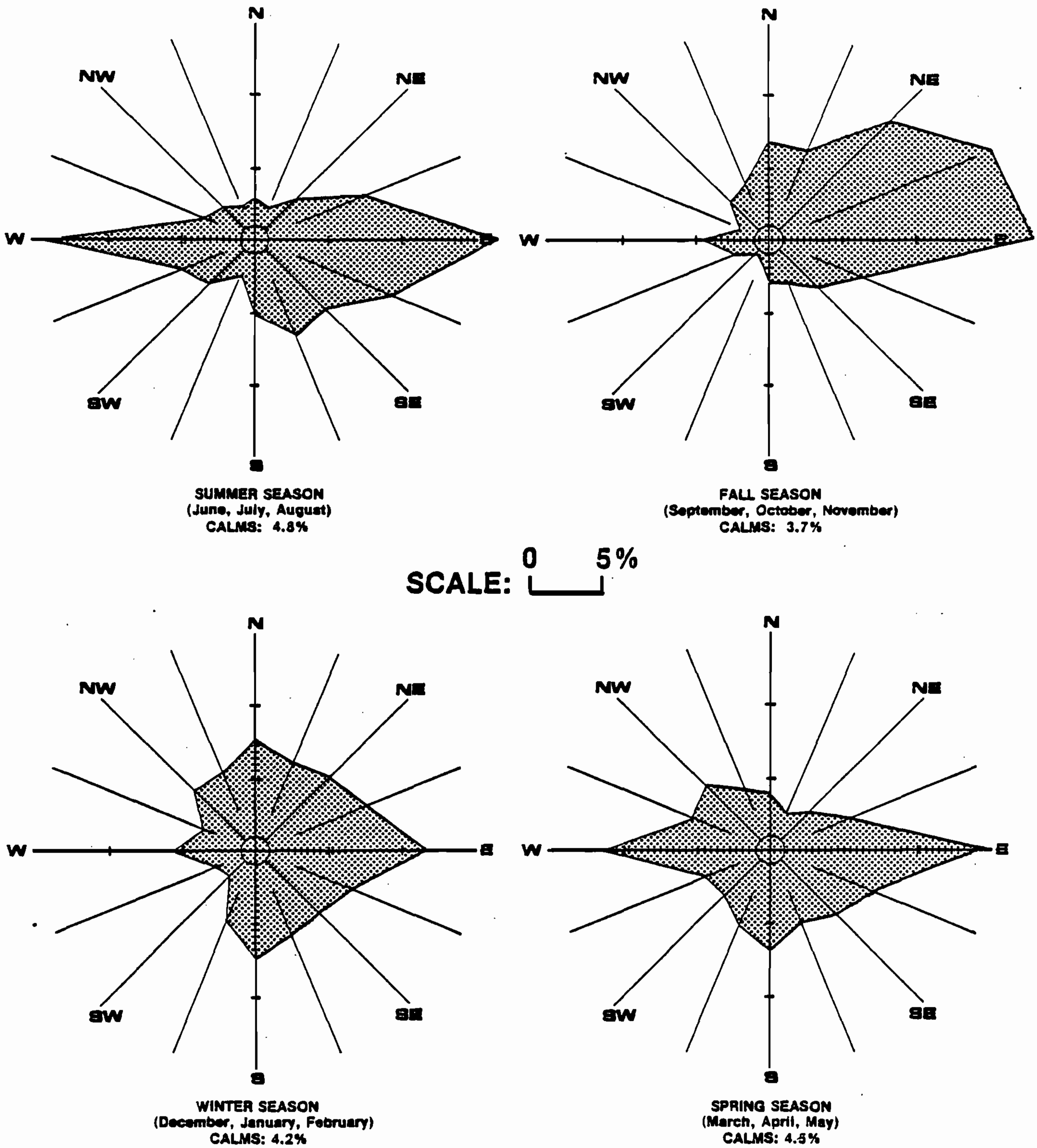


Figure 3-4
FIVE-YEAR SEASONAL WIND ROSES

SOURCE: ESE, 1981.

Tampa Electric Company
AIR PLAN OF STUDY
W.C. MacInnes Site

Table 3-3. Annual Relative Wind Speed and Direction Frequency Distribution at Tampa International Airport, Tampa, Florida (1970 to 1974)

Direction	Wind Speed (knots) 0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	Greater Than 21	Total
N	0.005352	0.018027	0.020947	0.008808	0.000548	0.000000	0.053682
NNE	0.005175	0.015494	0.017844	0.007462	0.000183	0.000023	0.046180
NE	0.006534	0.022317	0.024096	0.012368	0.000342	0.000000	0.065656
ENE	0.011665	0.040640	0.032471	0.011546	0.000274	0.000000	0.096596
E	0.017554	0.064234	0.052460	0.020217	0.000570	0.000023	0.155059
ESE	0.010817	0.032014	0.028820	0.009949	0.000183	0.000000	0.081783
SE	0.006425	0.019259	0.024325	0.009242	0.000068	0.000023	0.059341
SSE	0.004956	0.019259	0.022704	0.008306	0.000205	0.000000	0.055431
S	0.005314	0.017913	0.021335	0.010976	0.000753	0.000137	0.056428
SSW	0.002289	0.009059	0.017160	0.009378	0.000730	0.000046	0.038661
SW	0.002307	0.010611	0.013782	0.003925	0.000068	0.000023	0.030716
WSW	0.002794	0.010200	0.019487	0.005910	0.000274	0.000000	0.038665
W	0.004352	0.015152	0.044359	0.027063	0.000776	0.000091	0.091793
WNW	0.003571	0.010588	0.013007	0.010588	0.001438	0.000411	0.039602
NW	0.004587	0.016133	0.014056	0.010793	0.001460	0.000319	0.047349
NNW	0.004518	0.013440	0.013098	0.010268	0.001552	0.000183	0.043059
Total	0.098211	0.334337	0.379951	0.176798	0.009424	0.001278	1.000000

Total Relative Frequency of Calms Distributed Above = 4.3%

Source: National Climatic Center, 1970-1974.

1. Climatological joint frequencies of occurrence of wind speed and direction; and
2. Wind speed and stability by annual, seasonal, or monthly periods.

Stability near the ground is dependent primarily upon net radiation and wind speed. Without cloud influence, insolation (incoming radiation) during the day is dependent on solar altitude, which is a function of latitude, time of day, and time of year. If cloud cover is present, the density and extent of coverage decreases incoming and outgoing radiation. Insolation is estimated in this procedure by observation of solar altitude as modified by existing conditions of total cloud cover and cloud ceiling height. At night, estimates of outgoing radiation are made by consideration of cloud cover alone.

Running the STAR program requires the use of the following meteorological parameters:

1. Incoming solar radiation,
2. Cloud cover and ceiling height,
3. Wind direction and wind speed, and
4. Mixing layer height.

The STAR program used for studying the dispersion conditions at Tampa Airport Weather Station is based on six stability classes (see Table 3-4). Unstable conditions (Stability Classes A, B, and C) occur when air layers close to the ground undergo warming with associated low wind speeds. Stable conditions (Stability Class E) occur when the air layers close to the ground undergo cooling with associated low wind speeds. Drainage winds occur under E stability conditions. Neutral conditions (Stability Class D) occur with cloudy skies and/or high wind speeds.

Tables 3-5 through 3-8 show the percentage frequency distribution of stability classes with respect to wind speeds. Table 3-9 represents the 5-year (1960 to 1964) averaged mixing heights for each month and annually.

Table 3-4. Stability Classes for Studying Dispersion Conditions

Stability Class (Regular STAR)	Tabulation Reference	Definition
1	A	Extremely Unstable
2	B	Unstable
3	C	Slightly Unstable
4	D	Neutral
5	E	Stable
6	F	Very Stable

Source: National Climatic Center.

Table 3-5. Relative Frequency Distribution of Stability Classes and Wind Speed For December, January, and February at Tampa International Airport, Tampa, Florida (1970 to 1974) (in percent)

Stability Class	Wind Speed (knots)						
	0-3	4-6	7-10	11-16	17-21	Greater Than 21	Total
A	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B	0.29	1.16	1.10	0.00	0.00	0.00	2.55
C	0.12	2.35	8.36	0.66	0.00	0.00	11.49
D	0.14	2.38	7.25	10.45	1.00	0.17	21.39
E	1.27	4.10	11.12	7.24	0.43	0.05	24.21
F	9.10	21.87	9.38	0.00	0.00	0.00	40.35

Source: National Climatic Center, 1970-1974.

Table 3-6. Relative Frequency Distribution of Stability Classes and Wind Speed for March, April, and May at Tampa International Airport, Tampa, Florida (1970 to 1974) (in percent)

Stability Class	Wind Speed (knots) 0-3	4-6	7-10	11-16	17-21	Greater Than 21	Total
A	0.03	0.17	0.00	0.00	0.00	0.00	0.20
B	0.48	1.28	2.95	0.00	0.00	0.00	4.71
C	0.21	1.59	9.28	4.54	0.20	0.03	15.85
D	0.09	1.85	7.04	14.46	0.98	0.13	24.55
E	0.24	1.35	19.39	7.00	0.28	0.07	18.33
F	7.63	19.26	9.49	0.00	0.00	0.00	36.38

Source: National Climatic Center, 1970-1974.

Table 3-7. Relative Frequency Distribution of Stability Classes and Wind Speed for June, July, and August at Tampa International Airport, Tampa, Florida (1970 to 1974) (in percent)

Stability Class	Wind Speed (knots)						
	0-3	4-6	7-10	11-16	17-21	Greater Than 21	Total
A	0.19	0.75	0.00	0.00	0.00	0.00	0.94
B	1.13	4.19	5.15	0.00	0.00	0.00	10.47
C	5.16	4.21	11.75	2.52	0.03	0.00	23.67
D	0.06	3.88	7.02	7.42	0.27	0.04	18.69
E	0.17	0.76	9.07	2.06	0.12	0.02	12.20
F	8.45	26.17	4.05	0.00	0.00	0.00	38.67

Source: National Climatic Center, 1970-1974.

Table 3-8. Relative Frequency Distribution of Stability Classes and Wind Speed for September, October, and November at Tampa International Airport, Tampa, Florida (1970 to 1974) (in percent)

Stability Class	Wind Speed (knots)						
	0-3	4-6	7-10	11-16	17-21	Greater Than 21	Total
A	0.08	0.17	0.00	0.00	0.00	0.00	0.25
B	0.60	2.15	1.95	0.00	0.00	0.00	4.70
C	0.16	3.10	10.64	1.10	0.00	0.00	15.00
D	0.16	2.33	7.60	9.11	0.38	0.00	19.58
E	0.40	1.61	8.74	4.14	0.08	0.00	14.97
F	7.75	27.06	10.65	0.00	0.00	0.00	45.46

Source: National Climatic Center, 1970-1974.

Table 3-9. Five-Year Averaged Mixing Depths for Tampa, Florida, 1960 to 1964

Month	Mixing Depth (Meters)			
	Non-Precipitation Days		Precipitation Days	
	Morning*	Evening*	Morning*	Evening*
January	391	1,010	740	521
February	477	1,106	617	563
March	498	1,330	792	861
April	514	1,533	889	1,438
May	497	1,701	752	1,327
June	617	1,528	706	1,318
July	703	1,424	815	997
August	649	1,423	642	1,146
September	590	1,473	755	1,035
October	375	1,510	743	807
November	307	1,239	656	710
December	326	1,048	589	676
Annual	495	1,360	722	992

* Morning and evening times refer to 7:00 a.m. and 7:00 p.m., respectively.

Source: National Climatic Center, Asheville, North Carolina.

4.0 <u>SAMPLING PROGRAM DESCRIPTION</u>

4.1 REQUIREMENTS

In accordance with the Ambient Monitoring Guidelines for Prevention of Significant Deterioration, (EPA-450/4-80-012, November 1980), design of a PSD monitoring network (i.e., number and location of monitoring sites) is to be determined on a case-by-case basis by the source owner or operator, and reviewed by the permit-granting authority. Consideration is to be given to the effects of existing sources, spatial variability of pollutants at the site, terrain, meteorological conditions, existence of fugitive or reentrained dusts, and averaging time for the pollutants. In general, the number of monitors required will be a function of the spatial variability of pollutants in the study area (i.e., the greater the variability, the greater the number of monitors). Principal uses of PSD monitoring data are as follows:

1. Establish background air quality concentrations in the vicinity of the proposed source, and
2. Validate and refine models.

Existing ambient monitoring data may be used to satisfy PSD preconstruction monitoring requirements if certain criteria are met. These criteria relate to monitor location, data quality, and the representativeness of the data for current ambient conditions. The existing monitoring data should be representative of three types of impact areas:

1. Locations of maximum concentration increase from the proposed new source;
2. Locations of maximum impacts due to existing sources; and
3. Locations of maximum impacts due to all future sources, i.e., the proposed new source, existing sources, and other permitted but not yet operating sources.

These impact locations are determined through the application of models, consistent with EPA's Guideline on Air Quality Models (EPA-450/2-78-027, April 1978). Where an existing monitor is not located in these areas, the existing data may still be used as determined on a case-by-case basis. The data quality should conform to PSD data requirements, must have been collected during the 3-year period preceding permit application submittal, and must be shown to be representative of current conditions.

If appropriate existing monitoring data are not available to satisfy PSD requirements, a preconstruction ambient monitoring program must be undertaken for applicable pollutants. In an area of multisource emissions, the source applicant must use modeling techniques to determine the general locations of the three types of impact areas described previously. Monitors should then be placed in or near these areas.

4.2 EXISTING AMBIENT AIR QUALITY DATA

4.2.1 Description of Data

Total Suspended Particulate Matter (TSP)--Figure 4-1 shows the locations of the TSP samplers within a 15-km radius of the proposed W.C. MacInnes site from which data were available for reporting. The data presented in Table 4-1 were collected by the Hillsborough County Environmental Protection Commission (HCEPC), the Manatee County Health Department (MCHD), and Tampa Electric Company. The data were collected once every sixth day according to the National Air Sampling Network Schedule. Data for the last 3 calendar years are presented (1978, 1979, and 1980).

As shown in the table, the annual geometric means ranged from 29 micrograms per cubic meter (ug/m^3) at the MCHD Moccasin Wallow Road Fish Farm site in 1978 to 46 ug/m^3 at the HCEPC water treatment site in 1980. The maximum concentration of 156 ug/m^3 was observed at the MCHD Buckeye Road site in 1980. The second-highest concentration at this site during 1980 was 132 ug/m^3. The second-highest maximum concentration observed during the 3 years of data presented was 143 ug/m^3 in 1978, measured at the MCHD Moccasin Wallow Road Fish Farm site. The second-highest concentration observed at this site in 1978 was 60 ug/m^3.

Table 4-1. Summary of Ambient TSP Data (ug/m^3) in the Vicinity of the Proposed W.C. MacInnes Station Site

Network Operated By	Station Name/SAROAD No.	Sampling Period	No. Observations	Geometric Mean	Maximum 24-Hour	Second Maximum 24-Hour
HCEPC	Water Treatment Plant/ 101800019	1/1/78-12/28/78	61	38.0	109	96
		1/1/79-12/23/79	55	42.7	95	85
		1/1/80-12/31/80	55	46.3	119	111
HCEPC	Ruskin Fire Station/ 101800003	1/1/78-12/28/78	61	36.3	97	70
		1/1/79-12/29/79	56	38.7	71	66
		1/1/80-12/31/80	58	41.9	74	71
MCHD	Moccasin Wallow Road Fish Farm/ 102540011	1/1/78-12/28/78	54	29.1	143	60
		1/1/79-12/29/79	57	33.0	73	69
		1/1/80-12/31/80	59	35.3	62	61
MCHD	County Line at U.S. 41/ 102540005	1/1/78-12/28/78	58	34.3	74	68
		1/1/79-12/29/79	59	37.2	94	70
		1/1/80-12/31/80	58	40.4	71	63
MCHD	Piney Point Road Port Manatee/ 102540012	1/1/80-12/31/80	53	41.0	81	80
MCHD	Buckeye Road Holland House/ 102540008	1/1/78-12/28/78	60	35.1	88	86
		1/1/79-12/29/79	58	38.5	134	125
		1/1/80-12/31/80	53	40.0	156	132
Tampa Electric Company	MacInnes TMO	1/78-12/78	37	30.6	52	51
		1/79-12/79	34	37.7	86	83
		1/80-12/80	45	33.0	59	55

Sources: ESE, 1981.
Florida DER, 1981.

No violations of any ambient air quality standards (AAQS) were recorded during the 3-year reporting period.

Sulfur Dioxide (SO_2)--Table 4-2 presents a summary of the continuous and bubbler data collected in the vicinity of the proposed plant site. Continuous SO_2 monitoring data were available from the Tampa Electric Company monitoring site for the period August 1979 through July 1981. The monitoring site was moved to its current location (TM) in November 1979. The previous site (TMO) was approximately 4 km southwest of the current site. SO_2 bubbler data were available from six sites within a 15-km radius of the proposed plant site and were operated by HCEPC and MCHD. These data are presented in support of the continuous monitoring data from the Tampa Electric Company site. The locations of all of the sites are presented in Figure 4-1.

As shown in Table 4-2, the arithmetic mean concentrations for the bubbler method were less than 10 ug/m^3 for all years presented. The maximum 24-hour concentration reported with the bubbler method was 92 ug/m^3 and occurred in 1979 at the MCHD Piney Point Road site. The maximum 24-hour concentration reported by the W.C. MacInnes continuous site was 214 ug/m^3 and occurred on June 23, 1981. The maximum 3-hour concentration recorded at the W.C. MacInnes continuous site was 1,362 ug/m^3 and also occurred on June 23, 1981. The next highest recorded values at the W.C. MacInnes site were 514 ug/m^3, 3-hour average, and 160 ug/m^3, 24-hour average.

Presented in Table 4-3 are the frequency distributions of 24-hour and 3-hour values recorded at the W.C. MacInnes continuous site. Greater than 90 percent of all 3-hour and 24-hour concentrations were below 50 ug/m^3.

Table 4-2. Summary of Ambient SO_2 Data (ug/m^3) in the Vicinity of the Proposed W.C. MacInnes Station Site

Network Operated By	Station Name/SAROAD No.	Sampling Period	No. Observations	Arithmetic Mean	Maximum 24-Hour	Second Maximum 24-Hour
HCEPC	Ruskin Fire Station/ 101800003	4/1/78-12/28/78	46	9.0	76	47
		1/1/79-12/29/79	52	4.2	40	23
		1/1/80-12/31/80	55	4.58	31	27
MCHD	Moccasin Wallow Road Fish Farm/ 102540011	1/1/78-12/28/78	50	6.6	38	22
		1/1/79-12/29/79	54	5.6	40	37
		1/1/80-12/31/80	54	4.0	37	29
MCHD	County Line at U.S. 41/ 102540005	1/1/78-12/16/78	41	6.6	63	31
		1/1/79-12/29/79	49	7.3	63	57
		1/1/80-12/31/80	47	3.6	79	15
MCHD	Piney Point Road Port Manatee/ 102540012	1/1/78-10/29/78	38	8.5	58	45
		1/1/79-12/29/79	50	7.5	92	56
		1/1/80-12/31/80	53	4.6	74	35
MCHD	Buckeye Road Holland House/ 102540008	1/1/78-12/22/78	30	8.5	72	33
		1/1/79-12/29/79	50	6.1	50	31
		1/1/80-12/31/80	52	4.0	63	31
Tampa Electric Company	MacInnes† (TMO/TM)*	8/1/79-7/31/80	6,914	9.8	126	126
		8/1/80-7/31/81	8,521	22.0	214	160

* Site moved from TMO to TM location in November 1979.
† This is a continuous monitoring site.

Sources: Florida DER, 1981.
ESE, 1981.

Table 4-3. Frequency Distribution of SO_2 Concentrations Measured at the W.C. MacInnes (TMO/TM) Site

Upper Limit of Interval (ug/m^3)	24-Hour Average				3-Hour Average			
	8/79-7/80		8/80-7/81		8/79-7/80		8/80-7/81	
	I*	II†	I	II	I	II	I	II
25	90.7	90.7	69.3	69.3	90.1	90.1	73.8	73.8
50	5.6	96.3	22.5	91.8	5.2	95.3	16.8	90.6
75	2.4	98.7	4.4	96.2	3.0	98.3	4.9	95.6
100	1.0	99.6	2.3	98.5	0.7	99.0	1.8	97.4
150	0.4	100	1.1	99.6	0.6	99.5	1.4	98.8
200	0	100	0.3	99.9	0.3	99.8	0.5	99.3
250	0	100	0.1	100	0.1	99.9	0.3	99.6
300	0	100	0	100	0.1	99.9	0.1	99.7
400	0	100	0	100	<0.1	100	0.1	99.9
500	0	100	0	100	0	100	0.1	99.9
750	0	100	0	100	0	100	<0.1	100
1,000	0	100	0	100	0	100	0	100
1,500	0	100	0	100	0	100	<0.1	100
>1,500	0	100	0	100	0	100	0	100

* I = Percent occurrence within interval.
† II = Cumulative percent occurrence through specified interval.

Source: ESE, 1981.

4.2.2 Dispersion Modeling Evaluation

Because of the existence of several major air pollution sources which may potentially impact the W.C. MacInnes site (see Figure 3-2), the site could be characterized as an area of multisource emissions. As a result, a multisource modeling analysis of the site was undertaken to determine the general locations of the three maximum impact areas described in Section 4.1. The modeling was performed for SO_2 and NO_x emissions only. Particulate matter modeling was not performed due to the uncertainty in predicting fugitive TSP impacts, since specific engineering design of coal and limestone handling facilities has not been performed for the proposed W.C. MacInnes plant. Sources included in the modeling consisted of FPL's Manatee power plant, Tampa Electric Company's Big Bend Station, AMAX Phosphate, Manatee Energy, and the proposed W.C. MacInnes Station. Other sources were considered not to significantly affect the distribution of pollutant levels at the W.C. MacInnes site, based upon emission rate and distance from the site.

The dispersion modeling analysis was performed with the EPA-approved Industrial Source Complex (ISC) model, using procedures recommended in the Guideline on Air Quality Models. Five years (1970 through 1974) of Tampa, Florida hourly surface observations and upper air data were used in the model. These are the most representative, available data for the site and are in the format appropriate for model input. Receptor spacing used in the model was 0.5 km, with receptor rings placed from 0.5 km to 5.5 km surrounding the proposed power plant location. Copies of all supportive computer modeling printouts are provided in Appendix B.

Based on the results of the ISC modeling, isopleths were prepared showing the spatial distribution of maximum impact concentrations at the MacInnes site for the three emission scenarios previously described. Maximum concentrations for short-term (24 hours or less) averaging times are based on second-highest concentrations at each receptor point, using the 5-year meteorological data base. Annual concentration isopleths are based on 1970 meteorological data only. These isopleths, which are based on the preliminary location of the plant boiler buildings and stacks, are presented in Figures 4-2 through 4-10.

Shown in Figures 4-2, 4-3, and 4-4 are the annual, maximum 24-hour, and maximum 3-hour SO_2 impacts due to existing sources, respectively. Figures 4-5, 4-6, and 4-7 represent annual, maximum 24-hour, and maximum 3-hour SO_2 impacts due to the proposed W.C. MacInnes Station only. Figures 4-8, 4-9, and 4-10 show annual and maximum short-term SO_2 impacts due to all future sources, i.e., existing, proposed W.C. MacInnes Station, and other proposed sources (i.e., Tampa Electric Company Big Bend Unit 4).

Figure 4-2 depicts annual SO_2 impacts from existing sources and shows maximum impact areas to the east and west of AMAX Phosphate. This is reflective of the predominant east-west winds on an annual basis. Figures 4-3 and 4-4 show that maximum 24-hour and 3-hour impacts due to existing sources are generally located south and northeast of the W.C. MacInnes Station proposed location. Review of these results indicates these maximum impact areas are attributable to either Tampa Electric Company Big Bend Station influence (northeast impact area) or to the interaction of Big Bend with AMAX Phosphate and/or FPL Manatee (south impact area). The figures also indicate that there does not currently exist a large variability in maximum pollutant concentration over the W.C. MacInnes site or vicinity. The current TM monitoring site is located near the maximum 3-hour impact area shown in the northeast portion of the base map (Figure 4-4).

Figures 4-5 through 4-7 display the spatial distribution of maximum SO_2 impacts due to the proposed W.C. MacInnes Station only. Figure 4-5 shows a predominant annual average impact area to the east. Maximum 24-hour impact areas lie toward the east, west, and southwest of the proposed facility location. Maximum 3-hour impacts occur in several directions from the proposed source. The TM monitoring site lies near to the high impact areas for all averaging times lying east of the proposed facility.

Figures 4-8 through 4-10, showing the projected concentration distribution (existing sources, proposed W.C. MacInnes Station, and other proposed sources), indicate that maximum impact areas will lie towards the east, southwest, and west of the proposed W.C. MacInnes Station after the plant reaches full capacity. The TM monitoring site again is located close to the maximum impact area lying towards the east for all averaging times.

4.3 NETWORK DESIGN

Review of the dispersion modeling results indicates that currently a large degree of variability of SO_2 concentrations not exist at the W.C. MacInnes site. The available monitoring data also show that, in general, low pollutant levels and variability exist at the site. In addition, the current TM monitoring site is located within approximately 5 km of predicted maximum predicted impact areas for the existing, W.C. MacInnes Station only, and future sources scenarios.

Based upon the available ambient data and dispersion modeling results, a 2-station ambient network is proposed to satisfy PSD preconstruction monitoring requirements. One station will be the existing TM monitoring site, and will monitor for SO_2 continuously and for TSP on a noncontinuous basis (once every sixth day). The TM monitor is located within about 2 km of the predicted maximum SO_2 concentrations for all averaging times for the scenarios of:

1. The proposed W.C. MacInnes facility only, and
2. All future sources, including the proposed W.C. MacInnes Station.

It is also located at the distance from the proposed facility where maximum impacts are predicted.

The meteorological monitoring program now in effect at the TM site is also proposed to be continued. The collected data will aid in determining potential sources of any high measured pollutant concentrations.

The second monitoring station, TX, will measure continuously for SO_2 and noncontinuously for TSP. The location of the station is shown in Figures 4-2 through 4-10, and is near to a predicted maximum impact area for the following scenarios and averaging times:

1. Annual and 3-hour SO_2 impacts due to existing sources,
2. 24-hour and 3-hour SO_2 impacts due to the proposed MacInnes facility only, and
3. Annual and 3-hour SO_2 impacts due to all future sources, including the proposed MacInnes facility.

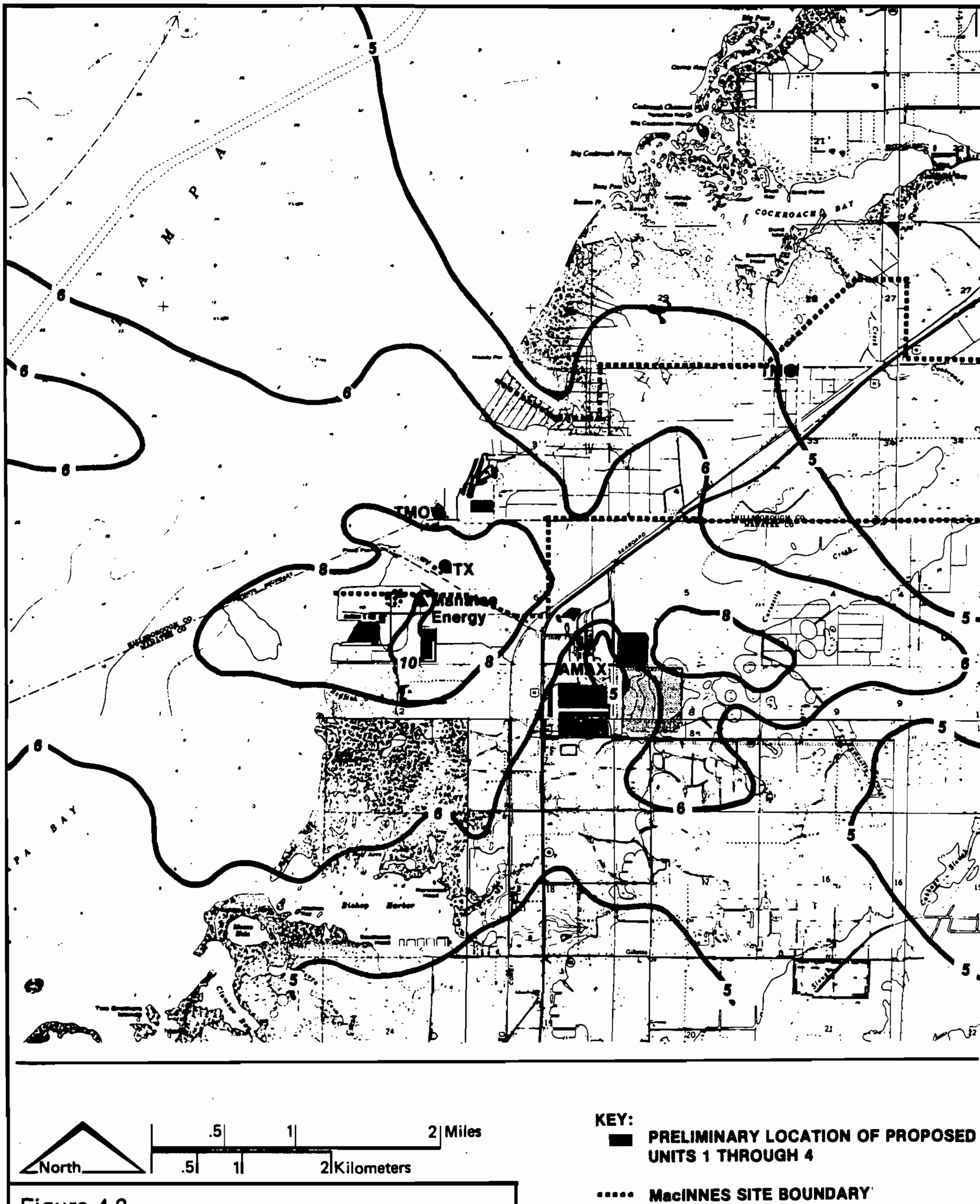


Figure 4-2
ANNUAL AVERAGE SO_2 IMPACTS DUE TO EXISTING SOURCES

Tampa Electric Company
AIR PLAN OF STUDY
W.C. MacInnes Site

SOURCES: USGS, 1969, 1973.
ESE, 1981.

Best Available Copy

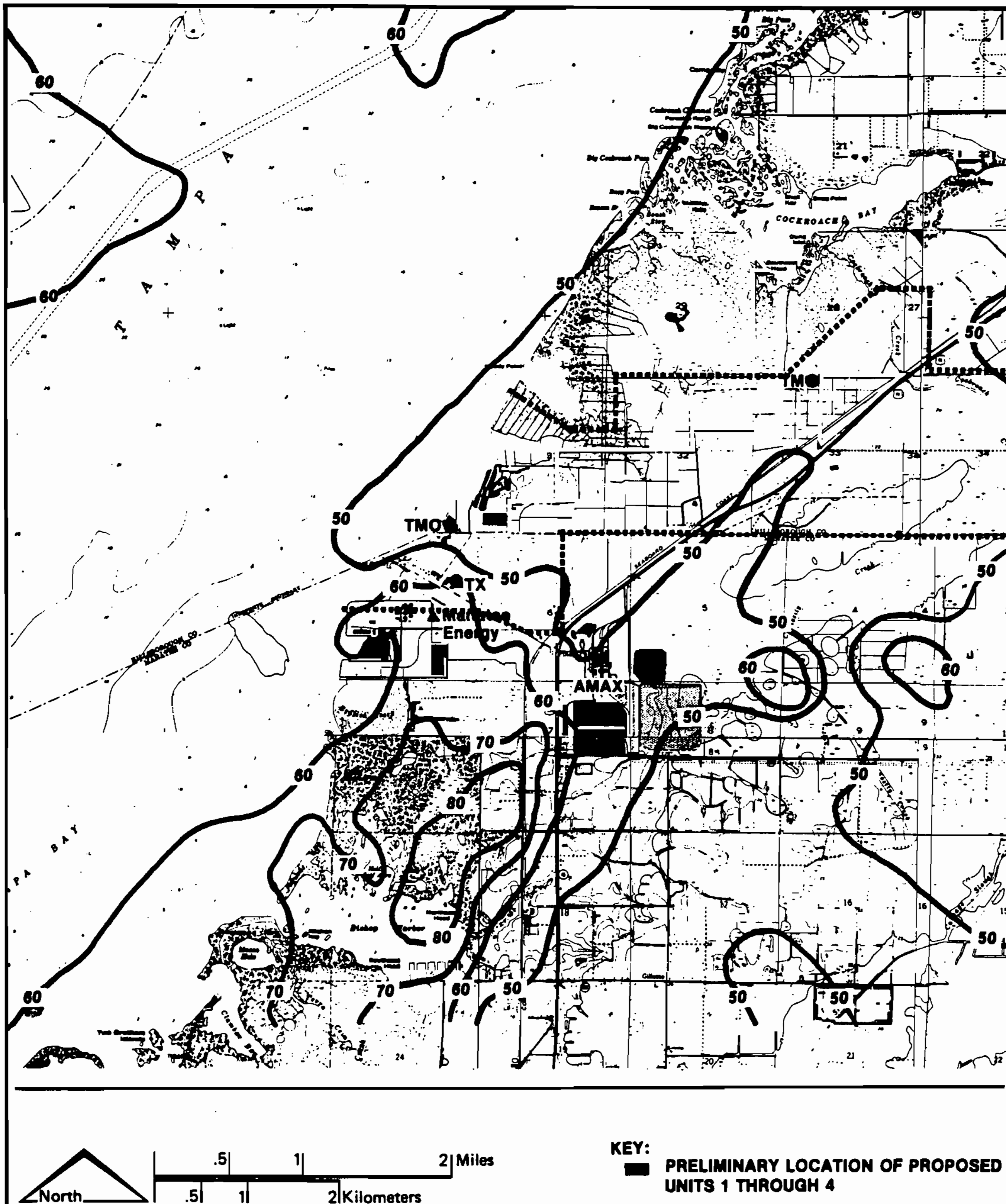
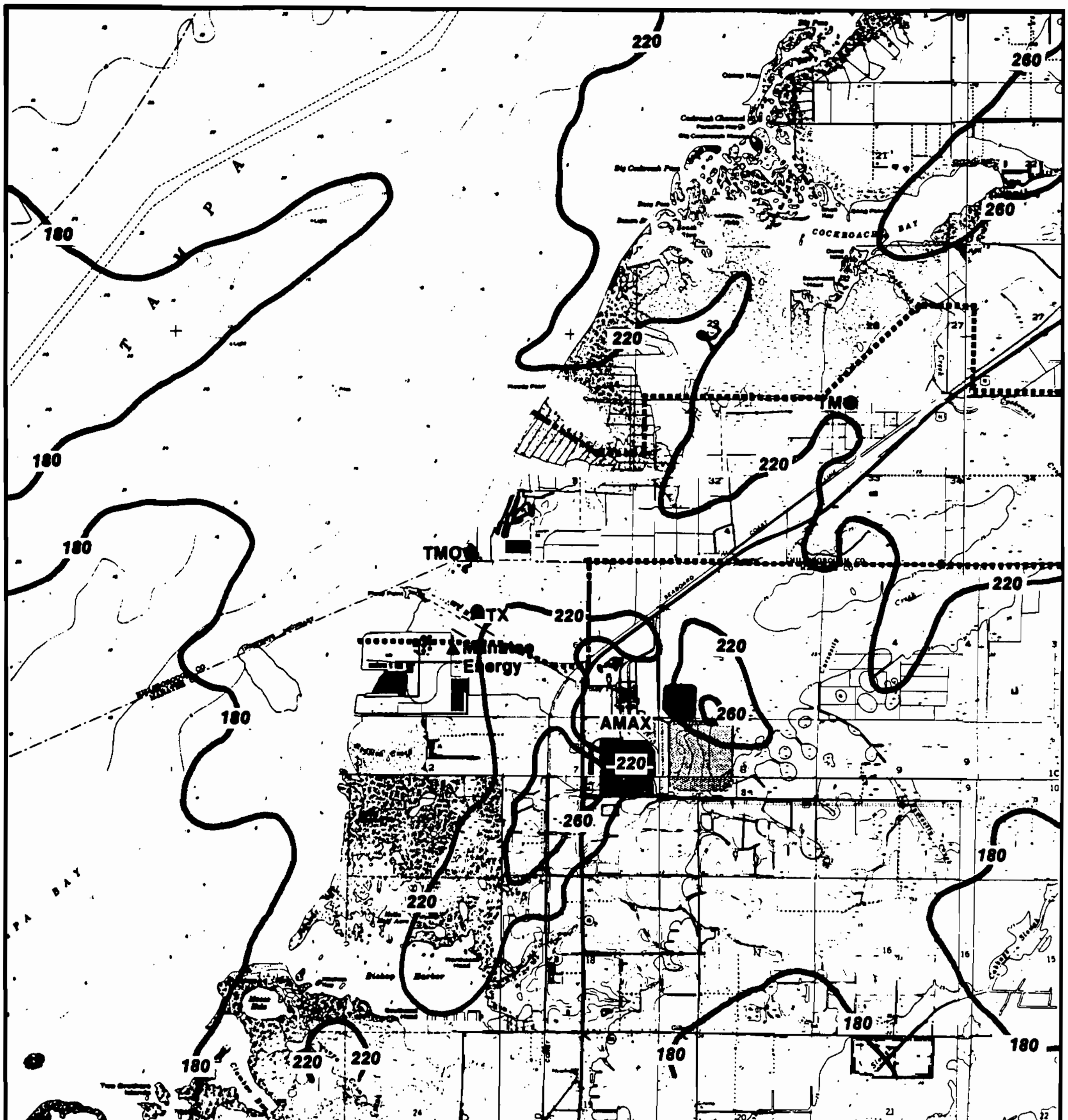


Figure 4-3
MAXIMUM 24-HOUR SO_2 IMPACTS DUE TO EXISTING SOURCES

Tampa Electric Company
AIR PLAN OF STUDY
W.C. MacInnes Site

SOURCES: USGS, 1969, 1973.
ESE, 1981.



North

.5 1 2 Miles

.5 1 2 Kilometers

KEY:

PRELIMINARY LOCATION OF PROPOSED UNITS 1 THROUGH 4

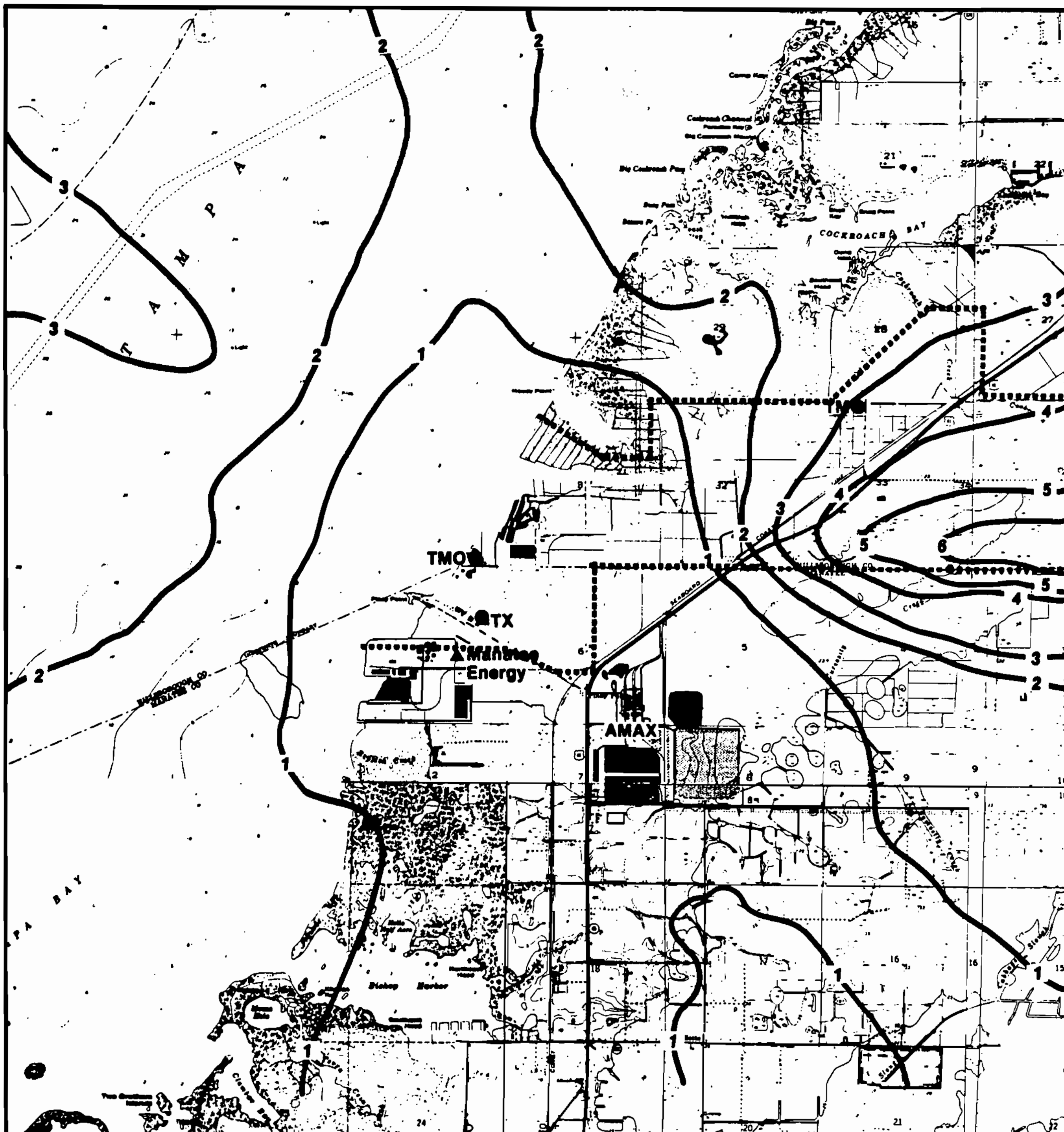
MacINNES SITE BOUNDARY

Figure 4-4
MAXIMUM 3-HOUR SO_2 IMPACTS DUE TO EXISTING SOURCES

Tampa Electric Company
AIR PLAN OF STUDY
W.C. MacInnes Site

SOURCES: USGS, 1969, 1973.
ESE, 1981.

Best Available Copy



North

.5 1 2 Miles

.5 1 2 Kilometers

KEY:

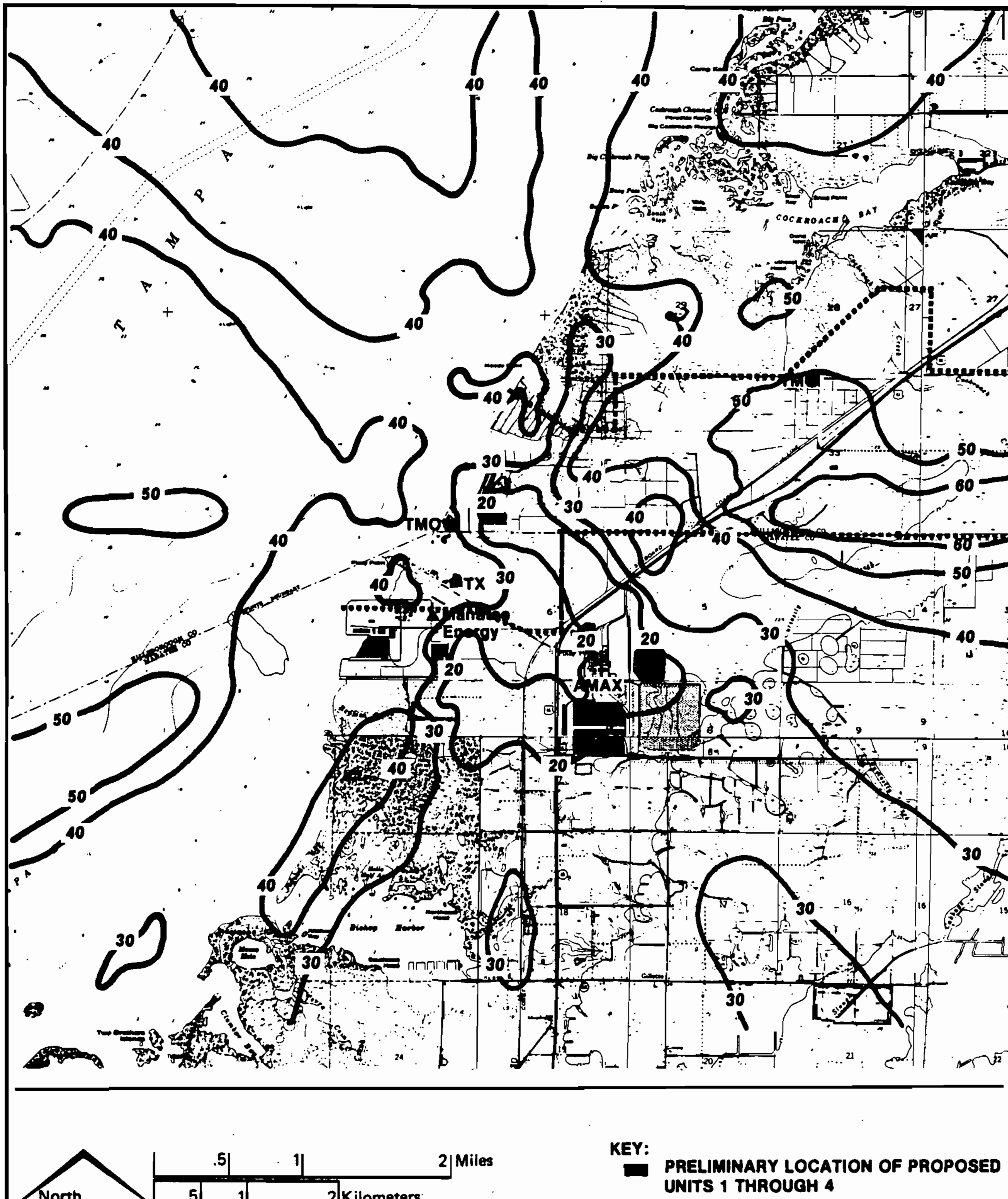
■ PRELIMINARY LOCATION OF PROPOSED UNITS 1 THROUGH 4

••••• MacINNES SITE BOUNDARY

Figure 4-5
ANNUAL AVERAGE SO_2 IMPACTS DUE TO MacINNES PLANT ONLY

Tampa Electric Company
AIR PLAN OF STUDY
W.C. MacInnes Site

SOURCES: USGS, 1969, 1973.
ESE, 1981.

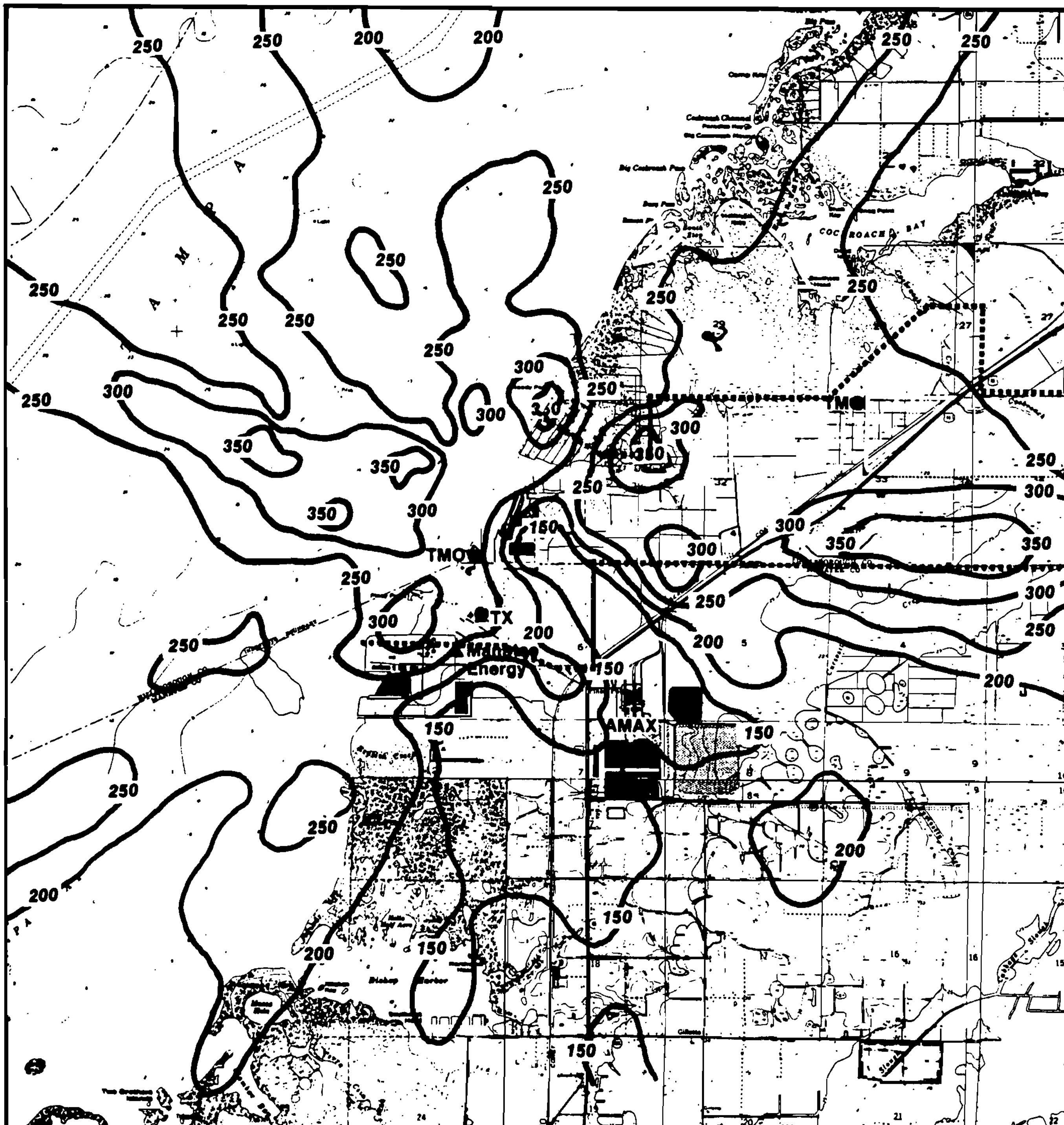


KEY:
PRELIMINARY LOCATION OF PROPOSED UNITS 1 THROUGH 4
MacINNES SITE BOUNDARY

Figure 4-6
MAXIMUM 24-HOUR SO_2 IMPACTS DUE TO MacINNES PLANT ONLY

Tampa Electric Company
AIR PLAN OF STUDY
W.C. MacInnes Site

SOURCES: USGS, 1969, 1973.
ESE, 1981.



North

.5 | 1 | 2 | Miles

.5 | 1 | 2 | Kilometers

KEY:

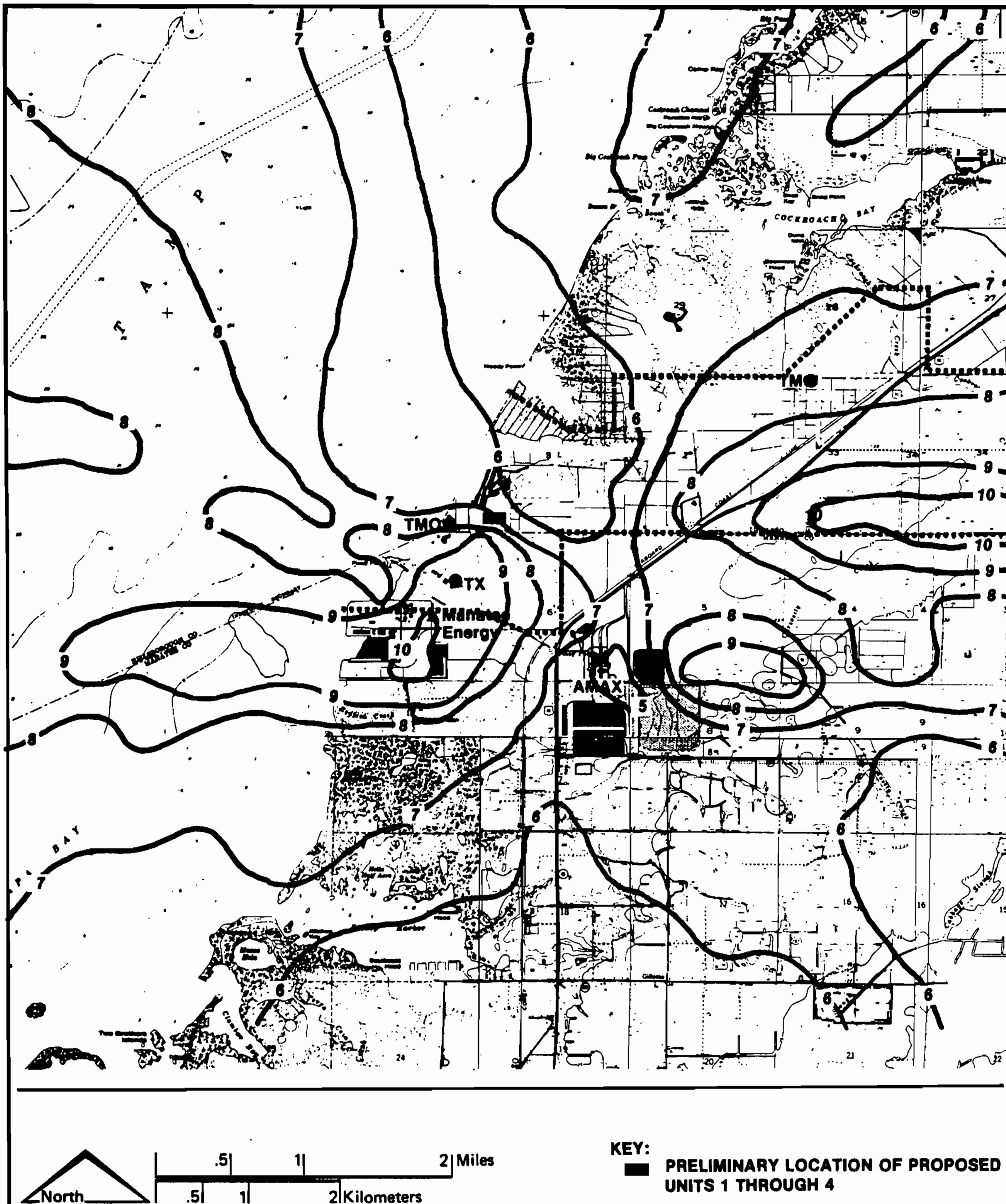
■ PRELIMINARY LOCATION OF PROPOSED UNITS 1 THROUGH 4

••••• MacINNES SITE BOUNDARY

Figure 4-7
MAXIMUM 3-HOUR SO_2 IMPACTS DUE TO MacINNES PLANT ONLY

Tampa Electric Company
AIR PLAN OF STUDY
W.C. MacInnes Site

SOURCES: USGS, 1969, 1973.
ESE, 1981.

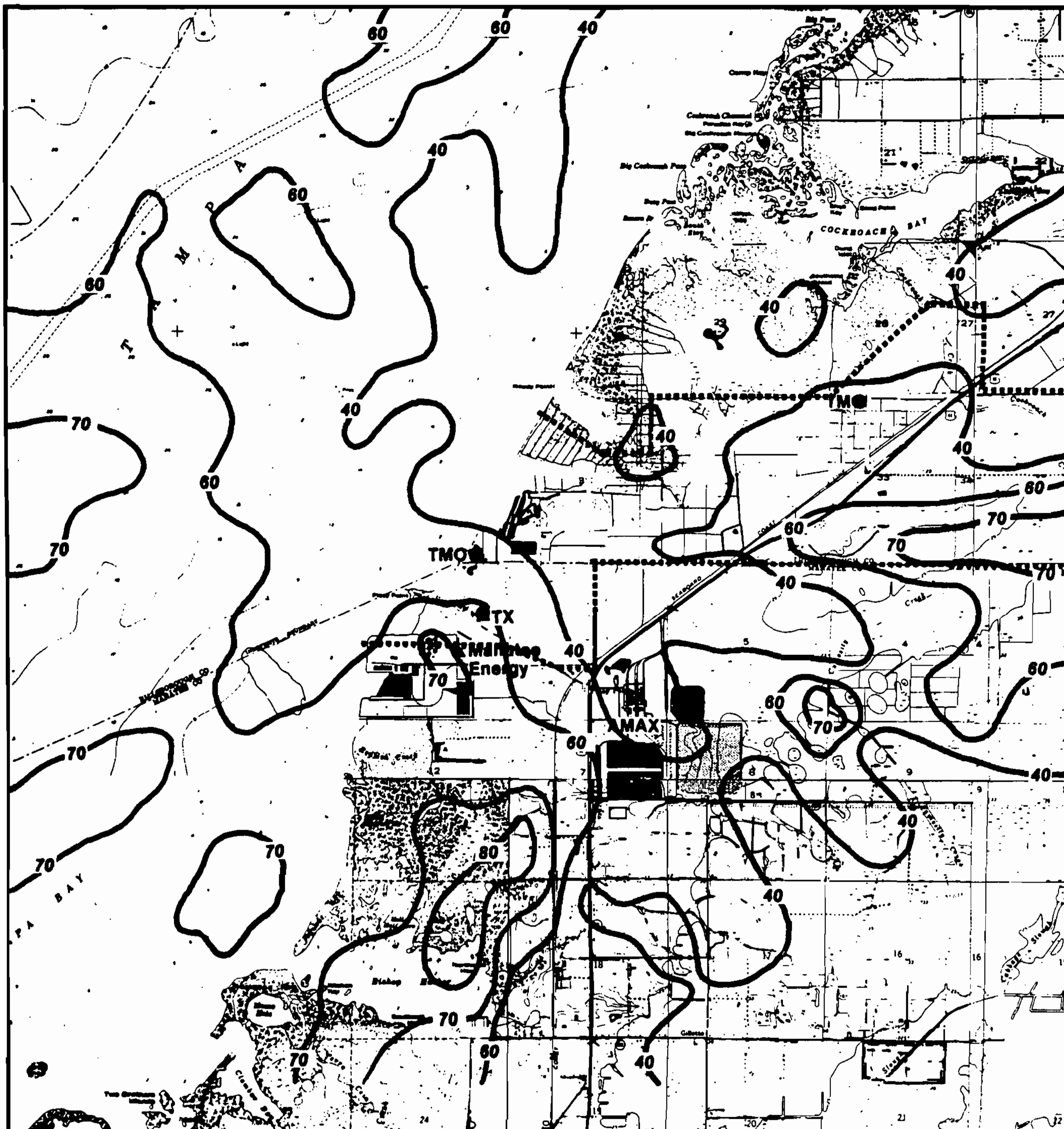


KEY:
PRELIMINARY LOCATION OF PROPOSED UNITS 1 THROUGH 4
MacINNES SITE BOUNDARY

Figure 4-8
ANNUAL AVERAGE SO_2 IMPACTS DUE TO FUTURE SOURCES

Tampa Electric Company
AIR PLAN OF STUDY
W.C. MacInnes Site

SOURCES: USGS, 1969, 1973.
ESE, 1981.



North

.5 1 2 Miles

.5 1 2 Kilometers

KEY:

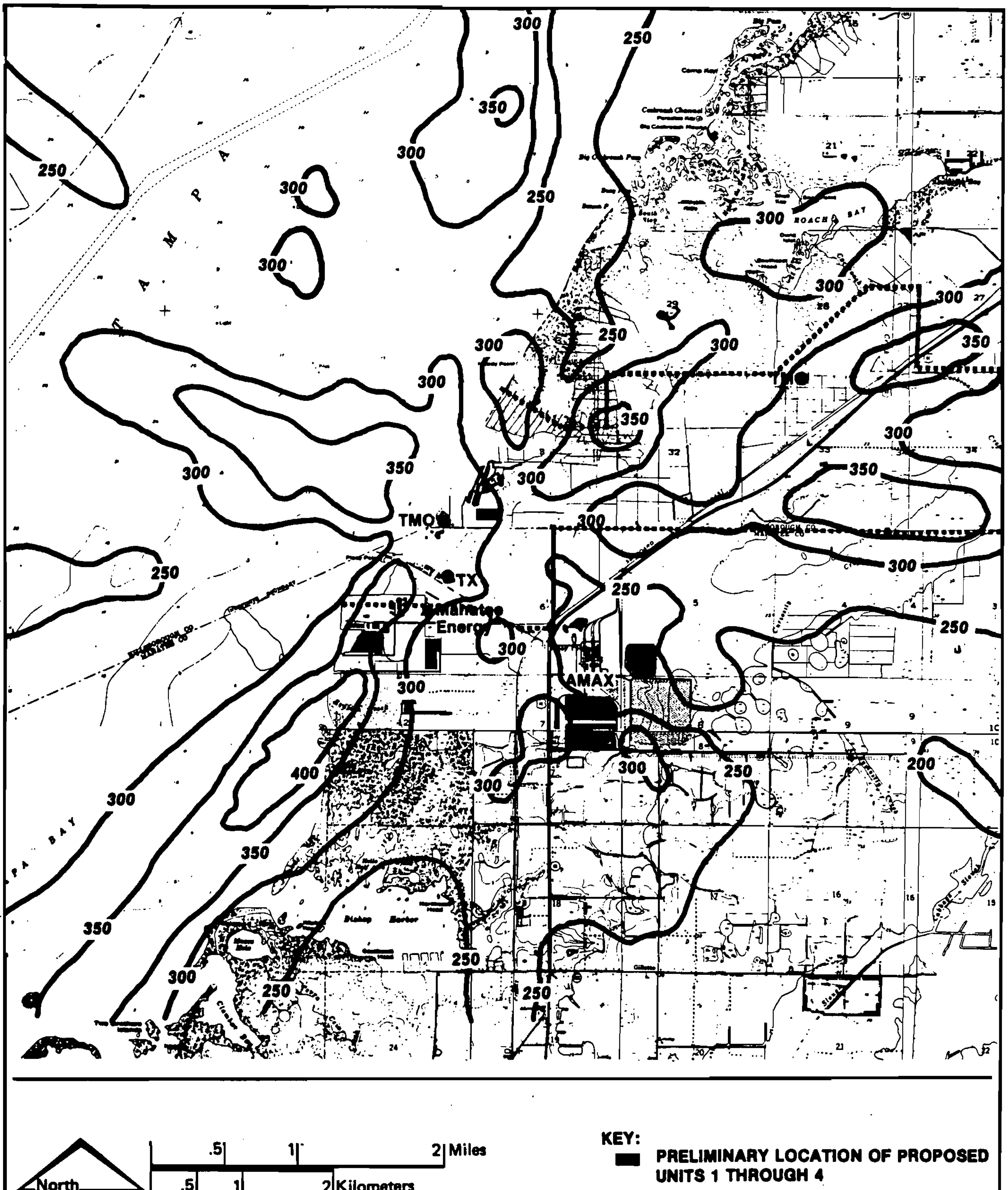
■ PRELIMINARY LOCATION OF PROPOSED UNITS 1 THROUGH 4

••••• MacINNES SITE BOUNDARY

Figure 4-9
MAXIMUM 24-HOUR SO_2 IMPACTS DUE TO FUTURE SOURCES

Tampa Electric Company
AIR PLAN OF STUDY
W.C. MacInnes Site

SOURCES: USGS, 1969, 1973.
ESE, 1981.



KEY:

■ PRELIMINARY LOCATION OF PROPOSED UNITS 1 THROUGH 4

••••• MacINNES SITE BOUNDARY

Figure 4-10
MAXIMUM 3-HOUR SO_2 IMPACTS DUE TO FUTURE SOURCES

Tampa Electric Company
AIR PLAN OF STUDY
W.C. MacInnes Site

SOURCES: USGS, 1969, 1973.
ESE, 1981.

5.0 MONITOR SITE DESCRIPTION

Monitoring station TM is located just north of the Hillsborough/ Manatee County Line and just west of U.S. Highway 41. The Universal Transverse Mercator (UTM) coordinates of the station are 350,500 mE and 3,060,250 mN. The monitoring site location is depicted in Figure 4-1 and in Figures 4-2 through 4-10. The site meets all siting criteria outlined in Ambient Air Monitoring Guidelines for Prevention of Significant Deterioration (EPA-450/4-80-012, November 1980). Table 5-1 lists the probe/measurement heights and distance from obstructions for the parameters to be monitored at the TM site. Also included is the distance from other pollutant sources and roadways.

Monitoring station TX is located just north of Piney Point Road and south of the Hillsborough/Manatee County line, immediately north of Port Manatee. The UTM coordinates of the station are 346,800 mE and 3,058,250 mN. This monitoring site is also shown in Figures 4-2 through 4-10. The site will meet all siting criteria outlined in EPA-450/4-80-012.

Table 5-1. TM MacInnes Monitoring Site Siting Parameters

Site Code	Parameter	Probe Height (meters)	Distance from Obstructions	Distance from Other Pollutant Sources and Roadways
TM01	Wind Speed	80	All of the probes at this site are above any obstructions including the citrus trees in the surrounding grove.	Besides the access road to the site, the only nearby roadway is U.S. 41, which is approximately 1 mile east of the site. There are two major pollutant sources in the area. One source is a shipping port (Port Manatee) which consists primarily of particulate sources. This source is located on the west side of U.S. 41 approximately 3 miles southwest of the TM MacInnes monitoring site. The other source is a large chemical plant which manufactures phosphate fertilizer. It is located on the east side of U.S. 41 approximately 2.5 miles southwest of the TM MacInnes monitoring site.
TM02	Wind Direction	80		
TM03	Wind Speed	10		
TM04	Wind Direction	10		
TM05	Delta Temperature	80 & 10		
TM06	Ambient Temperature	10		
TM07	Dew Point	10		
TM08	Barometric Pressure	4		
TM09	Solar Radiation	3.7		
TM10	Rain Gage	4		
TM3H	SO_2 Monitor	4.5		

Source: Tampa Electric Company, 1981.

6.0 DESCRIPTION OF MONITORS

6.1 SO_2 AND METEOROLOGICAL MONITORS

Presented in Table 6-1 are descriptions of the SO_2 and meteorological monitoring instruments currently in use at the TM monitoring site, including the principle of operation and description of the calibration system. These same instruments or identical instruments are proposed to be used at both the TM site in the future, as appropriate, to obtain additional PSD preconstruction monitoring data and at the proposed TX site.

Table 6-2 presents instrument specifications for the meteorological and continuous SO_2 monitors. Additional specifications for the meteorological monitors are presented in Table 6-3.

Table 6-1. Description of Sulfur Dioxide and Meteorological Monitoring Equipment

Instrument, Manufacturer, Model #	Principle of Operation	Description of Calibration System
Support Equipment		
Digital Voltmeter (rack mounted multimeter), Fluke, John Fluke Mfg. Co., Inc., Model # 8600A	The 8600A is a 4 1/2 digit multimeter featuring high accuracy and full autoranging capabilities except for current measurement functions including ac volts, dc volts, ac current, dc current, and resistance. Available options include a rechargeable battery pack (01) for portable operation, and a parallel BCD printer output (02). Option 521 for Fluke 2030A or 2020A printer, and Option 529 for operation on the IFEE-488 bus via the 820A translator. Superior reliability is assured through a high impact plastic case, LSP construction, dual slope measurement techniques and extensive input overload protection on all ranges. All dc voltage ranges will withstand $\pm$1200V dc or 1700V peak ac without damage. Similarly, all ac voltage ranges will endure 1200V rms without damage. The resistance ranges can handle continuous 250 rms or dc inputs without damage. All current ranges are protected by a 2A fuse which is replaceable from the front panel.	Returned to manufacturers semi-annually for calibration. S.E. Tech. Ctr. 940 N. Ferncreek Avenue Orlando, FL 32803 Calibrated traceable to NBS. See TECO SOP #010
Stripchart Recorders, Esterline-Angus Rack Mounted Miniservo Recorders, Model #MS-401-C	The Esterline-Angus 10 cm wide Miniservo Recorders use the "Z-fold" type chart paper and operate at a chart speed of 6 cm/hour. The recorders have a sensitivity of 100 MV full scale and respond to full scale in 0.5 second. The recorder accuracy is $\pm$ 0.5% of span. The writing system utilizes a disposable cartridge containing a stylus and red ink supply. The pen lifter is manually operated. The power requirements are 120V, 60 or 50 HZ.	The recorders are calibrated semi-annually by: Tampa Electric Company's Continuous Monitoring Network Maintenance Contractor using an NBS traceable DVM and following TECO's SOP #014.

Table 6-1. Description of Sulfur Dioxide and Meteorological Monitoring Equipment (Continued)

Instrument, Manufacturer, Model #	Principle of Operation	Description of Calibration System
Support Equipment (Continued)		
Data Logger including Integrator Buffer Memory Model #9217B, or Esterline Angus Model #PD2064	The Model PD-2064 is a key-programmable data acquisition system under the control of a tiny microprocessor. The system can gather analog and digital (optional) data from up to a total of 248 channels (analog plus digital). The system outputs the measured values in engineering or scientific units through various optional output devices. The solid state integrated circuit microprocessor is combined with RAMs (random access memory devices), ROMs (read-only memory devices), and PROMs (programmable ROMs) to provide a keyboard-programmable system that permits the instrument to scan, measure, collect, identify, and record both analog and digital input signals.	N/A
Magnetic Tape Deck, Kennedy, Model #9800	The Kennedy Model 9800 is a synchronous digital magnetic tape unit that with proper external formatting control is capable of reading and writing IBM compatible tapes, and is used in applications requiring high reliability at moderate tape speeds. Typical applications include operation with mini-computers, high speed data collection systems, and computer peripherals.	N/A
Mass Flowmeter and Transducer, Hastings Model #All-10KP	The Hastings Linear Mass Flowmeter utilizes a capillary tube heated uniformly by a transformer. The temperature distribution is symmetrical about	The in station mass flowmeter is calibrated according to Tampa Electric Company's SOP #013 using

Table 6-1. Description of Sulfur Dioxide and Meteorological Monitoring Equipment (Continued)

Instrument, Manufacturer, Model #	Principle of Operation	Description of Calibration System
Support Equipment (Continued)		
Mass Flowmeter and Transducer (Continued)	the mid-point at zero flow, and external thermocouples develop opposing outputs that equal zero. When the flow occurs through the tubing, heat is transferred to the gas and back again creating an asymmetrical temperature distribution. For a constant power input, the differential thermocouple output is a function of the mass flow rate and heat capacity of the gas. Since the heat capacity is relatively constant over wide ranges of temperature and pressure, the flowmeter may be calibrated directly in mass units. Changes in gas composition require only a simple multiplier to the air calibration to account for the difference in heat capacity, thus making the flowmeter useful for a wide variety of gases. High ranges of flow are achieved by dividing the flow with a shunting arrangement in a fixed ratio, thus the sensor need heat only a small portion of the total gas which results in lower power requirements while retaining its mass measuring characteristics.	the "transfer standard method" which employs a Hastings Digital Mass Flowmeter used exclusively for calibration purposes and recalibrated traceable to NBS by the manufacturer semi-annually.
SO2 Monitor		
SO2 Monitor, Thermo Electron, Model #43	Pulsating ultraviolet light is focused through a narrow bandpass filter into the fluorescent chamber. Here it excites SO2 molecules which give off their characteristic decay radiation. A second filter allows only this radiation to fall on a sensitive photo-multiplier tube. Electronic	Thermo Electron Model #143 Permeation Tube Calibrator equipped with a Hastings Mass Flowmeter and a "National Bureau of Standards" SO2 permeation tube (10 cm).

Table 6-1. Description of Sulfur Dioxide and Meteorological Monitoring Equipment (Continued)

Instrument, Manufacturer, Model #	Principle of Operation	Description of Calibration System
SO2 Monitor (Continued)		
	signal processing transfers the light energy impinging on the photomultiplier into a voltage which is in direct proportion to the concentration of SO2 in the sample stream being analyzed.	(Calibration intervals are approximately every 10 weeks.)
SO2 Permeation Tube Calibrator, Thermo Electron, Model #143	The Thermo Electron Model #143 Permeation Tube Calibrator is designed to provide a highly stable zero air flow, to which is added the flow from a permeation chamber consisting of a permeation tube in a temperature controlled oven. A stable air flow and a stable permeation rate are required to achieve the accuracy and reproductibility necessary to obtain an accurate calibration.	The SO2 permeation tube calibrator is calibrated by means of a calibrated Hastings Mass Flowmeter to verify the accuracy of the flow system and calibrated mercury thermometers to verify the oven temperature. (Calibration intervals are semi-annually.)
Meteorological Monitors		
Rain, Climet, Inc., Model #0501-3/-4	The tipping bucket rainage is designed to operate with a variety of recording systems. A measured 7.95 cc of water causes the bucket to over balance and swing to the opposite side. A magnet mounted under the bucket passes close to a magnetic switch during the tipping action causing a momentary closure of the switch. This pulse may be used to trigger a step marking stylus motor or actuate a digital counter or other similar devices. Each bucket tip of 7.95 cc of water, funneled from the 7.86 inch diameter collector tube, is equal to 1/100 of an inch of rainfall.	See TECO SOP #026

Instrument, Manufacturer, Model #	Principle of Operation	Description of Calibration System
Meteorological Monitors (Continued)		
Dew Point, Climet, Inc., Model #C1-65	The Climet Model C1-65 Dewpoint Hygrometer employs a patented dual mirror optical system to measure the dewpoint temperature in the air. The sample mirror is maintained precisely at dewpoint temperature by a proportional controller. It derives its control signal by projecting the output of a pulsed infrared LED (light emitting diode) to the surface of the two mirrors which reflect energy back to the two photodiodes. The outputs of the diodes are amplified, demodulated to a DC voltage, then fed into a ratioing circuit. When there is not any dew and the two signals are balanced on the same voltage, the ratio output of 10 volts is displayed as a full scale on the signal reference (SR) meter. The reference mirror will remain at an ambient temperature while the sample mirror with a 3-wire platinum resistance thermometer embedded in it is attached to a thermoelectric device (TED) which, under balanced conditions, is in a cooling mode. As aspirator fan draws air across the mirrors, and as soon as the dew starts to form the ratio starts to drop. When the proper dew layer thickness is reached, the proportional controller holds the mirror at the dewpoint temperature by alternately applying cooling and heating pulses to the TED at a rate of approximately 20 times per second. As the dewpoint changes, the controller will vary the heating-cooling duty cycle to maintain the same dew layer thickness. The output of the platinum resistance thermometer is linearized by a bridge	See TECO SOP #023

Table 6-1. Description of Sulfur Dioxide and Meteorological Monitoring Equipment (Continued)

Instrument, Manufacturer, Model #	Principle of Operation	Description of Calibration System
Meteorological Monitors (Continued)		
	circuit, then amplified to provide a dual recorder output of 0-1 volt and 0-1 milliamp. The sample mirror will eventually accumulate dirt and volatiles such as hydrocarbons. Therefore, an automatic servo system is provided to periodically heat the mirror to vaporize the volatile material and re-balance the outputs from the photodiodes.	
Barometric Pressure, Climet, Inc., Model #0502	The Model 0502 Pressure Transducer incorporates several stacked diaphrams of Ni Span C alloy, mechanically linked with invar fittings to a precision 1000 ohm potentiometer constructed with Platinum-alloy windings and contacts.	See TECO SOP #024
Ambient Temperature, Climet, Inc., Model #015-3	The 015-3 Temperature Probe is a dual Thermister unit, used to sense the environmental temperature. The components are selected to give excellent linearity and accuracy over a specific temperature range. Table of Specifications: Range - -30°C to +50°C: Accuracy and Interchangeability - ± 0.15°C, Maximum: Linearity - ± 0.16°C, Maximum: Time Constant - 10 sec. in still air: Dimensions - 3/8 dia. x 4" long. The Temperature Probes and Resistor Network form two resistive voltage divider strings, one for each probe. Change of the temperature causes a change in the probe resistance and therefore a change in the voltage in the resistor network. The FET switch chops the DC voltage levels, producing a square wave AC signal whose peak-to-peak value is the difference of the sensor voltages. This AC signal is amplified. The FET switch chops the amplified square wave signal producing a DC level proportional to the difference of the temperatures of the probes.	See TECO SOP #022

Table 6-1. Description of Sulfur Dioxide and Meteorological Monitoring Equipment (Continued)

Instrument, Manufacturer, Model #	Principle of Operation	Description of Calibration System
Meteorological Monitors (Continued)		
Solar Radiation, Climet, Inc., Model #0503	The Model 0503 Pyranometer is used for the measurement of global and sky radiation. The case is constructed of chromed brass and is supplied with a circular spirit level and adjustable leveling screws. The site for the pyranometer should be free from any obstructions above the plane of the sensing element and, at the same time, should be readily accessible. If practicable, the pyranometer should be so located that a shadow will not be cast on it at any time. If it is at all possible, the site should be so chosen that the elevation of any obstruction at azimuths between those corresponding to earliest sunrise and lates sunset should not exceed 5°. Care should be taken that it is not near light-colored walls or other objects likely to reflect sunlight onto it and that it is not exposed to artificial radiation sources. At most stations a flat roof provides the best location for mounting the stand for the pyranometer.	See TECO SOP #025 (not available at this time)
Wind Direction Sensors, (10 Meters and 80 Meters), Climet, Inc., Model #012-10	The 540° horizontal wind direction system was developed to overcome the ambiguity of the 360° system caused by the gap in the potentiometer winding. When the wind is fluctuating about the gap of the 360° potentiometer, the output shifts rapidly from zero to full scale, resulting in a record which is difficult to interpret manually and erroneous when read by a digital recorder. In the 540° system, two identical potentiometers are mounted one above the other on the same shaft. A	See TECO SOP #021

Table 6-1. Description of Sulfur Dioxide and Meteorological Monitoring Equipment (Continued)

Instrument, Manufacturer, Model #	Principle of Operation	Description of Calibration System
Meteorological Monitors (Continued)		
Wind Direction Sensors (Continued)	pulse, generated when the wiper passes the gap of one potentiometer, drives a solid state flip-flop contained within the logic circuit module which switches to the output of the other potentiometer. This technique extends the wind direction range from 0-360° to 0-540°. Wind direction may then back or veer a full 540° without encountering a "crossover" or ambiguous point.	
Wind Speed Sensors, (10 Meters and 80 Meters), Climet, Inc., Model #011-1	The 011-1 Wind Speed Transmitter consists of three major sections: anemometer cup assembly, transmitter housing assembly and light chopper-amplifier assembly. Anemometer Cup Assembly - The 014-102 Anemometer Cup Assembly consists of three arms, each integrally molded of rugged Lexan. The light weight and shape of the cups are responsible for the fast response and accuracy of the 011-1. Transmitter Housing Assembly - The transmitter housing is constructed entirely of machined aluminum. All parts are fully anodized to resist corrosion. The housing is provided with a removable cover held in place by silicon-greased "O" rings, providing easy access to the interior of the unit. Light Chopper - Amplified Assembly - The light beam chopper is mechanically linked to the anemometer cup assembly by a stainless steel driveshaft which rotates on precision ball bearings. A small LED is mounted directly above the 10-slot chopper disc so that its light passes through the slots onto the photodiode mounted beneath. Rotation of the chopper alternately masks and exposes the diode to the LED, producing	See TECO SOP #020

Table 6-1. Description of Sulfur Dioxide and Meteorological Monitoring Equipment (Continued)

Instrument, Manufacturer, Model #	Principle of Operation	Description of Calibration System
Meteorological Monitors (Continued)		
	electrical pulses at a frequency proportional to the rate of rotation of the cups. The diode output is applied to the amplifier circuit contained within the transmitter, amplifying the pulses to a uniform 10 volt peak-to-peak value.	
Amplifier (P.C. Boards) Climet, Inc. #D8002A	The amplifier combination and associated circuitry is used in application where no filtering or short term filtering (up to T of six seconds) is required. The amplifier circuit can be used to translate input signals that have either positive or negative offsets, i.e., the low end of the signal range is not zero volts.	Operational Checkout of the printed circuit board and associated curret-driven recording equipment consists of 1) Turn the translator power OFF and mechanically zero the recorder. 2) Turn the translator power ON. 3) Move the zero to its springloaded position and check the switch. 4) Move the Full Scale switch to its springloaded position and adjust the printed circuit board for full scale on the recorder. 5) Release the Full Scale switch. Climet´s electronic design employs the highest grade components in consertively-rated circuits to provide performance with maximum accuracy and the minimum of maintenance. Due to the conservative design, recalibration is seldom required; however, to ensure the

Table 6-1. Description of Sulfur Dioxide and Meteorological Monitoring Equipment (Continued)

Instrument, Manufacturer, Model #	Principle of Operation	Description of Calibration System
Meteorological Monitors (Continued)		
Amplifier (Continued)		maximum accuracy, it is recommended that the system be checked periodically. The adjustment and calibration procedure outlined is required only at the suggested maintenance intervals or when an electronic component is replaced. Before undertaking the maintenance procedure, it is advised that the personnel performing the task have previous electronic experience as the equipment may be severely damaged by improper handling. If in doubt about any part of the procedure, contact Climet Instrument's Field Service Manager at 714-793-2788.

Source: Tampa Electric Company, 1981

Table 6-2. Meteorological and SO_2 Equipment Specifications

Parameter	Instrument Range	Specifications Zero	Specifications Span
Wind Speed (80)	0 - 50 mph	0 ± 0.5 mph	50 ± 0.5 mph
Wind Direction (80)	0 - 540°	0° ± 3°	540° ± 3°
Wind Speed (10)	0 - 50 mph	0 ± 0.5 mph	50 ± 0.5 mph
Wind Direction (10)	0 - 540°	0° ± 3°	540° ± 3°
Delta Temperature	0 - ±10°F	(-10°F) ± 0.4°F	(+10°F) ± 0.4°F
Ambient Temperature	-10°F - 130°F	0°F ± 3.0°F	120°F ± 0.9°F
Dew Point	0° - 100°F	0°F ± 2.0°F	100°F ± 2.0°F
Barometric Pressure	28" - 32" Hg	28" Hg ± 0.04" Hg	32" Hg ± 0.4" Hg
Solar Radiation	0 - 2 Langleys	0 Langleys ± 0.02 Langleys	2 Langleys ± 0.02 Langleys
Rain Gage	0" - 1" Rain	0" Rain ± 0.10" Rain	1" Rain ± 0.1" Rain
SO_2 (1-11-80 to 2-26-81)	0 ppm - 1.0 ppm*	0 ppm ± 0.01 ppm	± 15% of designated span concentration
(2-27-81 to present)	0 ppm - 0.9 ppm*	0 ppm ± 0.01 ppm	± 15% of designated span concentration

* 10-percent zero offset.

Source: Tampa Electric Company, 1981.

Table 6-3. Meteorological Sensor Specifications

	Wind Speed	Wind Direction	Temperature	Dew Point	Precipitation	Solar Radiation
Accuracy	0.25 m/s<5 m/s ±5% otherwise	±3°	±0.5°C	±0.5°C	±1%	±5%
Threshold	0.5 m/s	0.5 m/s				
Range	Not specified	Not specified	Not specified	Not specified	Up to 50 mm/hr	
Distance Constant	3 m	10 m max.				
Damping Ratio		0.4-0.65				
Time Constant			Not specified	Not specified		
Resolution					0.25 mm event	
Linearity						Not specified
Response Time						Not specified

Source: Tampa Electric Company, 1981.

6.2 TSP MONITOR

The TSP monitor and related equipment to be used at the monitoring sites are described in detail in this section.

A Model GMWL-2000 high-volume sampler manufactured by General Metal Works, Cleves, Ohio, is used for TSP monitoring. A Dwyer 12-inch water manometer is used for determining flow rates. The sampler consists of three units: (1) the faceplate and gasket, (2) the filter adapter assembly, and (3) the motor unit. Figure 6-1 shows an exploded view of these parts and their relationship to each other.

A Model GMWL-2000 heavy-duty, turbine type blower is employed, manufactured by Ametek/Lamb Electric, Racine, Wisconsin, and capable of continuous operation for 24-hour periods with input voltages ranging from 110 to 120 volts. The blower is capable of pulling ambient air through an 8- by 10-inch glass fiber filter at a flow rate of 60 cubic feet per minute (ft^3/min). A Model 2E214 timer, manufactured by Dayton Electrical Manufacturing Company, Inc., of Chicago, Illinois, is used to control the sampler. The timer is graduated in 30-minute intervals and operates the blower by means of mechanical tripper switches. Two screw-type switch trippers are used, one to start the sampler and one to stop the sampler. An elapsed time indicator, Model 635G, manufactured by Cramer Division, Conrac Corporation, Old Saybrook, Connecticut, determines the total elapsed time of operation and verifies accumulative intermittent sampling periods.

The sampler is mounted vertically in a Model GMWL8500 anodized aluminum protective shelter so that the glass fiber filter is parallel to the ground. The shelter is mounted on stands so that the inlet to the sampler is approximately 8 to 10 feet above ground. The angular area between the roof and the housing is such that particles less than 100 microns effective diameter are pulled into the filter surface. Heavier particles fall out gravimetrically and do not contribute to the mass collected.

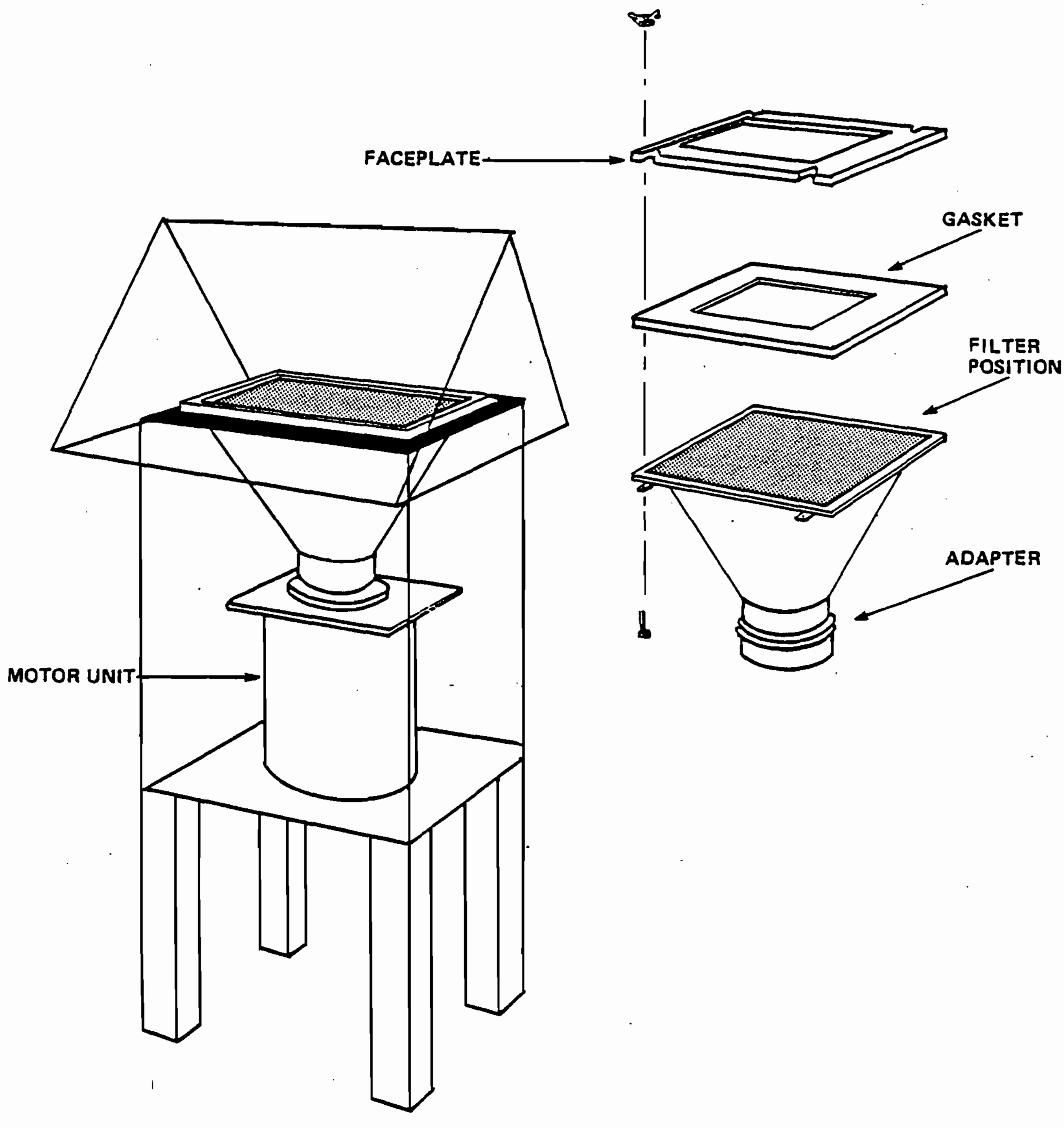


Figure 6-1
ASSEMBLED SAMPLER AND SHELTER WITH EXPLODED VIEW OF THE FILTER HOLDER

SOURCE: ESE, 1981.

Tampa Electric Company
AIR PLAN OF STUDY
W.C. MacInnes Site

7.0 DATA REPORTING AND QUALITY ASSURANCE PROGRAM

A complete description of data reporting procedures and Tampa Electric Company's quality assurance program are contained in the document entitled "Quality Assurance Plan for Tampa Electric Company, MacInnes--Continuous Ambient Air Monitoring Network" also being submitted to Florida DER along with this Air Monitoring POS document.

APPENDIX A

ESTIMATED EMISSIONS OF REGULATED POLLUTANTS

APPENDIX A

ESTIMATED EMISSIONS OF REGULATED POLLUTANTS

Fuel Usage and Heat Input Requirements

Four boilers: Two 500-MW units and two 900-MW units, gross capacity

Total gross capacity = 2,800 MW

Fuel type: Bituminous coal

Heat rate = 8,983 Btu/KW for all units

Minimum fuel heat value = approximately 10,000 Btu/lb

Maximum total heat input to boilers = 25,152 x 10^6 Btu/hr

Maximum coal consumption = 1,258 tons/hr, total all units

Maximum operating hours = 8,760/yr

Sulfur Dioxide, Particulate, and Nitrogen Oxides

Emissions based upon NSPS (40 CFR 60, Subpart Da) of:

Sulfur dioxide: Plant will emit about 0.8 lb/10^6 Btu at full 2,900-MW capacity

Particulate: 0.03 lb/10^6 Btu

Nitrogen oxides: 0.60 lb/10^6 Btu (bituminous coal)

Sulfur Dioxide: 25,152 x 0.8 = 20,122 lb/hr = 88,133 tons/yr

Particulate: 25,152 x 0.03 = 755 lb/hr = 3,305 tons/yr

Nitrogen Oxides: 25,152 x 0.6 = 15,091 lb/hr = 66,099 tons/yr

Carbon Monoxide

Emissions based on AP-42 factor of 1 lb/ton for pulverized coal boiler:

1,258 tons/hr x 1 lb/ton = 1,258 lb/hr = 5,510 tons/yr

Lead, Mercury, Beryllium, Fluorides, Arsenic, Sulfuric Acid Mist, Asbestos, and Vinyl Chloride

The following references were reviewed for emission factors of various noncriteria regulated pollutants:

1. Project Summary, Emissions Assessment of Conventional Stationary Combustion Systems: Volume III, External Combustion Sources for Electricity Generation, EPA-600/S7-81-003a, April 1981.
2. Characterization of Ash From Coal-Fired Power Plants, EPA-600/7-77-010, January 1977.
3. Health Impacts, Emissions, and Emission Factors for Noncriteria Pollutants Subject to De Minimis Guidelines and Emitted from Stationary Conventional Combustion Processes, EPA-450/2-80-074, June 1980.
4. Compound Forms of Fossil Fuel Fly Ash Emissions, Environmental Science and Technology, Vol. 14, No. 4, April 1980.
5. Project Summary, Trace Metals and Stationary Conventional Combustion Processes, EPA-600/57-80-155, February 1981.

Noncriteria regulated pollutants are contained in coal fly ash in varying amounts. Emissions depend on coal composition, firing method, and control systems.

The following emission factors are for coal boilers equipped with electrostatic precipitators (ESP) and were obtained or derived from the references.

Pollutant	Emission Factor ($lb/10^{12}$ Btu) Ref. 1	Ref. 2*	Ref. 3†	Ref. 4*	Ref. 5
Lead	72-90	2.1-24.0	—	2.1-4.5	11.6-14.4
Mercury	—	0.01-0.3**	18.2***	<0.03**	3.9-7.0***
Beryllium	4.2-5.1	0.01-0.3	4.0-4.8	0.05-0.3	1.0
Fluorides	9,512***	20**	9,320***	0.6-1.8**	—
Arsenic	—	1.5-13.2	—	0.9-3.0	0.2-11.6
Sulfuric Acid Mist	—	—	147.6††	—	—
Asbestos	—	—	Negligible	—	—
Vinyl Chloride	—	—	Negligible	—	—

* Based upon particulate emission rate of 0.03 $lb/10^6$ Btu after ESP control.

† Based upon typical trace element content of coal recommended in reference: mercury, 0.2 ppm; beryllium, 0.9 ppm; and fluorides, 100 ppm.

** Particulate emissions only; does not include gaseous emissions.

†† Assumes coal sulfur content of 6 percent and hot side ESP with FGD system as worst emission case.

*** Because these elements are emitted primarily in the gas phase, an average 80-percent removal efficiency is reported when employing a wet-scrubbing device.

Emission estimates are calculated for the range of factors given:

Lead: $25{,}152 \times 2.1 \div 10^6 = 0.053$ lb/hr = 0.23 ton/yr

$25{,}152 \times 90 \div 10^6 = 2.26$ lb/hr = 9.90 tons/yr

Mercury: $25{,}152 \times 0.01 \div 10^6 = 0.00025$ lb/hr = 0.001 ton/yr

$25{,}152 \times 18.2 \div 10^6 = 0.46$ lb/hr = 2.01 ton/yr

Beryllium: $25{,}152 \times 0.01 \div 10^6 = 0.00025$ lb/hr = 0.0011 ton/yr

$25{,}152 \times 5.1 \div 10^6 = 0.13$ lb/hr = 0.57 ton/yr

Fluorides: Because fluorides are emitted primarily in the gas phase, an additional 80-percent removal was assumed with use of a wet flue gas desulfurization system

$25{,}152 \times 0.6 \div 10^6 \times 0.2 = 0.003$ lb/hr = 0.13 ton/yr

$25{,}152 \times 9{,}512 \div 10^6 \times 0.2 = 47.8$ lb/hr = 209.6 tons/yr

Arsenic: $25{,}152 \times 0.2 \div 10^6 = 0.0050$ lb/hr = 0.02 ton/yr

$25{,}152 \times 13.2 \div 10^6 = 0.33$ lb/hr = 1.45 ton/yr

Sulfuric Acid Mist: $25{,}152 \times 147.6 \div 10^6 = 3.71$ lb/hr = 16.25 tons/yr

Radionuclides

Reference: "Characterization of Ash from Coal-Fired Power Plants," EPA-600/7-77-010, January 1977.

Principal radionuclide emissions from coal-fired power plants consist of Radon 222, Uranium 238 and daughters, and Thorium 232 and daughters (Federal Register, Vol. 44, No. 249, December 27, 1979). Review of the above referenced document indicates that Uranium and Thorium are contained in coal fly ash. No data are available, however, concerning Radon 222. Uranium in coal fly ash after control by an electrostatic precipitator was measured at 10 parts per million (ppm), while Thorium was measured at 3 ppm. Assuming that all the Uranium and Thorium emitted become radionuclides, the following annual emission rates were determined:

Tons/year = Particulate matter (tons/yr) x ppm $\div 10^6$

Tons/year = 3,305 tons/yr x 13 $\div 10^6$ = 0.043 ton/yr

Total Reduced Sulfur, Reduced Sulfur Compounds, Hydrogen Sulfide, and Benzene

There is no evidence or indication in the available literature that these pollutants are emitted from coal-fired power plants. Therefore, emissions of these pollutants from the proposed Tampa Electric Company plant were assumed to be zero.

Volatile Organic Compounds (VOC)

Reference: EPA Memo, from Robert E. Neligan, Director, Monitoring and Data Analysis Division, to David Wagner, Director, Air and Hazardous Materials Division, Region VIII. "Reactive Volatile Organic Compounds from Coal-Fired Power Plants," January 23, 1978.

VOC = 0.01 lb/ton x 1,258 tons/hr = 12.58 lb/hr = 55.1 tons/yr

Reference: Emissions of Reactive Volatile Organic Compounds from Utility Boilers, TRW, Inc., EPA-600/7-80-111, May 1980.

Test data from three sites representing largest units tested (all about 360 MW) and utilizing ESP for particulate collection showed VOC emission rates (C_2 to C_{16} hydrocarbons), ranging from 0.0011 lb/10^6 Btu to 0.0053 lb/10^6 Btu heat input. These values are probably high because C_2 hydrocarbons include ethane, which is not classified as a VOC.

VOC: 25,152 x 0.0011 = 27.67 lb/hr = 121.2 tons/yr

25,152 x 0.0053 = 133.3 lb/hr = 583.9 tons/yr

APPENDIX B

ISC MODEL OUTPUT COMPUTER PRINTOUTS

(Provided separately)

TECO/DER Meeting 2/19/82

	Buck Oven	DER	(904) 488-0130
	Henry Postrozny	DER-NPDES	904-487-1620
	Tom Rogers	DER-BAQM	(904) 488-1344
	Bob King	DER-BAQM	"
	J.P. Subramani	DER-NPDES	904-487-1620
	Blaine Oliver	DUCA	(904) 488-4925
	Andrew Feinstein	DER-Dredge & Fill	488-0130
	Cindy Hilty	DER-BWA	488-6221
	John A. Reese	DER-SOLID WASTE	488-0300
	Larry Curtin	Holland & Knight	813-682-1161
Q	Jerry Williams	Tampa Electric Co.	813-228-4837
	Lawrence Olsen	DER/Biology	904-487-2245
	Stan Hvostik	PSC-System Planning	904-488-8501
contact	John Ramil	Tampa Electric Co.	813/228-4837
	Lynn Robinson	Tampa Electric Co.	813/228-4839
	Karen Anthony	DER-PPS	904-488-0130
	Randy Kautz	Game & Fish	(904) 488-6661
	Susan Mashburn	ENV. SERVICE CTR, TALLA.	904-222-0433
F	Vilma Brueggemeyer	Tampa Electric Co.	(813) 228-4841
	Rick Lotspeich	DER-Dredge & Fill Permitting	(904) 488-0130

Program Module | Addendum No. 44 | Accounting System

BEST AVAILABLE COPY

New Module xxx Module Revision ____ Module Termination ____

Source of Funding Industrial Siting Trust Fund

Module Number 8214 Effective Date 7/23/82

Module Title (Brief) TA82-04 Florida Power and Light

MODULE DESCRIPTION:

Includes activities associated with accounting for personnel time and expenses associated with the Florida Power and Light Company 230 KV Midway-Jensen-Crane Transmission Line in Martin and St. Lucie Counties.

Program Module	Addendum No. 28	Accounting System

BEST AVAILABLE COPY

New Module xxx Module Revision ___ Module Termination ___

Source of Funding Industrial Siting Trust Fund

Module Number 8186 Effective Date 4/1/82

Module Title (Brief) PPS PA 83-16 Tampa Electric Company

MODULE DESCRIPTION:

Review and processing of Tampa Electric Company's (TECO) power plant siting application for the MacInnes Site.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

ROUTING AND TRANSMITTAL SLIP

TO: (NAME, OFFICE, LOCATION)

1. ~~Patty~~
2. Mike Harley
3.
4.

I think this should go to Mike Harley. He needs to give me something to sign not later than 3/18. He needs to talk to Art Lyle.

FROM: Clair	DATE 3/3
	PHONE

08-18-93

TAMPA ELECTRIC
A TECO ENERGY COMPANY

RECEIVED

FEB 23 1994

Bureau of
Air Regulation

January 27, 1994
Resent February 18, 1994

Certified Mail P 231 802 159
Return Receipt Requested

Mr. Clair H. Fancy
Bureau Chief
Bureau of Air Regulation
Division of Air Resources Management
Florida Department of Environmental Protection
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Re: Tampa Electric Company
Phillips Station Diesel Unit No. 1
Amended Proposed Air Permit No. AO28-234787, Issued November 15, 1993
Existing Air Permit No. AO28-154204, Issued September 16, 1988
Former Air Permit No. AO28-71313, In effect on January 1987
Consent Order Case No. 86-1532, Filed January 5, 1987

Dear Mr. Fancy:

The purpose of this letter is to request the Department to issue Amended Permit AO28-234787 so as to exempt Tampa Electric Company from EPA Method 5 testing for particulate emissions so long as opacity does not exceed 10 percent. The reasons for this request are set forth below.

Tampa Electric Company acquired the subject Phillips Power Station from the former operator, Sebring Utilities Commission ("Sebring") in March of 1991. The station has two 19 Megawatt Diesel Units constructed in September 1983, is located in Highlands County, and is permitted through the Department's South District. Proposed amended permit, No. AO28-234787, addresses the facility's Diesel Unit No. 1 and was issued by the Department on November 15, 1993. Tampa Electric Company has filed a timely request for Extension of Time, requesting additional time until February 16, 1994, in which to petition for an administrative hearing on Amended Permit No. AO28-234787. This request was filed to allow the Department to consider this letter's request.

During the current Permit renewal for Diesel Unit No. 1, the above referenced January 5, 1987, Consent Order became an issue. That Consent Order was entered into between the Department and the former operator, Sebring. A copy of the Consent Order is attached. Paragraph 7 of the Consent Order voids an exemption from annual particulate emission testing that had previously been granted in the air permit (Permit No. AO28-71313) as Specific Condition 7. That condition, a copy of which is attached, stated visible emissions shall not exceed 20 percent, and that a Method Five test for particulates is required if opacity exceeds 10 percent. This exemption is allowed in Florida Administrative Code 17-296.330.

According to our knowledge, the visible emissions in 1986, which are referred to in the Consent Order, were the result of maintenance and operating practices by the former operator, and have since been corrected. Diesel Unit No. 1 was overhauled in 1987, and the resultant particulate testing (enclosed), which was conducted on December 15, 1987, shows emissions well below the 0.1 lbs/mmbtu limit. It is important to note that the existing permit, issued in September of 1988, and after the problem was corrected, re-authorized the exemption. All annual compliance tests since the existing permit was issued have been below the greater than 10 percent opacity limit.

It is Tampa Electric's position that it is entirely appropriate for the proposed amended permit to be issued which continues to exempt the company from particulate testing if visible emissions are 10 percent or less.

It is noted that Phillips Station Diesel Unit No. 2, which was also the subject of the Consent Order, continues to be in compliance, and does have the Method 5 exemption in its current amended permit (enclosed) as Specific Condition 6 (AO28-234794, issued November 15, 1993, amended January 18, 1994).

Accomplishing this test requires personnel and equipment setup that is an unnecessary expense to Tampa Electric Company and its customers when alternate means are available.

Tampa Electric Company is an established, reputable company in Florida with quality personnel and operating procedures for dealing with environmental concerns.

For all the above reasons, Tampa Electric believes it would be inappropriate for the Department to now revoke the exemption for testing for particulate emissions that has existed in the present permit for the past five years. Consequently, Tampa Electric Company requests that the Department issue Amended Permit No. AO28-234787 so as to exempt the particulate testing requirement so long as opacity does not exceed 10 percent.

Mr Arthur E. Lyall in your South District office is the permitting engineer for this permit.

If you have any questions regarding this matter please feel free to call me or Mr. Ralph Mitchell at (813) 228-4839.

Sincerely,

Robert Mitchell

for Patrick A. Ho, P.E.
Manager
Environmental Planning

MM119R

Attachments:
Consent Order, Case No. 86-1532
Existing Permit, A028-154204
Amended Proposed Permit A028-234787
Particulate Test, 12/15/87
Annual VE Compliance Tests 1988, 1989, 1990, 1991, 1992, and 1993
Diesel 2 Amended Permit A028-234794

cc: Arthur E. Lyall, FDEP

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET
ATLANTA, GEORGIA 30365

OCT 9 1984

DER
OCT 25 1984
BAQM

REF: 4RC

Stephen Smallwood, P.E.
Chief, Bureau of Air Quality Management
Florida Department of Environmental Regulations
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301-8241

Re: Certification of Pollution Control Facility

Applicant: Tampa Electric Company

Address: P. O. Box 111
Tampa, Florida 33601

Dear Sir:

Enclosed is a copy of the Notice of Federal Certification of Pollution Control Facility pursuant to Section 169 of the Internal Revenue Code of 1954, as amended, which I have today forwarded to the Internal Revenue Service.

Sincerely yours,

for James H. Sargent
Regional Counsel

Enclosure

12/5
Patty-
for our power plant siting file.
Also, send a copy to Buck

Form Approved
OMB No. 158–R0013

U.S. ENVIRONMENTAL PROTECTION AGENCY

NOTICE OF FEDERAL CERTIFICATION

(Pursuant to Section 169 of the Internal Revenue Code of 1954, as amended)

PLEASE TAKE NOTICE that pursuant to section 169 of the Internal Revenue Code of 1954, as amended, and Part 20 of Title 40 of the Code of Federal Regulations, the control facility identified herein

[X] Is certified

[ ] Will, if constructed, reconstructed, acquired, erected, installed and operated in accordance with the accompanying application, be certified

as being in compliance with the applicable regulations of Federal agencies and the general policies of the United States for cooperation with the States in the prevention and abatement of [ ] water pollution [X] air pollution under the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq.) or the Clean Air Act, as amended (42 U.S.C. 1857 et seq.). This certification is based on facts furnished by the applicant, and is valid for purposes of section 169 only to the extent that such facts are complete and accurate.

1. NAME OF APPLICANT Tampa Electric Company 2. EMPLOYER IDENTIFICATION NUMBER 59-0475140	ADDRESS *(Street, City, State, Zip Code)* P. O. Box 111 Tampa, FL 33601
3. PERSON AUTHORIZED TO RECEIVE CERTIFICATION:	
NAME A. Spencer Autry TITLE Manager, Environmental Planning	ADDRESS *(Street, City, State, Zip Code)* P. O. Box 111 Tampa, FL 33601

4. DESCRIPTION OF CONTROL FACILITY

The facility consists of an electrostatic precipitator and the adjacent flyash collection equipment (hoppers, piping, silo, etc.) used for the collection of flyash from the coal fired, Gannon Station Unit No. 4 electric generating station.

5. LOCATION OF CONTROL FACILITY *(Street, City, State, Zip Code)*

F. J. Gannon Station, Port Sutton Road, Tampa, FL 33619

6. EFFLUENT DISCHARGED TO

Inapplicable

7. THE CONTROL FACILITY IDENTIFIED HEREIN [ ] DOES [X] DOES NOT GENERATE PROFITS THROUGH THE RECOVERY AND SALES OF WASTES, OR OTHERWISE.

8. THE CONTROL FACILITY IDENTIFIED HEREIN [X] IS [ ] IS NOT A BUILDING THE ONLY FUNCTION OF WHICH IS THE ABATEMENT OR CONTROL OF POLLUTION, AS DETERMINED IN ACCORDANCE WITH SECTION 1.169-2 (2) (i) OF THE INCOME TAX REGULATIONS.

9.
[X] A. THE CONTROL FACILITY IDENTIFIED HEREIN IS USED ONLY IN CONNECTION WITH PLANTS OR PROPERTIES THAT WERE IN SERVICE ON OR BEFORE DECEMBER 31, 1975

[ ] B. _____% OF THE AMORTIZABLE BASIS OF THE FACILITY IS ALLOCABLE TO ITS USE IN CONNECTION WITH PLANTS OR PROPERTIES THAT WERE IN SERVICE ON OR BEFORE DECEMBER 31, 1975.

10.
[X] A. THE CONTROL FACILITY PERFORMS NO FUNCTION IN ADDITION TO THE ABATEMENT OR CONTROL OF POLLUTION.

[ ] B. _____ % OF THE AMORTIZABLE BASIS OF THE CONTROL FACILITY IS ALLOCABLE TO THE ABATEMENT OR CONTROL OF POLLUTION.

ISSUED THIS 9th DAY OF October , 19 84	SIGNATURE [signature]
STATE CERTIFICATION NUMBER 84-002	TITLE for JAMES H. SARGENT REGIONAL COUNSEL

EPA Form 3300–3 (8–77)

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

INTEROFFICE MEMORANDUM

For Routing To District Offices And/Or To Other Than The Addressee	
To: Bob K	Loctn.:
To:	Loctn.:
To:	Loctn.:
From:	Date:
Reply Optional [ ] Reply Required [ ]	Info. Only [ ]
Date Due:	Date Due:

TO: Buck Oven

THRU: Clair Fancy

FROM: Tom Rogers/Bob King JR

DATE: March 10, 1982

SUBJ: Comments on TECO MacInnes Plan of Study (POS)

The following comments concerning the TECO MacInnes POS are listed under the POS title and section.

Section	Air Quality Plan of Study
2.1	o All major facilities within 50 kilometers of the proposed site should be included in the emissions inventory. The inventory should include emission rates suitable for determination of baseline concentrations and increment consumption. (See rule 17-2.500(4)(b)2., F.A.C.)
2.2	o Preconstruction air quality analysis may be necessary for several other emitted pollutants, namely nitrogen dioxide, lead, beryllium and flourides. (See explanation in PSD Air Monitoring Plan of Study comments).
	o If possible, include an analysis of the diurnal wind pattern associated with the land/sea breeze.
	o Table 2-4 does not reflect the recently adopted changes to Rule 17-2.300(3), F.A.C., regarding the ambient air quality standards for lead and ozone. The State's standards are the same as the federal standards.
	o The use of block averaging over small averaging periods (e.g. 3-hour) in the modeling analysis is the guideline method. The guideline is currently under review with the use of moving averages being considered.

- o A finer grid resolution for the annual modeling (1.0 km. is proposed) may be necessary if any ambient air quality standards or PSD increments are shown to be threatened at the coarser resolution.

- o Emissions from inventoried facilities should reflect maximum actual rates associated with the averaging time to be calculated.

- o The calculation of increment consumption should include impacts from the proposed facility along with any other increment consuming facilities in the area.

- o The baseline date for this area for both SO_2 and PM is December 27, 1977.

Section	PSD Ambient Air Monitoring Plan of Study
1.0	o The plan of study is developed for a facility with a gross capacity of 2,800 MW (two 500 MW units and two 900 MW units), while you state that the ultimate gross capacity may be 3,200 MW. Please clarify.
2.0	o Florida DER does require the collection of ambient air monitoring data as a preconstruction review requirement. (See rule 17-2.500(5)(f), F.A.C.).
	o Table 2-1 is based on the total plant capacity of 2,800 MW. Table 2-2, showing de minimus impacts for the purpose of monitoring exemption, is calculated for a capacity of 1,400 MW. Actual modeled impacts should be approximately double the figures shown to be comparable to a 2,800 MW capacity. The predicted maximum impacts would be even larger at the 3,200 MW level. Consequently, preconstruction air quality analysis may be necessary for lead, total fluorides, and possibly beryllium. In addition, the de minimus impact level for NO_2 in the FDER regulations is 14 ug/m^3 over a 24-hour averaging period (See Table 500-3, F.A.C.). FDER will be proposing to change the averaging period to an annual average in the future, however at this time, based on your calculations, monitoring would be required for NO_2 also.

Section	PSD Ambient Air Monitoring Plan of Study
4.0	o Monitoring data should be collected over the 12 month period prior to application submittal.
	o Figure 4-1 is missing.

In general, the plan of study for air quality analysis is thorough and sound. It is evident, however, that air quality may be a limiting factor in this application. Monitoring data on site are presently showing elevated ambient levels of SO_2 and PM attributable to other sources in the area. In addition, preliminary modeling completed by the applicant shows that over three-fourths of the PSD increment for SO_2 is consumed by the proposed plant itself at only a 1,400 MW capacity.

CF/TR/BK/bjm

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

INTEROFFICE MEMORANDUM

For Routing To District Offices And/Or To Other Than The Addressee		
To:	Loctn.:	
To:	Loctn.:	
To:	Loctn.:	
From:	Date:	
Reply Optional [ ]	Reply Required [ ]	Info. Only [ ]
Date Due:	Date Due:	

To: Power Plant Siting Review Committee

From: Hamilton S. Oven, Jr. HSO

Date: February 12, 1982

SUBJECT: TECO MacInnes Power Plant Site

Tampa Electric Company will be bringing in a Plan of Study for their MacInnes site, coal-fired power plant on Friday February 19, 1982 at 10:00 a.m., Conference Room A, 4th Floor.

HSOjr:my

March 10 : Comments on Plan of Study

DER
FEB 15 1982
BAQM

DEPARTMENT OF ENVIRONMENTAL REGULATION

ROUTING AND TRANSMITTAL SLIP

ACTION NO.	
ACTION DUE DATE	

TO: (NAME, OFFICE, LOCATION)	INITIAL / DATE
1. ~~Bill Thomas,~~ Suite 601	INITIAL DATE 2/12/82
2. Bob King & Tom	INITIAL DATE
3.	INITIAL DATE
4.	INITIAL DATE

REMARKS:

DER
FEB 15 1982
BAQM

INFORMATION
- REVIEW & RETURN
- REVIEW & FILE
- INITIAL & FORWARD

DISPOSITION
- REVIEW & RESPOND
- PREPARE RESPONSE
- FOR MY SIGNATURE
- FOR YOUR SIGNATURE
- LET'S DISCUSS
- SET UP MEETING
- INVESTIGATE & REPT
- INITIAL & FORWARD
- DISTRIBUTE
- CONCURRENCE
- FOR PROCESSING
- INITIAL & RETURN

FROM: Buck Oven

DATE 2/12/82

PHONE

TAMPA ELECTRIC
A TECO ENERGY COMPANY

00005

AIR QUALITY
PLAN OF STUDY

W.C. MacInnes Station
Tampa Electric Company

Submitted by:

TAMPA ELECTRIC COMPANY
Tampa, Florida

FEBRUARY 1982

AIR QUALITY

PLAN OF STUDY

W.C. MacINNES STATION

TAMPA ELECTRIC COMPANY

Submitted by:

TAMPA ELECTRIC COMPANY
Tampa, Florida

FEBRUARY, 1982

TABLE OF CONTENTS

Section		Page
1.0	INTRODUCTION	1-1
2.0	SCOPE OF WORK	2-1
	2.1 LITERATURE SEARCH/DATA COMPILATION	2-1
	2.2 MONITORING DATA EVALUATION	2-3
	2.2.1 Requirements	2-3
	2.2.2 Ambient Monitoring Program	2-5
	2.2.2.1 Existing Meteorological and Air Quality Data--	2-5
	2.2.2.2 Preconstruction Monitoring--	2-5
	2.2.3 Use of Results	2-6
	2.3 CLIMATOLOGICAL/METEOROLOGICAL ASSESSMENT	2-6
	2.3.1 Analysis of Existing Data	2-6
	2.3.2 Analysis of Preconstruction Monitoring Program Results	2-7
	2.3.3 Use of Results	2-7
	2.4 CONTROL TECHNOLOGY REVIEW	2-8
	2.4.1 Requirements	2-8
	2.4.2 Analysis	2-8
	2.4.3 Use of Results	2-11
	2.5 IMPACT ANALYSIS	2-12
	2.5.1 Requirements	2-12
	2.5.2 Analysis of Impacts--PSD/AAQS	2-16
	2.5.2.1 Emission Inventories--	2-16
	2.5.2.2 Dispersion Modeling--	2-16
	2.5.3 Additional Impact Analysis	2-20
	2.5.3.1 Fogging Potential Modeling--	2-20
	2.5.3.2 Soils, Vegetation, and Visibility--	2-21
	2.5.3.3 Construction Impacts--	2-21

TABLE OF CONTENTS
(Continued, Page 2 of 2)

Section			Page
	2.5.3.4	Salt Drift and Particulate Deposition Analysis--	2-21
	2.5.3.5	Fugitive Dust Analysis--	2-21
	2.5.3.6	Stack Height Optimization--	2-22
	2.5.3.7	Alternative Site Evaluation--	2-22
2.5.4	Use of Results		2-23

LIST OF TABLES

Table		Page
2-1	Significance Levels for Air Quality Impacts	2-2
2-2	Federal NSPS for Electric Utility Steam Generating Units Firing Bituminous Coal	2-9
2-3	National AAQS	2-13
2-4	State of Florida AAQS	2-14
2-5	PSD Allowable Increments	2-15

LIST OF FIGURES

Figure		Page
1-1	W.C. MacInnes Site	1-2

1.0 INTRODUCTION

Tampa Electric Company is planning the construction of a coal-fired electric generating facility comprised of four generating units. The facility, named the W.C. MacInnes Station, will be located in southwestern Hillsborough County, along the Hillsborough-Manatee County line (Figure 1-1).

Prior to initiation of construction of the new plant, government approvals, including permits related to air quality impacts resulting from the facility, must be obtained. This document presents an Air Quality Plan of Study (POS), which is designed to provide information necessary to satisfy all government review requirements related to air quality laws and regulations.

All major new sources of air pollutants regulated under the Clean Air Act must be approved by the United States Environmental Protection Agency (EPA) under federal Prevention of Significant Deterioration (PSD) review requirements. This review is used to determine whether significant air quality deterioration will result from the new source. The POS addresses PSD requirements contained in 40 CFR 52.21 (August 7, 1980).

Major sources are required to undergo the following reviews related to PSD: 1) control technology review; 2) air quality analysis; 3) source impact analysis; 4) source information; and 5) additional impact analyses. The control technology review includes determination of Best Available Control Technology (BACT) for each applicable pollutant, as well as compliance with emission standards and standards of performance [i.e., New Source Performance Standards (NSPS)] under 40 CFR 60. The source impact analysis requires demonstration of compliance with federal and state Ambient Air Quality Standards (AAQS) and PSD allowable air quality increments. The air quality analysis requires the collection of continuous ambient monitoring data for applicable pollutants prior to permit application submittal. The additional impact analysis includes the assessment of impacts upon soils, vegetation, and visibility, as

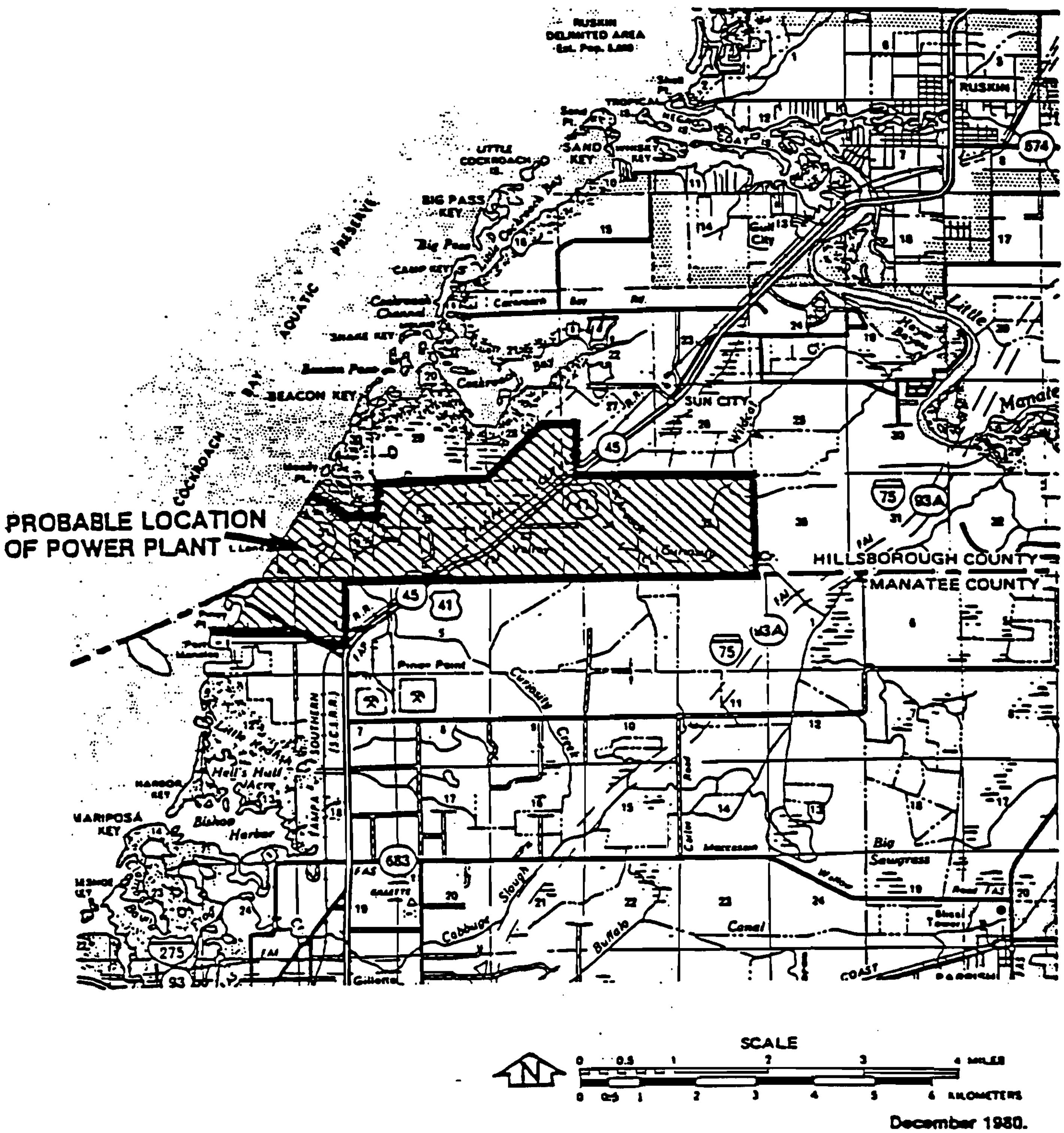


Figure 1-1
W.C. MacINNES SITE

Tampa Electric Company
AIR PLAN OF STUDY
W.C. MacInnes Site

well as those due to commercial and residential growth in the area resulting from the proposed source.

? In early 1980, the Florida Department of Environmental Regulation (DER) received administrative and technical review authority from EPA for the federal PSD new source review program. Federal PSD applications are submitted to Florida DER, which conducts the technical review and prepares the PSD preliminary determination. EPA may then comment on the preliminary determination during the required 30-day public comment period, but must review and sign the final determination and federal PSD permit.

In addition to review under Clean Air Act requirements, the planned generating facility will also be subject to comprehensive reviews under the National Environmental Policy Act (NEPA) and Florida Electrical Power Plant Siting Act (EPPSA). Both of these laws require environmental impact analysis, including consideration of air-related effects. Application requirements under the Florida EPPSA are contained in Florida DER Form 17-1.122(72). State of Florida air quality regulations, including state PSD regulations, are contained in Chapter 17-2, Florida Administrative Code (FAC).

The air quality POS is designed to adequately address all federal, state, and local air quality standards and regulations, and other air quality related issues. Specifically, the scope of work addresses the following, where applicable:

1. Federal Prevention of Significant Deterioration regulations (40 CFR 52.21).
2. National Environmental Policy Act and Federal Environmental Information Document guidelines (Environmental Impact Assessment Guidelines for New Source Fossil Fueled Steam Electric Generating Stations, EPA-130/6-79-001, July 1979).
3. State of Florida Air Quality regulations (Chapter 17-2, Florida Administrative Code).

4. State of Florida Power Plant Siting Act/Application for Certification of Proposed Electrical Power Generating Plant Site (Chapter 17-17, Florida Administrative Code; Florida DER Form 17-1.122(72).

The results of this work effort will be incorporated into appropriate sections of the Site Certification Application/Environmental Information Document (SCA/EID).

2.0 SCOPE OF WORK

2.1 LITERATURE SEARCH/DATA COMPILATION

Climatological data representative of the W.C. MacInnes site will be collected and summarized. Available data characterizing both regional and local climatology and on-site dispersion meteorology will be gathered, including: temperature, precipitation, wind speed, wind direction, dew point, relative humidity, mixing heights, severe storm, inversions, stagnation, and stability data. Available information concerning land/sea breeze effects and unique dispersion meteorology will also be obtained. Sources of data will include:

1. National Climatic Center, National Oceanic and Atmospheric Administration;
2. Climatic Atlases and other weather publications;
3. Tampa Electric Company (on-site data); and
4. Other public documents specific to region or site.

All applicable federal, state, and local air quality regulations as they relate to power plant construction and operation will be identified and documented. Available air quality data representative of the site will be collected. Existing literature, including state, federal, and local data banks, will be reviewed for those pollutants emitted due to power plant construction and operation. Data gathered at the Tampa Electric Company W.C. MacInnes monitoring sites will also be included. Information concerning data quality and validity will also be gathered.

An air pollutant emission inventory will be developed for pollutants emitted in major quantities due to power plant operation. This inventory will include emission rates, stack parameters, and location for all existing sources and permitted but not yet operating sources located within the area of influence of the W.C. MacInnes Station. A list of all increment consuming sources will also be developed. The "area of influence" is defined as the distance to which source impacts fall below the air quality significance levels (Table 2-1).

Table 2-1. Significance Levels for Air Quality Impacts

Pollutant	Annual (ug/m^3)	24-Hour (ug/m^3)	8-Hour (mg/m^3)	3-Hour (ug/m^3)	1-Hour (mg/m^3)
Sulfur Dioxide	1	5	—	25	—
Total Suspended Particulates	1	5	—	—	—
Nitrogen Dioxide	1	—	—	—	—
Carbon Monoxide	—	—	0.5	—	2

Source: Federal Register, June 19, 1978.

Sources of data will include:

1. Florida DER Air Pollution Inventory System (APIS) forms,
2. National Emissions Data System (NEDS) forms,
3. Florida DER Air Quality Data summaries,
4. Local agency annual air quality reports,
5. Environmental Impact Statements (EISs), and
6. PSD applications submitted for area of interest.

Other pertinent documents related to the air quality or meteorology of the site will be obtained and reviewed. Sources could include Development of Regional Impact (DRI) applications, regional planning council reports, port development authority reports, meteorological publications, and air quality impact studies.

2.2 MONITORING DATA EVALUATION

2.2.1 Requirements

The 1977 Amendments to the Clean Air Act have been interpreted to suggest that ambient air monitoring for a period of up to 1 year generally is appropriate to complete the PSD requirements of the act.

This monitoring requirement is derived from Sections 165 (a)(7) and 165 (e)(2) which state:

> Section 165 (a)(7):
>
> ...the person who owns or operates, or proposes to own or operate, a major emitting facility for which a permit is required under this part agrees to conduct such monitoring as may be necessary to determine the effect which emissions from any such facility may have, or is having, on air quality in any area which may be affected by emissions from such source;...
>
> Section 165 (e)(2):
>
> Effective one year after date of enactment of this part, the analysis required by this subsection shall include continuous air quality monitoring data gathered for purposes of determining

whether emissions from such facility will exceed the maximum allowable increases or the maximum allowable concentration permitted under this part. Such data shall be gathered over a period of one calendar year preceding the date of application for a permit under this part unless the State, in accordance with regulations promulgated by the Administrator, determines that a complete and adequate analysis for such purposes may be accomplished in a shorter period. The results of such analysis shall be available at the time of the public hearing on the application for such permit.

On August 8, 1980, EPA promulgated revised regulations (40 CFR 52.21) which, to a great degree, clarify the use of and rationale for preconstruction monitoring, as well as the relative amount of monitoring required prior to submission of a PSD permit application. Although it was the intent of Congress to include monitoring requirements [Section 165 (e)(2)] as a means of checking the accuracy of dispersion models, increment consumption cannot be based on monitoring data. First, the year-to-year variability of air quality data is a limiting factor in using the data for comparison with future years. Second, increment consumption is generally based upon allowable emissions.

Ambient air quality monitoring is, however, important in assessing compliance with AAQS. For this reason, Congress [Section 165 (a)(7)] and EPA [40 CRF 52.21(m)(ii)] promulgated requirements for air monitoring as necessary to evaluate compliance with AAQS. To give guidance in this area, EPA promulgated "Ambient Monitoring Guidelines for Prevention of Significant Deterioration" (EPA-450/4-80-012, November 1980). Information on the need, type, and procedures for preconstruction PSD air quality monitoring is discussed in this guideline. The guideline document indicates that for power plants, from 4 months to 1 year of air monitoring at one to four sites is required.

2.2.2 Ambient Monitoring Program

2.2.2.1 Existing Meteorological and Air Quality Data— Existing meteorological data will be used for dispersion modeling and impact assessment. Surface wind speed and wind direction data will be used from the Tampa International Airport for the period 1970 to 1974. Coincident upper air data from Tampa International Airport will be used to determine mixing heights for the same time period.

Existing ambient air quality data are collected by the Hillsborough County Environmental Protection Commission (HCEPC) and the Manatee County Health Department (MCHD) at locations throughout the two counties to develop a historical data base and to test for compliance with AAQS. Data collected at these stations, in conjunction with the requisite preconstruction monitoring data, will be evaluated for validity and summarized to assess the existing ambient air quality levels in the vicinity of the proposed plant location. Collected ambient air quality data will be used to develop appropriate background air quality concentrations for criteria pollutants for the W.C. MacInnes site, according to recommended EPA/Florida DER methodology and procedures suggested in the Guideline on Air Quality Models (EPA/450-2-78-027, April 1978). These background concentrations will account for any concentrations attributable to sources of pollution not included in the point source emission inventory (i.e., area sources and far-away sources), and will be added to the point source impacts to predict total air quality levels.

2.2.2.2 Preconstruction Monitoring--An ambient monitoring POS document for the W.C. MacInnes site has been prepared and presents the applicability of the proposed W.C. MacInnes Station to ambient monitoring requirements, the rationale for monitoring, sampling program description, and descriptions of the monitoring equipment and procedures to be used. It is anticipated at this time that monitoring will be conducted for sulfur dioxide (SO_2) and total suspended particulate matter (TSP).

An on-site meteorological monitoring program will also be conducted. This program will include monitoring for wind speed and wind direction (two heights), barometric pressure, rainfall, dew point, ambient temperature, and solar radiation.

All data will be evaluated and incorporated into the various analysis and SCA/EID sections, as appropriate. Results of the preconstruction monitoring program will also be used in the determination of appropriate background air quality concentrations, as described in Section 2.2.2.1. Any instances of unusually high measured concentrations will be identified and investigated further. Possible contributing sources, emission conditions, and meteorological conditions causing unique dispersion phenomena will be identified and evaluated in regards to frequency of occurrence, magnitude, and predictability.

2.2.3 Use of Results

The information collected and results of this section will be incorporated into Sections 2.6, 2.7, and 6.2 of the SCA/EID document. This will meet the requirements of:

1. The Application for Site Certification [DER Form 17-1.122(72)] for Sections 2.6, 2.8 and 6.2,
2. The "Guidelines for the Preparation of an Environmental Impact Assessment Report for New Source Fossil-Fueled Steam Electric Generating Stations" for Section II.E.1,
3. 40 CFR 52.21(m) Air Quality Analysis, and
4. Chapter 17-2.500(5)(f) Preconstruction Air Quality Monitoring and Analysis.

2.3 CLIMATOLOGICAL/METEOROLOGICAL ASSESSMENT

2.3.1 Analysis of Existing Data

The collected meteorological/climatological data will be used to prepare a complete regional and local climatological assessment of the MacInnes site. The following parameters will be presented:

1. Monthly and annual means and extremes of temperature, precipitation, wind speed, wind direction, dew point, and relative humidity;
2. Annual and seasonal wind roses;
3. Morning and afternoon mixing height data;
4. Frequency of fog occurrence;
5. Severe storm occurrence;
6. Frequency of occurrence of atmospheric stability categories; and
7. Occurrence of atmospheric inversion and stagnation conditions.

2.3.2 Analysis of Preconstruction Monitoring Program Results

The representativeness of the existing Tampa International Airport 5-year meteorological data base and the available on-site meteorological data base will be assessed for use in the atmospheric dispersion models. These models will be used in the impact analysis to predict proposed plant impacts. Frequencies of occurrence of wind direction, wind speed, and atmospheric stability will be developed for comparison. Any unique dispersion conditions which occurred will be identified and evaluated, and any periods of unusually high pollutant concentrations will be analyzed to determine potential sources. Results will be incorporated into Section 2.6 of the SCA/EID and used in Section 5.5 to predict air quality impacts.

2.3.3 Use of Results

The results of the Climatological/Meteorological Assessment will be incorporated into Section 2.6 of the SCA/EID document and used in Sections 5.5 and 5.7 to predict maximum air quality impacts. This will meet the requirements of:

1. The Application for Site Certification for Sections 2.6, 5.5, and 5.7; and
2. The "Guidelines for the Preparation of an Environmental Impact Assessment Report for New Source Fossil-Fueled Steam Electric Generating Stations" for Sections II.E.1, II.D, and II.B;

and serve as input to fulfill the requirements of:

1. 40 CFR 52.21(k) Source Impact Analysis and 40 CFR 52.21(o) Additional Impact Analysis, and
2. Chapter 17-2.500(d) Ambient Impact Analysis and Chapter 17-2.500(e) Additional Impact Analysis.

2.4 CONTROL TECHNOLOGY REVIEW

2.4.1 Requirements

BACT determination is required for all new major sources by both EPA and Florida DER pursuant to PSD regulations [CFR, Title 40, Part 52, Section 52.21(j) and Chapter 17-2.500(c)]. Florida DER requires that the source owner or representative for each different point emission source prepare a form [Florida DER Form 1.122(16)] and evaluate the environmental, energy, and economic impacts of selected and alternative control techniques. Florida DER also forms a BACT review committee to evaluate all available data and recommend BACT emission limits. A determination of Lowest Achievable Emission Rate (LAER) may also be required for sources located in a designated nonattainment area.

The BACT analysis must include information on aspects of air emissions from the proposed plant, including emission rates, control systems, process equipment, and methods. BACT emission limits can in no case exceed applicable federal NSPS (see Table 2-2). Design information, if available, should be submitted. Source information should include such items as location, stack parameters used in modeling, and other information considered important. "Guidelines for Determining Best Available Control Technology (BACT)," (EPA, December 1978), the "PSD Workshop Manual" (EPA, October 1980), and memorandums issued by EPA (Barber, 1978) will be used in preparation of the BACT analysis.

2.4.2 Analysis

The selection of fuel quality and type and air pollution control equipment efficiency can affect the following areas:

1. Compliance with the NSPS emission standards,

Table 2-2. Federal NSPS for Electric Utility Steam Generating Units Firing Bituminous Coal

Pollutant	Emission Limitation	Percentage Reduction Requirements
SO_2	1.2 lb/MM Btu (520 ng/J*)	90% (30-day rolling average) required if emissions are between 0.6 and 1.2 lb/MM Btu; 70% (30-day rolling average) required if emissions are less than 0.6 lb/MM Btu
PM	0.03 lb/MM Btu (13 ng/J*) Opacity limited to 20% (6-minute average); 27% allowed 6 min/hr**	99%†
NO_x	0.6 lb/MM Btu (260 ng/J*)	65%†

* Nanograms per joule.
† Satisfied automatically if emission limitation is met.
** A source-specific opacity standard may be established if opacity is greater than 20 percent when complying with the PM limitation.

Source: 40 CFR, Part 60, Subpart Da.

2. Compliance with AAQS,
3. Compliance with PSD increments, and
4. Impacts upon designated nonattainment areas.

Consequently, the environmental team and the architect/engineer (A/E) must interface before the final selection of fuel and air pollution control equipment is made. The State of Florida has adopted EPA NSPS (Table 2-2). The A/E will receive these values for incorporation in the design criteria.

Dispersion modeling with the anticipated emission rates and stack parameters will determine the projected concentration impacts to be compared with the AAQS. Modeling will also reveal whether or not the PSD increments for SO_2 and particulate matter will be exceeded. Any cases of exceeding or nearing the pollutant standards will be evaluated for possible redesign consideration.

The air quality control systems employed at the proposed plant will be described and evaluated, and all sources of pollutant emissions including fugitive emission sources will be identified and quantified. Both the main boiler control systems and control systems for associated facilities (i.e., coal handling system, limestone handling system, fly ash system, etc.) will be described. The following items will be presented:

1. Boiler design parameters (Btu heat input, exhaust flow rate, gas temperature, etc.);
2. Fuel specifications (consumption and quality);
3. Applicable emission limits;
4. Discussion and justification of BACT control systems selected according to EPA/Florida DER requirements, considering energy, environmental, and economic impacts;

5. Emission point stack gas exit parameters, emission rates, and location;
6. Control system design specifications for all control systems (generic information if detailed design data are not available), including basics of operation, efficiency, operating and maintenance costs, waste generation, and energy consumption; and
7. LAER determination and justification for volatile organic compound (VOC) emissions (W.C. MacInnes site is located in ozone nonattainment area; therefore, VOC emissions require LAER control).

The proposed project will be a phased construction project, with several years between phases (units). For such projects, EPA and Florida DER regulations require that BACT be reviewed prior to each phase commencing construction. Therefore, control system design specifications will only be developed for the first phase. Emission parameters for subsequent phases will be based upon NSPS and/or worst-case emissions anticipated.

2.4.3 Use of Results

The information developed for this activity will be incorporated into Sections 3.7 and 9.4 of the SCA/EID. This will meet the requirements of:

1. The Application for Site Certification [Florida DER Form 17-1.122(72)] for Sections 3.7 and 9.4;
2. The "Guidelines for the Preparation of an Environmental Impact Assessment Report for New Source Fossil-Fueled Steam Electric Generating Stations" for Sections II.C.3, III.A.7, III.C, and V.C.2(j);
3. 40 CFR 52.21(n) Source Information and 40 CFR 52.21(j) Control Technology Review; and
4. Chapter 17-2.500(5)(b) Technology Review, Chapter 17-2.500(5)(c) Best Available Control Technology, Chapter 17-2.500(5)(h) Permit Application Information Required, Chapter 17-2.630 Best

Available Control Technology, and Chapter 17-2.640 Lowest Achievable Emission Rate.

2.5 IMPACT ANALYSIS

2.5.1 Requirements

An atmospheric dispersion modeling analysis of the proposed coal-fired facility's impact on ambient air quality levels is required under federal PSD regulations [CFR, Title 40, Part 52, Section 52.21 (k) and (o)] and State of Florida PSD regulations [FAC, Chapter 17-2.500(5)(d) and (e)]. The air quality impact analysis must demonstrate that the proposed source will not cause or contribute to a violation of either the maximum allowable PSD increments or AAQS. Tables 2-3 and 2-4 present federal and state AAQS, respectively. Table 2-5 presents PSD increments.

PSD regulations specifically allow or require the use of atmospheric dispersion models [40 CFR Part 52.21 (1)] in performing the air quality impact analysis. Approved EPA dispersion models should be used. Modified dispersion models can be used for air quality impact analysis, provided EPA has given prior consultation. Guidance for the use and application of dispersion models related to impact analysis is presented in "Guideline on Air Quality Models" (EPA, EPA-450/2-78-027, 1978).

To determine PSD increment consumption, the PSD baseline air quality concentration level must be determined. Florida DER and EPA define baseline concentration as

> "that ambient concentration level which exists in the baseline area at the time of the applicable baseline date. A baseline concentration is determined for each pollutant for which a baseline date is established and shall include: (a) The actual emissions representative of sources in existence on the applicable baseline date, except as provided in paragraph (b)(13)(ii); (b) The allowable emissions of major stationary sources which commenced construction before January 6, 1975, but were not in operation by the applicable baseline date. (ii) The following will not be included in the baseline

Table 2-3. National AAQS (ug/m^3)

Pollutant	Averaging Time	Primary Standard	Secondary Standard
Suspended Particulate Matter	Annual Geometric Mean	75	60
	24-Hour Maximum	260*	150*
Sulfur Dioxide	Annual Arithmetic Mean	80	N/A
	24-Hour Maximum	365*	N/A
	3-Hour Maximum	N/A	1,300*
Carbon Monoxide	8-Hour Maximum	10,000*	10,000*
	1-Hour Maximum	40,000*	40,000*
Hydrocarbons	3-Hour Maximum (6 to 9 A.M.)	160*	160*
Nitrogen Dioxide	Annual Arithmetic Mean	100	100
Ozone	1-Hour Maximum	235*	235*
Lead	Calendar Quarter	1.5	1.5

* Maximum concentration not to be exceeded more than once per year.

Sources: Code of Federal Regulations, Title 40, Part 50.

Table 2-4. State of Florida AAQS (ug/m^3)

Pollutant	Averaging Time	Standard
Suspended Particulate Matter	Annual Geometric Mean	60
	24-Hour Maximum	150*
Sulfur Dioxide	Annual Arithmetic Mean	60
	24-Hour Maximum	260*
	3-Hour Maximum	1,300*
Carbon Monoxide	8-Hour Maximum	10,000*
	1-Hour Maximum	40,000*
Hydrocarbons	3-Hour Maximum (6 to 9 A.M.)	160*
Nitrogen Dioxide	Annual Arithmetic Mean	100
Photochemical Oxidants	1-Hour Maximum	160*

* Maximum concentration not to be exceeded more than once per year.

Source: FAC, Chapter 17-2.

Table 2-5. PSD Allowable Increments (ug/m³)

Pollutant/Averaging Time	Class I	Class II	Class III
Particulate Matter			
Annual Geometric Mean	5	19	37
24-Hour Maximum*	10	37	75
Sulfur Dioxide			
Annual Arithmetic Mean	2	20	40
24-Hour Maximum*	5	91	182
3-Hour Maximum*	25	512	700

* Increment can be exceeded once per year.

Sources: Federal Register, Vol. 43, No. 118, June 19, 1978.
FAC, Chapter 17-2.

concentration and will affect the applicable maximum allowable increase(s): (a) Actual emissions from any major stationary source on which construction commenced after January 6, 1975; and (b) Actual emissions increases and decreases at any stationary source occurring after the baseline date."

In addition to air quality impact analyses, federal PSD regulations [40 CFR Part 52.21(o)] require additional impact analyses of the impairment to visibility, soils, and vegetation that would occur as a result of the source and general commercial, residential, industrial, and other growth associated with the source.

2.5.2 Analysis of Impacts--PSD/AAQS

2.5.2.1 Emission Inventories--The emission inventory information developed during the literature search phase will be used in the impact analysis, along with plant design information. This information will be used in different stages of the dispersion modeling impact analysis and will be updated periodically throughout the course of the project. Both a PSD baseline and future sources emission inventory will be developed.

2.5.2.2 Dispersion Modeling--Dispersion modeling will be used in a number of applications, including:

1. Estimating PSD baseline concentrations,
2. Determination of future air quality levels,
3. PSD increment evaluation, and
4. Comparison with AAQS.

Approved EPA models or modifications to the approved models will be used. Guidance for the use and application of dispersion models is presented in the EPA publication "Guidelines on Air Quality Models" (EPA, 1978). This guideline will be closely followed in this study where applicable. Any exceptions to the suggested models or methodologies will be documented. Additional guidance is provided in the "PSD Workshop Manual" (EPA, 1980).

Two recognized techniques for estimating or predicting ground-level pollutant concentrations will be used.

1. Industrial Source Complex short-term model (ISCST), and
2. Industrial Source Complex long-term model (ISCLT).

The ISC dispersion model is a Gaussian plume model which can be used to assess the air quality impact of various sources associated with an industrial complex located in either flat or complex terrain. In addition to predicting ambient concentrations, the model can be used to calculate dry deposition resulting from significant particulate gravitational settling velocities. ISC also specifies, upon request, the meteorological period during which the maximum calculated concentrations or depositions occurred.

The ISCST model, an extended version of the Single Source (CRSTER) model, calculates impacts for each hour of meteorological input data from emission data and stack parameters. Various averaging times are available through program options (1-hour, 2-hour, 3-hour, 4-hour, 6-hour, 8-hour, 12-hour, 24-hour, annual, and an average over the total number of days per year of meteorological input data). Twenty-four-hour averages are calculated from midnight to midnight of each day; shorter-term averages are calculated for nonoverlapping, consecutive time periods. The sector-averaged ISCLT model extends and combines basic features of the Air Quality Display Model (AQDM) and the Climatological Dispersion Model (CDM).

Several options are available in the ISC models. The ISC programs accept the following source types: stack, volume, and area. The volume source option is also used to simulate line sources. The Gaussian plume equation is used to calculate ground-level concentrations for stack and volume sources. The area source equation in the ISC model programs is based on the equation for a continuous and finite crosswind Gaussian line source. The additional capability has been implemented in the short-term model to process 5 years of meteorological data with one source execution, and summarize the 5-year model results by implementing composite concentration tables for the 24-hour and 3-hour averaging times.

The generalized Briggs (1971 and 1975) plume-rise equations, including momentum terms, are used to calculate final plume rise or plume rise as a function of downwind distance. Procedures suggested by Huber and Snyder (1976) and Huber (1977) are used to evaluate the effects on plume dispersion of aerodynamic wakes and eddies formed by buildings and other structures. A wind-profile exponent law is used to adjust the observed mean wind speed from the measurement height to the emission height for the plume rise and concentration calculations.

The ISC model can be used to account for variations in terrain height over the receptor grid. The Pasquill-Gifford curves (Turner, 1970) are used to calculate horizontal (σy) and vertical (σz) plume spread. The ISC model has one rural and two urban dispersion mode options. In the rural mode, rural mixing heights and the σy and σz values for the indicated stability category are used in the calculations. In one urban mode, the stable E and F categories are redefined as neutral stability. In the other urban mode, the E and F stability categories are combined and the σy and σz values for the stability category [one step less stable than the indicated stability category (except A)] are used in the calculations. Urban mixing heights are used in both urban models.

Various output options can be selected for the ISC models. Tables of the highest and second-highest concentrations or depositions can be requested for each averaging time. A table of the annual arithmetic averages is also available. In addition, the ISC models can provide the user with tables of the 50 maximum concentrations or depositions, or an average over the period of meteorological input data. Receptor grids of polar, cartesian, or discrete receptor grids can be specified.

Long-Term Modeling

The ISCLT model requires annual average emissions, stack parameters, and meteorological data in order to calculate annual average concentrations. Annual average emissions and stack parameters for all SO_2 and particulate matter sources within the impact area of the proposed facility will be developed as described previously. The ISCLT will be used to estimate annual average ground-level concentrations due to all sources and due to the proposed plant only (incremental impact).

Meteorological data for input to the ISCLT will be obtained primarily through the National Climatic Center, Asheville, North Carolina, as described in the meteorology section of this POS. These data are provided in the "STAR" format, which is the proper format for input to the AQDM, and contains the frequency of occurrence of wind direction and wind speed as a function of atmospheric stability class. On-site meteorological data may be used if more appropriate.

A 1.0-kilometer (km) grid spacing will be used in the ISCLT to estimate the spatial distribution of ground-level concentrations and to determine maximum annual-average concentrations. Predicted concentrations will not be calibrated (i.e., no adjustments to model values).

Short-Term Modeling

The ISCST dispersion model will be used to determine worst-case short-term (24 hours or less) air quality impacts for all criteria pollutant emissions from the proposed facility. The model will also be applied to major emission sources within 25 km of the plant site and will use their annual average emissions and stack parameters. Area sources will not be considered in the short-term modeling; however, an appropriate short-term background level will be added to all point source concentration estimates to account for area source emissions.

Short-term concentration estimates as provided by the models will not be adjusted (i.e., a calibration factor of 1.0 will be employed). A minimum receptor grid spacing of 0.1 km will be used in the ISCST to estimate maximum short-term concentrations.

In addition to the previously mentioned models, specialized meteorological conditions, if identified, will be evaluated with available models and techniques.

Emission Scenarios

The following emission scenarios will be modeled in order to comply with the impact assessment requirements for both EPA and Florida DER:

1. The incremental impact of the proposed facility;
2. Compliance with allowable Class I and Class II PSD increments for each phase of construction:
   a. EPA and Florida DER baseline (August 7, 1977) or as appropriate; and
   b. Projected levels with the proposed facilities operating.
3. Compliance with AAQS for each phase of construction:
   a. EPA AAQS, and
   b. Florida DER AAQS.

2.5.3. Additional Impact Analysis

The impacts of associated facilities and impacts on soils, vegetation, and visibility will be assessed for each phase of operation, as discussed in the following paragraphs.

2.5.3.1 Fogging Potential Modeling--The fogging potential from the cooling tower will be assessed with the Oak Ridge Fog and Drift (ORFAD) model, developed at Oak Ridge National Laboratory, or a similar model. The ORFAD model calculations are based on physical meteorological assumptions and generate a probabilistic forecast of where and when fog will develop in the vicinity of the tower. Visibility is assessed downwind of the tower with the incorporation of a Gaussian plume dispersion algorithm.

2.5.3.2 Soils, Vegetation, and Visibility--A land use evaluation will be performed in the vicinity of the planned site to assess effluent impacts on soils, vegetation, and visibility. With particular regard to commercial agriculture, a literature search on the sensitivity of the local agricultural crops and soil mediums to the predicted pollutant concentration will be addressed and reported in the study results. Potential adverse visibility impacts will be evaluated, with particular attention to Class I areas.

2.5.3.3 Construction Impacts--During heavy construction operations, fugitive dust will be generated. A qualitative assessment will be performed describing the fugitive sources and the associated relative impacts. Available mitigative measures will be discussed in conjunction with unavoidable environmental impacts associated with new construction.

2.5.3.4 Salt Drift and Particulate Deposition Analysis--A salt drift and particulate deposition study due to operation of the on-site cooling tower will be performed. The ORFAD model or similar model will be used to perform the evaluation. Impacts will be assessed for compliance with PSD increments and AAQS.

2.5.3.5 Fugitive Dust Analysis--A fugitive dust analysis will be performed for the proposed station. The analysis will assess fugitive emissions from materials handling and storage areas, as well as any other identified fugitive emissions. The results will be submitted in tabular form to include information on source identification, throughput values, emission factors, types of control, control efficiencies, and controlled and uncontrolled emissions rates. Impacts will be assessed with the ISCST model for comparison to allowable PSD increments and AAQS.

2.5.3.6 Stack Height Optimization--The 1977 Clean Air Act Amendments require that the degree of emission limitation required for control of any pollutant not be affected by a stack height that exceeds good engineering practice (GEP) or any other dispersion technique. On January 12, 1979, and in September 1981 EPA promulgated proposed regulations on stack heights. The proposed GEP stack height means the highest of:

1. 65 meters, or
2. A height established by applying the formula:

$$H_g = H + 1.5L$$

where: H_g = Good engineering practice stack height,

H = Height of the structure or nearby structure, and

L = Lesser dimension (height or width) of the structure or nearby structure.

A nearby structure is defined for a specific structure or terrain feature as that distance equal to five times the lesser of the height or width dimension of a structure or terrain feature not greater than one-half mile. While the GEP stack height regulation does not require that the actual stack not exceed this height, modeling for determining compliance with AAQS and PSD increments cannot incorporate a stack height greater than the GEP stack height. A stack height optimization analysis will be performed to determine GEP height for each major emission stack at the facility.

2.5.3.7 Alternative Site Evaluation--The SCA/EID requires that alternative site locations be evaluated for the proposed facility. Results of the evaluation are incorporated into Section 8, Alternative Energy Sources and Sites. A qualitative (and quantitative, where possible) comparative evaluation of air quality impacts associated with each alternative site in relation to the following will be provided:

1. Compliance with AAQS,
2. Compliance with Class I and Class II PSD increments,

3. Impacts upon nonattainment areas, and
4. Impacts upon other sensitive areas (parks, counties, etc.).

2.5.4 Use of Results

The results of the air quality impact analysis will be incorporated into the following sections of the SCA/EID: 4.1, 5.5, and 5.7. The activities performed in this section will meet the requirements of:

1. The Application for Site Certification [Florida DER Form 17-1.122(72)] for Sections 4.1, 5.5, and 5.7;
2. "Guidelines for the Preparation of an Environmental Impact Assessment Report for New Source Fossil-Fueled Steam Electric Generation Stations" for Sections II.A, II.B, II.D, and II.E.1;
3. 40 CFR 52.21(k) Source Impact Analysis, and 40 CFR 52.21(o) Additional Impact Analysis; and
4. Chapter 17-2.500(5)(d) Ambient Impact Analysis and Chapter 17-2.500(5)(e) Additional Impact Analysis.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

March 17, 1982

DER
MAR 19 1982
BAQM

Jerry Williams, Director
Environmental Planning
Tampa Electric Company
Tampa, Florida

Dear Jerry:

First, attached is a receipt for the $2500 Notice of Intent fee submitted by TECO for the MacInnes #1 pre-application review.

Second, the following is a compendium of comments received to date from DER Power Plant Siting review personnel regarding the MacInnes Site Plan of Study. Since these were received from a number of staff, there may be some overlap in those comments. However, I have tried to group them by topic.

It should be noted that several factors make it difficult to review the Plan of Study, focusing on the uncertain design plans. These include: what length and size of transmission lines are under consideration; what items will be addressed as part of the main site plan vs. associated facilities, such as rail spurs, coal conveyors from Port Manatee, coal storage and handling areas at Port Manatee (or whether these latter areas will be addressed through a different permit); what FGD by product disposal plans are under consideration; what type cooling mode is proposed; and so forth. Also, the impact of many features, and thus the detail of analysis required will depend on ultimate site build-out and conceptual plans for build-out. The current plan of study only speaks to the first 500MW unit. These concerns are elaborated on further in the following.

Need For Power

Submittal of the same Need information given to the Public Service Commission (minus computer printouts on load flows), plus the PSC Need Order if available, will suffice for Chapter One of the application.

Zoning/Land Use

It is not clear from the proposed Table of Contents whether zoning information for the site, transmission, and associated facilities will be addressed, in either Section 2.2.1, or in Chapter 7.

DEPARTMENT OF ENVIRONMENTAL REGULATION

ROUTING AND TRANSMITTAL SLIP

ACTION NO.	
ACTION DUE DATE	

1. TO: (NAME, OFFICE, LOCATION) ~~Clair Fancy - BAQM~~	INITIAL	
	DATE	
2. ~~Larry~~	INITIAL	
	DATE	
3. ~~Tom~~ TR	INITIAL	
	DATE	
4.	INITIAL	
	DATE	

REMARKS:

INFORMATION
- REVIEW & RETURN
- REVIEW & FILE
- INITIAL & FORWARD

DISPOSITION
- REVIEW & RESPOND
- PREPARE RESPONSE
- FOR MY SIGNATURE
- FOR YOUR SIGNATURE
- LET'S DISCUSS
- SET UP MEETING
- INVESTIGATE & REPT
- INITIAL & FORWARD
- DISTRIBUTE
- CONCURRENCE
- FOR PROCESSING
- INITIAL & RETURN

FROM:

DATE

PHONE

Also, POS Section 4.6 (Land Use) does not specifically mention zoning. Please submit detailed information of zoning categories and an analysis of potential conflicts at the time of application filing rather than 15 days prior to the Land Use/Zoning Hearing.

Site Design

Since the site appears to be almost entirely within the 100 year Hurricane Flood Zone, the application should address how TECO will assure that site design meets the applicable regulations (primarily Hillsborough County's Flood Insurance Regulations).

Air Quality (includes comments on POS plus PSD Ambient Air Monitoring POS)

POS 2.1 - All major facilities within 50 kilometers of the proposed site should be included in the emissions inventory. The inventory should include emission rates suitable for determination of baseline concentrations and increment consumption. (See rule 17-2.500(4)(b)2., F.A.C.

POS 2.2 - Preconstruction air quality analysis may be necessary for several other emitted pollutants, namely nitrogen dioxide, lead, beryllium and fluorides. (See explanation in PSD Air Monitoring Plan of Study comments).

- If possible, include an analysis of the diurnal wind pattern associated with the land/sea breeze.

- Table 2-4 does not reflect the recently adopted changes to Rule 17-2.300(3), F.A.C., regarding the ambient air quality standards for lead and ozone. The State's standards are the same as the federal standards.

- The use of block averaging over small averaging periods (e.g. 3-hour) in the modeling analysis is the guideline method. The guideline is currently under review with the use of moving averages being considered.

- A finer grid resolution for the annual modeling (1.0 km. is proposed) may be necessary if any ambient air quality standards or PSD increments are shown to be threatened at the coarser resolution.

- Emissions from inventoried facilities should reflect maximum actual rates associated with the averaging time to be calculated.

- The calculation of increment consumption should include impacts from the proposed facility along with any other increment consuming facilities in the area.

- The baseline date for this area for both SO_2 and PM is December 27, 1977.

PSD 1.0 - The plan of study is developed for a facility with a gross capacity of 2,800 MW (two 500 MW units and two 900 MW units), while it is stated that the ultimate gross capacity may be 3,200 MW. Please clarify.

PSD 2.0 - Florida DER does require the collection of ambient air monitoring data as preconstruction review requirement. (See rule 17-2.500(5)(f), F.A.C.).

- Table 2-1 is based on the total plant capacity of 2,800 MW. Table 2-2, showing de minimus impacts for the purpose of monitoring exemption, is calculated for a capacity of 1,400 MW. Actual modeled impacts should be approximately double the figures shown to be comparable to a 2,800 MW capacity. The predicted maximum impacts would be even larger at the 3,200 MW level. Consequently, preconstruction air quality analysis may be necessary for lead, total fluorides, and possibly beryllium. In addition, the de minimus impact level for NO_2 in the FDER regulations is 14 ug/m^3 over a 24-hour averaging period (See Table 500-3, F.A.C.) FDER will be proposing to change the averaging period to an annual average in the future, however at this time, based on your calculations, monitoring would be required for NO_2 also.

PSD 4.0 - Monitoring data should be collected over the 12 month period prior to application submittal.

- Figure 4-1 is missing.

In general, the plan of study for air quality analysis is thorough and sound. It is evident, however, that air quality may be a limiting factor in this application. Monitoring data on site are presently showing elevated ambient levels of SO_2 and PM attributable to other sources in the area. In addition, preliminary modeling completed by the applicant shows that over three-fourths of the PSD increment for SO_2 is consumed by the proposed plant itself at only a 1,400 MW capacity.

Surface Water Quality

- It should be pointed out that the waters adjacent to the McInnes site in Hillsborough County are Outstanding Florida Waters. The OFW designation extends 500 feet west of the mean high water line throughout the Hillsborough County portion of the McInnes site. This was not noted in the Plan of Study. Also, the proposed project site is within Class II waters approved for shellfish harvesting.

- Several factors need to be known before determining the adequacy of the baseline monitoring program: the source of cooling water and its chemical characteristics, whether the facility will be discharging once through cooling water or blowdown, and where the intake and discharge points will be located.

- There is really no explanation as to how water quality station locations were chosen, other than that they lie approximately along two northwesterly transects. What about stations near the proposed point of discharge? It is unclear from the text whether any of the water quality monitoring stations coincide with the proposed discharge location(s). If this is not the case, then at least monthly sampling for the parameters in Table 4-2 should occur at the locations(s). More inshore sampling stations for wauer quality and aquatic ecology should be planned in the area of that discharge.

- The distribution of the water quality sampling points in Tampa Bay does not appear adequate. It is suggested that additional sampling sites be located west of the channel shown in the study maps and that the existing stations be spread more uniformly in the study area east of the channel.

- Two diurnal studies at eight sites are planned. Where are the sites located? Are two studies adequate to determine diurnal variability throughout the year in this area? Consideration of additional diurnal studies is suggested.

- An additional water quality sampling station should be included offshore of Bishop's Harbor at the 1.5 meter depth contour, if such a station is not already included in the south transect.

- If TECO anticipates any future discharges from the MacInnes Station to Cockroach or Piney Point Creek, the monitoring frequency for parameters listed in Table 4.2 will need to be increased to at least monthly sampling.

- Historical water quality data obtained in the literature review/data search should be separated from the baseline water quality data so that the impact of the Big Bend station on water quality will not be misrepresented as "background conditions" at the MacInnes site.

- p. 4-1 4 - sample number - It is unclear what "three duplicate samples" means. Does this result in the 25 determinations per episode listed for most of the water quality parameters?

- A dye study conducted at the proposed discharge point is planned. The 12 hour monitoring period is not adequate to determine time of travel and dispersion rates in this system.

- At least two dye studies should be conducted at the proposed discharge point. The first should occur approximately midway into an outgoing tide while the second should take place midway into an incoming tide. Also, both dye studies should be conducted on relatively windless days.

- Inland water quality monitoring is planned on a quarterly basis. Until specific site plans are available to determine possible impact of the facility on inland waters, no recommendation as to the adequacy of quarterly sampling can be made.

Aquatic Ecology

p. 4-37 - annual variations - Sampling for a fifth quarter indeed does address annual variations, but only vaguely.

p. 4-39 - shell pits - Where are these shell pits and what is the significance of sampling them?

p. 4-44 - otter trawling - Why are trawls being planned only at night?

- TECO indicates trawling and seining will occur monthly while sampling with trammel nets will occur quarterly. Trawling is an active method, while a trammel net is a passive technique. The two methods used in conjunction would fill in some of the gaps of each method and provide more useful data.

- Ichthyoplankton - Blue crab larvae should be included as an invertebrate indicator species along with shrimp and stone crab.

- The POS does not discuss the need for a full scale 316 demonstration (cooling mode as yet unknown), nor does it outline "Representative Important Species" for such a demonstration. While emphasis has been placed on the commercial genera _Penaeus_ and _Minnippe_, the list of RIS should be more extensive. Coordination in this regard should commence immediately if TECO intends to submit a complete application in one year.

p. 45 - submergent vegetation - There is no mention of quarterly determination of seagrass density in terms of blades/m^2.

Dredge/Fill

Although it may be implied in the Plan, the geology/soils information (POS 4.3.3) will also be needed to aid in addressing dredge/fill impacts in addition to the wetland vegetation studies mentioned in 4.5.4. Substrate constituence will influence turbidity problems, resuspension of any existing pollutants, and spoil disposal problems. Also, POS 4.5.4 does not mention using Aquatic Ecology data in the application Section 4.1.2 portion to address dredge/fill impacts.

- The project will need a mean high water survey submitted. These require:

1) The signed, sealed, and certified copy of the MHW Line Plat as prescribed in Chapter 177, Part II, F?S? and Rule 16-3, F.A.C.

2) The Surveyor's Report, certified.

3) Certified copies of all field notes acquired and used in the determination of the location of all points on the Mean High Water Line;

4) letters of proposed methods and procedures submitted to DNR; and

5) Approvals of such procedures and any changes required by DNR.

- Other information pertaining to the extent of dredging & filling activities for channels, canals, coal storage, fly ash, and the plant site must also be supplied.

Aquatic Preserve

The proposed project site is within the Cockroach Bay Aquatic Preserve. Please provide information that the proposed project will conform to the Aquatic Preserve Rules pursuant to Chapter 16 Q 20, F.A.C.

Terrestrial Ecology

p. 4-32 - food web studies - The paragraph on food web studies is somewhat vague. That is, it appears to be an afterthought about a complex series of interrelationships which could require much time and effort to unravel.

Groundwater

- The plan relies too heavily on the development of a conceptual ground water model as the end result of their data collection and analysis. Such models, especially those dealing with solute transport, are still very much in the research developpment stage, and are considered as such by leading ground water modelers. These models require precise understanding of the physical and chemical processes in order for such models to be reliable for predictive uses. Most of these processes are not yet well understood. We will need more high quality site specific field studies and less use of unreliable models.

- Boreholes drilled during this study will probably be used for their monitoring wells. In order to locate the monitoring wells properly, they should be positioned after the data is analyzed so that the most relevant zones can be monitored.

- A more specific, detailed outline of the studies that are being undertaken should be provided.

- On page 4-24, a method to minimize groundwater impacts by maintaining groundwater elevations at selected levels is mentioned. How they would propose to accomplish this will need to be explained, considering the hydrogeology of the area.

Transmission Lines

- Regarding mapping of land use and vegetation in the 1000 foot wide transmission corridors: If the corridors leave the main site, information should be supplied on maps of at least 1:24000 scale, delineating features down to 3 acres in size using Level II of the Florida Land Use and Cover Classification System for land use and Level III for vegetation (TECO had mentioned using FLUUCS for the main site mapping as well). Land use should also be displayed for at least a quarter mile on each side of the corridor.

- Section 4.4.3.5 discusses ecological surveys in the Corridors and associated facilities, but only for those areas of special concern, such as "important wetlands." We need to know how "important" is defined by TECO to evaluate the acceptability of this proposal.

Quality Control

- Will split sampling and analyses with an independent laboratory be implemented as a form of quality control?

We appreciate the opportunity to review TECO's plans at this early stage of the process. If you have questions on specific comments, let me know and I will direct you to the correct individual for discussion.

Sincerely,

Karen W. Anthony

Karen W. Anthony
Power Plant Siting
Bureau of Permitting

KWA/vw

Attachment

cc: Tom Rogers/Bob King

Lawrence Olsen
J. P. Subramani
Cindy Hilty
Andy Feinstein
John Reese
Sam Johnston
J. J. Crane
Suzanne Walker
Doug Farrel

TAMPA ELECTRIC
A TECO ENERGY COMPANY

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DER-BAQM

May 4, 1990

Certified Mail # P 242 785 997
Return Receipt Requested

Mr. Hamilton S. Oven, Jr., P.E.
Florida Department of
Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2449

Re: Hardee Power Station
BACT Economic Analysis

Dear Mr. Oven:

As requested during our meeting of April 26, 1990, with Messrs. Clair Fancy and Barry Andrews, please find enclosed our economic analysis for NO_x control technologies based on the methodology outlined by the OAQPS Control Cost Manual, which identifies the capital recovery factor as a separate component of the total factor applied to the capital cost.

The conclusion of this analysis is that for the Hardee Power Station project, neither the SCR nor the Quiet Combustor alternatives result in a reasonable cost per ton of NO_x removal. Although we do not believe that there is a valid basis for your identified BACT economic threshold value of $4,000 per ton of NO_x removed, it should be noted that the outcome of this analysis, as with the previous analysis, clearly shows that the cost per ton of NO_x removal for the SCR and Quiet Combustor alternatives exceed your threshold value.

We hope this additional information allows the Department to finalize the only outstanding issue in the BACT determination.

In summary, on the basis of the enclosed information and having addressed all of the Department's concerns and requests, we recommend the following air emission limits for the Hardee Power Station:

Natural Gas

NO_x, ppmvd corrected to 15% 02	42
CO, ppmvd	10
VOC, ppmvd	2
PM/PM10, lb/hr	5

<u>Oil</u>

NO_x, ppmvd corrected to 15% 02	65
CO, ppmvd	26
VOC, ppmvd	5
PM/PM 10, lb/hr	10

Sulfur limitations should be based on an annual average of .3% sulfur in fuel oil with a maximum of .5% based on deliveries.

Thank you for your assistance. Please feel free to call if you have any further questions.

Sincerely,

Jerry L. Williams

Jerry L. Williams
Director
Environmental

JLW/ams/DD114.DOC

Enclosure

cc: Clair Fancy, FDER-Tallahassee (w/enc.)
Barry Andrews, FDER-Tallahassee (w/enc.)
Seminole Electric Cooperative, Inc.
TECO Power Services Corp.

HARDEE POWER STATION ECONOMIC ANALYSES

Attached are the analyses for the SCR and Quiet Combustor alternatives (Attachments 1 and 2). The base estimates of costs were developed by Black & Veatch and by General Electric. The analyses presented at our last meeting (April 26,1990) utilized these estimates as adjusted for specific financial factors such as levelized cost of fuel, incremental levelized demand charge, interest rate during construction, and fixed charge rate. The analyses presented here presents these same estimates as modified to reflect the OAQPS Control Cost Manual methodology concerning the capital recovery factor. The first page of these attachments graphically presents the results of the analyses. This is followed by the detailed analysis for different fuel utilizations, associated notes, and the development of the capital cost. The following discusses our findings after review of this methodology.

Our previous analyses utilized a fixed charge rate applied against the total capital investment. The Manual recommends utilizing a capital recovery factor (CRF) applied against the total capital investment as one component of the annual costs. The Manual suggests an additional 4% factor applied against the total capital investment as another component of the annual cost to account for administrative, insurance, and property tax costs (Section 2.4.5.8, page 2-29).

The CRF for this project has been calculated per the definition in the Manual (Formula 2.3, page 2-13). The formula has two components: the pretax marginal rate of return on private investment and the economic life. The pretax marginal rate of return for this project is 14.37% and the economic life is 20 years. This results in a CRF of 15.42%. The factors for administrative, insurance, and property tax costs have been calculated and sum to 2.16%. These two factors total to a project fixed charge rate of 17.58%. However, in keeping with the Manuals methods, these two factors are kept separated in the attached analyses.

The examples given in the Manual utilize a 10% pretax marginal rate of return. The following table compares the results of these numbers utilizing a 20 year economic life to our case (14.37% for 20 years).

	OAQPS Manual Case	Hardee Power Case
Pretax marginal rate of return	10.00	14.37
CRF	11.74	15.42
Admin, prop. tax, insurance	4.00	2.16
Total factors applied to capital	15.74	17.58

We would expect a utility's CRF to be fairly close to this project's CRF (15.42%) if calculated according to the pretax marginal rate of return (as specified by the Manual), over a 20 year life, and calculated over the economics of the project. Some variances may occur due to:

- The economic life of the project. This project has a twenty year economic life while utility projects often have a thirty year economic life. For example, a project with a 12% pretax marginal rate of return and a 30 year economic life would have a CRF of 12.41%. The same project with a 20 year economic life would have a CRF of 13.39%.

- The amount of imbedded debt. Utilities generally have a lower interest rate on long term debt (due to imbedded debt) which, if utilized in this calculation, would tend to decrease the rate of return. The structure of this project is such that their is no imbedded debt.

- The expected return on equity. A utility's return is set by regulation. This is not the case for this project. A greater return is expected due to the owner accepting greater risks. The structure of a utility is such that there is less risk for this type of project than for the structure of this project.

While we do not believe the economic values suggested by the manual for illustrative purposes to be totally correct, we have assessed the sensitivity of our analyses to the CRF. Attachment 3 presents analyses utilizing a 10% pretax marginal rate of return over 20 years with the guideline 4% factor for administration, property taxes and insurance. For the 100% natural gas case at 100% capacity factor, a summary of the results are as follows:

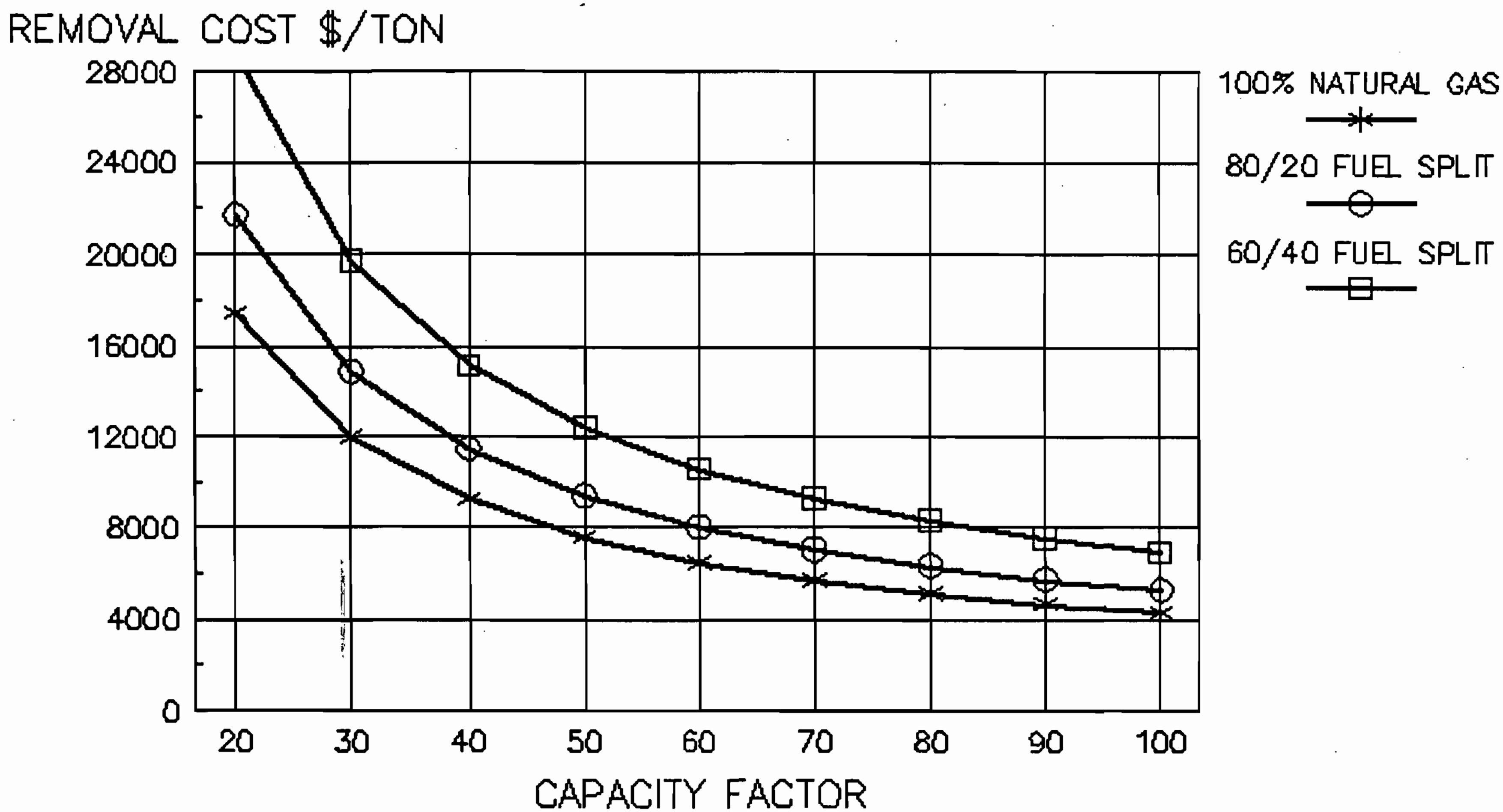
	Hardee Power Case	OAQPS Manual Case
Pretax Marginal Rate of Return	14.37	10.00
Capital Recovery Factor	15.42	11.74
Factor for Admin, Insurance, and Property Taxes	2.16	4.00
SCR Alternative, \$/ton NOX Removed	4304	4151
Quiet Combustor Alternative, \$/ton NOX Removed	5388	5201

Therefore, even with the economic factors suggested by the Manual, neither the SCR alternative nor the Quiet Combustor alternative results in a reasonable cost per ton of NOX removal.

ATTACHMENT 1

NOX REMOVAL COSTS

SCR



SCR

Capacity factor	20	30	40	50	60	70	80	90	100
% Natural Gas firing	100	100	100	100	100	100	100	100	100
% No. 2 Fuel Oil firing	0	0	0	0	0	0	0	0	0
Annual Costs, $X1000									
====================									
Direct Annual Cost									
Differential O&M Cost (2)	5,630	5,630	5,630	5,630	5,630	5,630	5,630	5,630	5,630
Ammonia (3)	120	180	240	300	360	420	480	540	600
Energy (4)									
Heat Rate Penalty	342	513	685	856	1,027	1,198	1,369	1,540	1,711
SCR Power Consumption	209	314	419	524	628	733	838	942	1,047
Lost Generation Capacity (5)	370	370	370	370	370	370	370	370	370
	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Direct Annual Cost	6,672	7,008	7,343	7,679	8,015	8,351	8,687	9,023	9,359
Indirect Annual Cost									
Capital Recovery (1)	4,268	4,268	4,268	4,268	4,268	4,268	4,268	4,268	4,268
Admin, Property Taxes, and Insurance	598	598	598	598	598	598	598	598	598
	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Indirect Annual Cost	4,866	4,866	4,866	4,866	4,866	4,866	4,866	4,866	4,866
Total Annual Cost	11,538	11,874	12,210	12,545	12,881	13,217	13,553	13,889	14,225
NOx Emissions									
=============									
42ppm natural gas, tpy	841	1,262	1,682	2,103	2,523	2,944	3,364	3,785	4,205
9ppm natural gas, tpy	180	270	360	450	540	630	720	810	900
	-----	-----	-----	-----	-----	-----	-----	-----	-----
Removed, tpy	661	992	1,322	1,653	1,983	2,314	2,644	2,975	3,305
Cost Effectiveness, $/ton	17,455	11,976	9,236	7,592	6,496	5,713	5,126	4,669	4,304

SCR

Capacity factor	20	30	40	50	60	70	80	90	100
% Natural Gas firing	80	80	80	80	80	80	80	80	80
% No. 2 Fuel Oil firing	20	20	20	20	20	20	20	20	20
Annual Costs, $X1000									
Direct Annual Cost									
Differential O&M Cost (2)	5,630	5,630	5,630	5,630	5,630	5,630	5,630	5,630	5,630
Ammonia (3)	96	144	192	240	288	336	384	432	480
Energy (4)									
Heat Rate Penalty	359	538	717	896	1,076	1,255	1,434	1,614	1,793
SCR Power Consumption	168	251	335	419	503	586	670	754	838
Lost Generation Capacity (5)	370	370	370	370	370	370	370	370	370
Total Direct Annual Cost	6,622	6,933	7,244	7,555	7,866	8,177	8,488	8,799	9,111
Indirect Annual Cost									
Capital Recovery (1)	4,268	4,268	4,268	4,268	4,268	4,268	4,268	4,268	4,268
Admin, Property Taxes, and Insurance	598	598	598	598	598	598	598	598	598
Total Indirect Annual Cost	4,866	4,866	4,866	4,866	4,866	4,866	4,866	4,866	4,866
Total Annual Cost	11,488	11,799	12,110	12,421	12,732	13,044	13,355	13,666	13,977
NOx Emissions									
42ppm natural gas, tpy	673	1,009	1,346	1,682	2,018	2,355	2,691	3,028	3,364
9ppm natural gas, tpy	144	216	288	360	432	504	576	648	720
Removed, tpy	529	793	1,058	1,322	1,586	1,851	2,115	2,380	2,644
Cost Effectiveness, $/ton	21,725	14,876	11,451	9,396	8,026	7,048	6,314	5,743	5,286

SCR

Capacity factor	20	30	40	50	60	70	80	90	100
% Natural Gas firing	60	60	60	60	60	60	60	60	60
% No. 2 Fuel Oil firing	40	40	40	40	40	40	40	40	40
Annual Costs, $X1000									
Direct Annual Cost									
Differential O&M Cost (2)	5,630	5,630	5,630	5,630	5,630	5,630	5,630	5,630	5,630
Ammonia (3)	72	108	144	180	216	252	288	324	360
Energy (4)									
Heat Rate Penalty	375	562	750	937	1,125	1,312	1,499	1,687	1,874
SCR Power Consumption	126	188	251	314	377	440	503	565	628
Lost Generation Capacity (5)	370	370	370	370	370	370	370	370	370
Total Direct Annual Cost	6,573	6,859	7,145	7,431	7,718	8,004	8,290	8,576	8,863
Indirect Annual Cost									
Capital Recovery (1)	4,268	4,268	4,268	4,268	4,268	4,268	4,268	4,268	4,268
Admin, Property Taxes, and Insurance	598	598	598	598	598	598	598	598	598
Total Indirect Annual Cost	4,866	4,866	4,866	4,866	4,866	4,866	4,866	4,866	4,866
Total Annual Cost	11,439	11,725	12,011	12,297	12,584	12,870	13,156	13,442	13,729
NOx Emissions									
42ppm natural gas, tpy	505	757	1,009	1,262	1,514	1,766	2,018	2,271	2,523
9ppm natural gas, tpy	108	162	216	270	324	378	432	486	540
Removed, tpy	397	595	793	992	1,190	1,388	1,586	1,785	1,983
Cost Effectiveness, $/ton	28,842	19,709	15,143	12,403	10,576	9,272	8,293	7,532	6,923

NOTE:

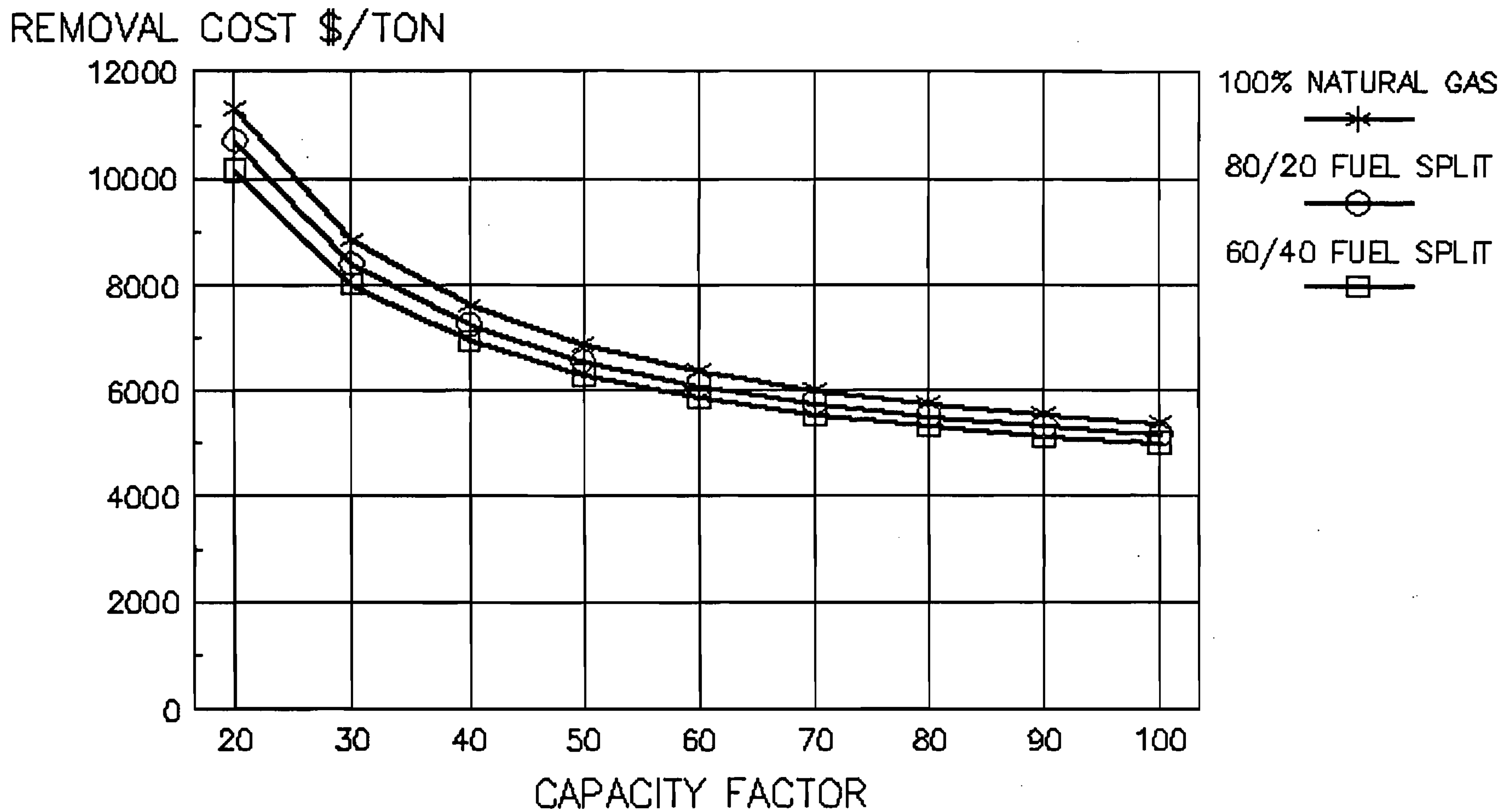
1. Based on a Total Capital Investment of $27,680,000 with a project specific capital recovery factor of 15.42%. Administrative costs, property taxes, and insurance utilize a factor of 2.16% of Total Capital Investment. The sum of these two factors represent the project specific fixed charge rate of 17.58%.
2. Differential O&M includes maintenance & labor and catalyst replacement. Complete replacement after 2 years.
3. Ammonia cost is based on $250/ton and a stoichmetric ratio of 1.2.
4. Energy includes auxilliary power for the SCR as well as a 0.42% CT heat rate penalty for the SCR. The additional fuel cost associated with heat rate penalty utilizes Tampa Electric Company's (TEC) current levelized fuel cost forecast of $11.68/MBtu for natural gas and $14.49 for oil.
   Increased BOP power consumption is charged at $99.98/MWh. This latter factor also utilized the TEC fuel cost forecast.
5. The SCR lost generation capacity is based on an 0.42% penalty. An incremental levelized demand charge of $81.64/kW/yr was utilized based on project specific parameters.

TECO Power Services - Hardee Power Station

SCR CAPITAL COSTS ($X1000)

SCR Reactor	12,750
SCR Auxilliaries and Ammonia Storage	1,500
SCR Erection	2,625
Foundations, Ammonia System Erection & BOP Equipment	450
Contingency (10%)	1,733
Subtotal	19,058
Sales Tax (6%)	1,143
Indirect costs (14.5%)	2,763
Subtotal	22,964
Escalation (4.7%)	1,620
Total Escalated Cost	24,584
Interest During Construction	3,095
Total Capital Investment	27,679

ATTACHMENT 2
NOX REMOVAL COSTS
QUIET COMBUSTOR



Quiet Combustor

Capacity factor	20	30	40	50	60	70	80	90	100
% Natural Gas firing	100	100	100	100	100	100	100	100	100
% No. 2 Fuel Oil firing	0	0	0	0	0	0	0	0	0
Annual Costs, $X1000									
Direct Annual Cost									
Differential O&M Cost (2)	(503)	(490)	(477)	(465)	(452)	(439)	(426)	(414)	(401)
Energy (3)									
Heat Rate Penalty	1,272	1,909	2,545	3,181	3,817	4,453	5,090	5,726	6,362
Pump Power Consumption	34	51	68	84	101	118	135	152	169
Lost Generation Capacity	0	0	0	0	0	0	0	0	0
Total Direct Cost	804	1,469	2,135	2,801	3,467	4,133	4,798	5,464	6,130
Indirect Annual Cost									
Capital Recovery (1)	2,681	2,681	2,681	2,681	2,681	2,681	2,681	2,681	2,681
Admin, Property Taxes, Insur	376	376	376	376	376	376	376	376	376
Total Indirect Annual Cost	3,057	3,057	3,057	3,057	3,057	3,057	3,057	3,057	3,057
Total Annual Cost	3860	4526	5192	5858	6524	7189	7855	8521	9187
NOx Emissions									
Gas:									
42ppm natural gas, tpy	841	1,262	1,682	2,103	2,523	2,944	3,364	3,785	4,205
25ppm natural gas, tpy	500	750	1,000	1,250	1,500	1,750	2,000	2,250	2,500
Removed, tpy	341	512	682	853	1,023	1,194	1,364	1,535	1,705
Oil:									
65ppm oil, tpy	0	0	0	0	0	0	0	0	0
42ppm oil, tpy	0	0	0	0	0	0	0	0	0
Removed, tpy	0	0	0	0	0	0	0	0	0
Total removed, tpy	341	512	682	853	1023	1194	1364	1535	1705
Cost Effectiveness, $/ton	11,321	8,849	7,613	6,871	6,377	6,024	5,759	5,553	5,388

Quiet Combustor

Capacity factor	20	30	40	50	60	70	80	90	100
% Natural Gas firing	80	80	80	80	80	80	80	80	80
% No. 2 Fuel Oil firing	20	20	20	20	20	20	20	20	20
Annual Costs, $X1000									
====================									
Direct Annual Cost									
Differential O&M Cost (2)	(503)	(490)	(477)	(465)	(452)	(439)	(426)	(414)	(401)
Energy (3)									
Heat Rate Penalty	1,333	2,000	2,667	3,334	4,000	4,667	5,334	6,001	6,667
Pump Power Consumption	35	53	71	89	106	124	142	159	177
Lost Generation Capacity	0	0	0	0	0	0	0	0	0
	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Direct Cost	866	1,563	2,261	2,958	3,655	4,352	5,049	5,746	6,443
Indirect Annual Cost									
Capital Recovery (1)	2,681	2,681	2,681	2,681	2,681	2,681	2,681	2,681	2,681
Admin, Property Taxes, Insur	376	376	376	376	376	376	376	376	376
	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Indirect Annual Cost	3,057	3,057	3,057	3,057	3,057	3,057	3,057	3,057	3,057
Total Annual Cost	3,923	4,620	5,317	6,014	6,712	7,409	8,106	8,803	9,500
NOx Emissions									
=============									
Gas:									
42ppm natural gas, tpy	673	1,009	1,346	1,682	2,018	2,355	2,691	3,028	3,364
25ppm natural gas, tpy	400	600	800	1,000	1,200	1,400	1,600	1,800	2,000
	-----	-----	-----	-----	-----	-----	-----	-----	-----
Removed, tpy	273	409	546	682	818	955	1,091	1,228	1,364
Oil:									
65ppm oil, tpy	265	397	530	662	795	927	1,060	1,192	1,325
42ppm oil, tpy	171	257	342	428	514	599	685	770	856
	-----	-----	-----	-----	-----	-----	-----	-----	-----
Removed, tpy	94	141	187	234	281	328	375	422	469
Total removed, tpy	367	550	733	916	1100	1283	1466	1649	1833
Cost Effectiveness, $/ton	10,704	8,404	7,254	6,564	6,104	5,775	5,529	5,337	5,184

Quiet Combustor

Capacity factor	20	30	40	50	60	70	80	90	100
% Natural Gas firing	60	60	60	60	60	60	60	60	60
% No. 2 Fuel Oil firing	40	40	40	40	40	40	40	40	40
Annual Costs, $X1000									
Direct Annual Cost									
Differential O&M Cost (2)	(503)	(490)	(477)	(465)	(452)	(439)	(426)	(414)	(401)
Energy (3)									
Heat Rate Penalty	1,395	2,092	2,789	3,486	4,184	4,881	5,578	6,275	6,973
Pump Power Consumption	37	56	74	93	111	130	148	167	185
Lost Generation Capacity	0	0	0	0	0	0	0	0	0
Total Direct Cost	929	1,657	2,386	3,114	3,843	4,571	5,300	6,028	6,757
Indirect Annual Cost									
Capital Recovery (1)	2,681	2,681	2,681	2,681	2,681	2,681	2,681	2,681	2,681
Admin, Property Taxes, Insur	376	376	376	376	376	376	376	376	376
Total Indirect Annual Cost	3,057	3,057	3,057	3,057	3,057	3,057	3,057	3,057	3,057
Total Annual Cost	3,986	4,714	5,443	6,171	6,900	7,628	8,357	9,085	9,814
NOx Emissions									
Gas:									
42ppm natural gas, tpy	505	757	1,009	1,262	1,514	1,766	2,018	2,271	2,523
25ppm natural gas, tpy	300	450	600	750	900	1,050	1,200	1,350	1,500
Removed, tpy	205	307	409	512	614	716	818	921	1,023
Oil:									
65ppm oil, tpy	530	795	1,060	1,325	1,590	1,854	2,119	2,384	2,649
42ppm oil, tpy	342	514	685	856	1,027	1,198	1,370	1,541	1,712
Removed, tpy	187	281	375	469	562	656	750	843	937
Total removed, tpy	392	588	784	980	1176	1372	1568	1764	1960
Cost Effectiveness, $/ton	10,167	8,017	6,942	6,296	5,866	5,559	5,329	5,150	5,006

NOTE:

1. Based on a Total Capital Investment of $17,388,000 with a project specific capital recovery factor of 15.42% Administrative costs, property taxes, and insurance utilize a factor of 2.16% of Total Capital Investment. The sum of these two factors represent the project specific fixed charge rate of 17.58%.
2. Differential O&M includes BOP maintenance and water treatment chemical costs. A credit of $528,000 for reduced maintenance was utilized for the improved combustor.
3. Energy includes increased BOP power consumption as well as a 1% CC heat rate penalty for the quiet combustor. The additional fuel cost associated with heat rate penalty utilizes Tampa Electric Company's current levelized fuel cost of $11.68/MBtu for natural gas and $14.49/MBtu for oil. Increased BOP power consumption is charged at $99.98/MWh for natural gas and $124.03/MWh for oil.

TECO Power Services - Hardee Power Station
QUIET COMBUSTOR CAPITAL COSTS ($X1000)

Differential Combustion Turbine Costs	8,363
HRSG Modification	763
Water Treatment, Storage, and Injection Equipment	1,163
Foundations & BOP Equipment	288
Contingency (10%)	1,058
Subtotal	11,633
Sales Tax (6%)	698
Indirect costs (14.5%)	1,687
Subtotal	14,017
Escalation (4.7%)	1,425
Total Escalated Cost	15,442
Interest During Construction	1,946
Total Capital Investment	17,388

TECO Power Services - Hardee Power Station

SCR (For comparison purposes only. . .see note 1)

Capacity factor	20	30	40	50	60	70	80	90	100
% Natural Gas firing	100	100	100	100	100	100	100	100	100
% No. 2 Fuel Oil firing	0	0	0	0	0	0	0	0	0
Annual Costs, $X1000									
====================									
Direct Annual Cost									
Differential O&M Cost (2)	5,630	5,630	5,630	5,630	5,630	5,630	5,630	5,630	5,630
Ammonia (3)	120	180	240	300	360	420	480	540	600
Energy (4)									
Heat Rate Penalty	342	513	685	856	1,027	1,198	1,369	1,540	1,711
SCR Power Consumption	209	314	419	524	628	733	838	942	1,047
Lost Generation Capacity (5)	370	370	370	370	370	370	370	370	370
	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Direct Annual Cost	6,672	7,008	7,343	7,679	8,015	8,351	8,687	9,023	9,359
Indirect Annual Cost									
Capital Recovery (1)	3,252	3,252	3,252	3,252	3,252	3,252	3,252	3,252	3,252
Admin, Property Taxes, and Insurance	1,107	1,107	1,107	1,107	1,107	1,107	1,107	1,107	1,107
	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Indirect Annual Cost	4,360	4,360	4,360	4,360	4,360	4,360	4,360	4,360	4,360
Total Annual Cost	11,031	11,367	11,703	12,039	12,375	12,711	13,046	13,382	13,718
NOx Emissions									
=============									
42ppm natural gas, tpy	841	1,262	1,682	2,103	2,523	2,944	3,364	3,785	4,205
9ppm natural gas, tpy	180	270	360	450	540	630	720	810	900
	-----	-----	-----	-----	-----	-----	-----	-----	-----
Removed, tpy	661	992	1,322	1,653	1,983	2,314	2,644	2,975	3,305
Cost Effectiveness, $/ton	16,689	11,465	8,853	7,285	6,240	5,494	4,934	4,499	4,151
========================									

NOTE:

1. This comparison analyses utilizes a pretax marginal rate of return of 10% over a 20 year economic life. This results in a capital recovery factor of 11.74% and is applied against the total capital investment. A factor of 4% is applied against the total capital investment to account for administration, property taxes, and insurance per the OAQPS Control Cost Manual guidelines.

TECO Power Services - Hardee Power Station

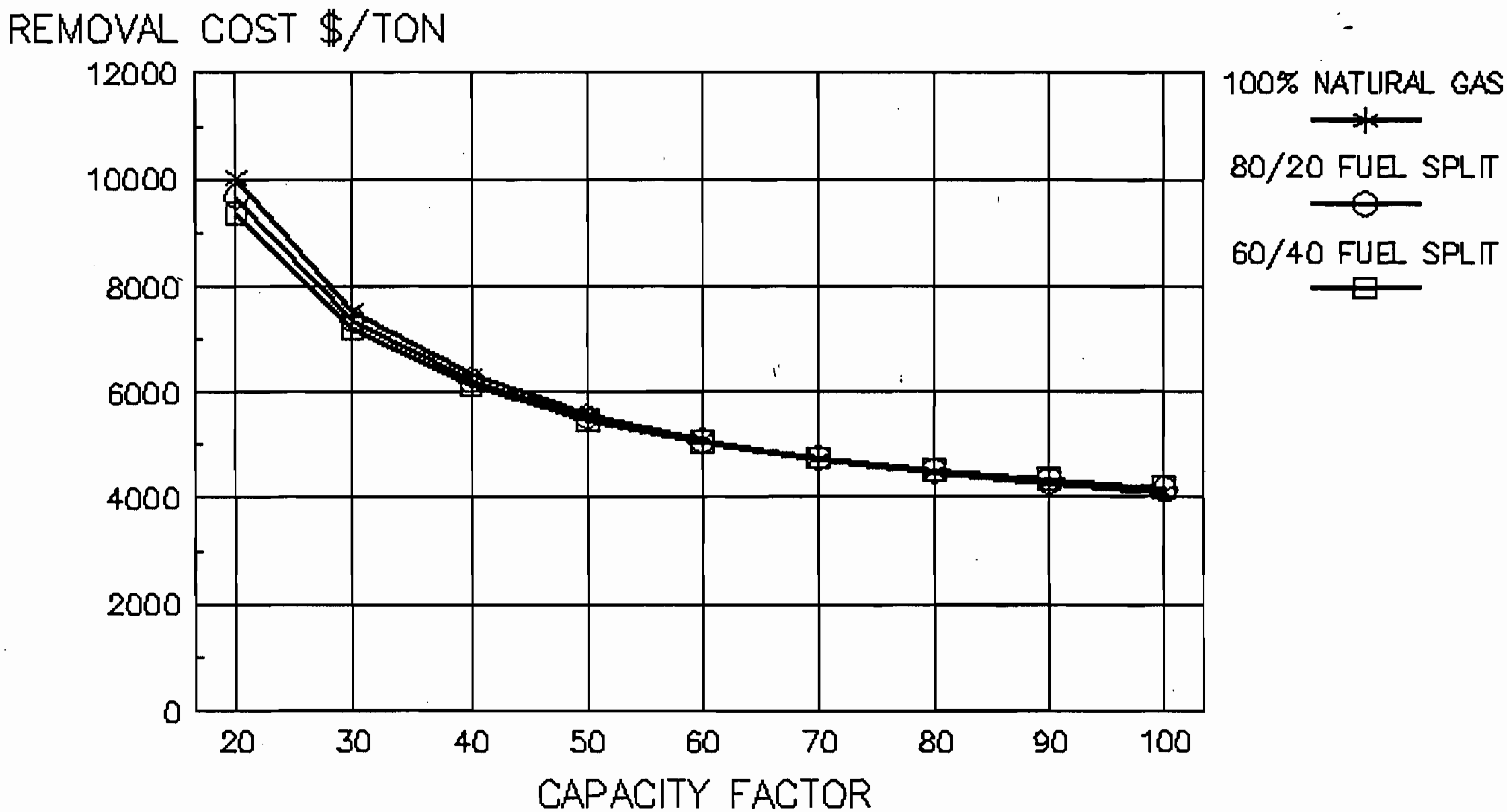
Quiet Combustor (For comparison purposes only. . .see note 1)

Capacity factor	20	30	40	50	60	70	80	90	100
% Natural Gas firing	100	100	100	100	100	100	100	100	100
% No. 2 Fuel Oil firing	0	0	0	0	0	0	0	0	0
Annual Costs, $X1000									
Direct Annual Cost									
Differential O&M Cost	(503)	(490)	(477)	(465)	(452)	(439)	(426)	(414)	(401)
Energy									
Heat Rate Penalty	1,272	1,909	2,545	3,181	3,817	4,453	5,090	5,726	6,362
Pump Power Consumption	34	51	68	84	101	118	135	152	169
Lost Generation Capacity	0	0	0	0	0	0	0	0	0
Total Direct Cost	804	1,469	2,135	2,801	3,467	4,133	4,798	5,464	6,130
Indirect Annual Cost									
Capital Recovery (1)	2,043	2,043	2,043	2,043	2,043	2,043	2,043	2,043	2,043
Admin, Property Taxes, Insur	696	696	696	696	696	696	696	696	696
Total Indirect Annual Cost	2,739	2,739	2,739	2,739	2,739	2,739	2,739	2,739	2,739
Total Annual Cost	3542	4208	4874	5540	6205	6871	7537	8203	8868
NOx Emissions									
Gas:									
42ppm natural gas, tpy	841	1,262	1,682	2,103	2,523	2,944	3,364	3,785	4,205
25ppm natural gas, tpy	500	750	1,000	1,250	1,500	1,750	2,000	2,250	2,500
Removed, tpy	341	512	682	853	1,023	1,194	1,364	1,535	1,705
Oil:									
65ppm oil, tpy	0	0	0	0	0	0	0	0	0
42ppm oil, tpy	0	0	0	0	0	0	0	0	0
Removed, tpy	0	0	0	0	0	0	0	0	0
Total removed, tpy	341	512	682	853	1023	1194	1364	1535	1705
Cost Effectiveness, $/ton	10,388	8,227	7,146	6,498	6,066	5,757	5,526	5,346	5,201

NOTE:

1. This comparison analyses utilizes a pretax marginal rate of return of 10% over a 20 year economic life. This results in a capital recovery factor of 11.74% and is applied against the total capital investment. A factor of 4% is applied against the total capital investment to account for administration, property taxes, and insurance per the OAQPS Control Cost Manual guidelines.

NOX REMOVAL COSTS
QUIET COMBUSTOR



TAMPA ELECTRIC
A TECO ENERGY COMPANY

RECEIVED
MAY 21 1990
DER - BAQM

May 18, 1990

Mr. Hamilton S. Oven, Jr., P.E.
Florida Department of
Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Re: Hardee Power Station
BACT Economic Analysis

Dear Mr. Oven:

During our recent discussions with Mr. Barry Andrews, he has identified additional concerns regarding the O & M costs associated with catalyst replacement every two (2) years which were part of our May 4, 1990 submittal. Mr. Andrews is of the opinion that the frequency of this replacement should be every three (3) years.

To address his concerns and for comparison purposes, the enclosed analysis indicates our O & M costs for the SCR alternative using a three year replacement frequency for the catalyst. The conclusion of this analysis is that even with the three year catalyst replacement, the SCR alternative does not result in a reasonable cost per ton of NO_x removal for the Hardee Power Station project. Furthermore, to the extent we do not believe there is a valid economic basis for your identified BACT economic threshold value of $4,000 per ton of NO_x removed, this analysis still indicates that the costs for the SCR alternative exceed your threshold value in all cases, except for the case of capacity factors in excess of 90% and 100% natural gas, which exceed $3,656 per ton.

We hope this additional information addresses Mr. Andrews' concerns and allows the Department to come to a resolution on this matter.

FEDERAL EXPRESS

[redacted]

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7284302491

[redacted]

Date 5/18/90

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Company: TAMPA ELECTRIC	Department/Floor No.
Street Address: 702 NO. FRANKLIN ST	
City: TAMPA	State: FL	ZIP Required: 33602

2 To (Recipient's Name) Please Print: Mr. Clair Fancy	Recipient's Phone Number (Very Important): ( )
Company: Florida Dept. of Env. Regulation	Department/Floor No.
Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip® Codes.): 2600 Blair Stone Road	
City: Tallahassee	State: FL	ZIP Required: 32399-240

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PAR #445-146-23-18-281

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Street Address
City | State | ZIP Required

3 PAYMENT 1 [X] Bill Sender 2 [ ] Bill Recipient's FedEx Acct. No. 3 [ ] Bill 3rd Party FedEx Acct. No. 4 [ ] Bill Credit Card
5 [ ] Cash

[redacted]

4 SERVICES (Check only one box)

Priority Overnight Service (Delivery by next business morning†)	Standard Overnight Service (Delivery by next business afternoon†)
11 [ ] YOUR PACKAGING	51 [ ]
16 [X] FEDEX LETTER *	56 [ ] FEDEX LETTER *
12 [ ] FEDEX PAK *	52 [ ] FEDEX PAK *
13 [ ] FEDEX BOX	53 [ ] FEDEX BOX
14 [ ] FEDEX TUBE	54 [ ] FEDEX TUBE
Economy Service (formerly Standard Air) (Delivery by second business day†)	Heavyweight Service (for Extra Large or any package over 150 lbs.)
30 [ ] ECONOMY SERVICE	70 [ ] HEAVYWEIGHT **
	80 [ ] DEFERRED HEAVYWEIGHT **

†Delivery commitment may be later in some areas.
*Declared Value Limit $100.
**Call for delivery schedule.

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1 [ ] HOLD FOR PICK-UP (Fill in Box H)
2 [X] DELIVER WEEKDAY
3 [ ] DELIVER SATURDAY (Extra charge) (Not available to all locations)
4 [ ] DANGEROUS GOODS (Extra charge) (CSS not available for Dangerous Goods Shipments)
5 [ ] CONSTANT SURVEILLANCE SVC. (CSS) (Extra charge) (Release Signature Not Applicable)
6 [ ] DRY ICE ________ Lbs.
7 [ ] OTHER SPECIAL SERVICE ________
8 [ ]
9 [ ] SATURDAY PICK-UP (Extra charge)
10 [ ]
11 [ ] DESCRIPTION
12 [ ] HOLIDAY DELIVERY (If offered) (Extra charge)

PACKAGES	WEIGHT In Pounds Only	YOUR DECLARED VALUE	OVER SIZE
Total	Total	Total	

DIM SHIPMENT (Heavyweight Services Only)
[ ] ________ lbs.

Received At
1 [ ] Regular Stop 3 [ ] Drop Box
2 [ ] On-Call Stop 4 [ ] B.S.C. 5 [ ] Station
FedEx Emp. No.

Emp. No. | Date
[ ] Cash Received
[ ] Return Shipment
[ ] Third Party [ ] Chg. To Del. [ ] Chg. To Hold
Street Address
City | State | Zip
Received By:
X
Date/Time Received | FedEx Employee Number

5 Release Signature:
Date/Time

Federal Express Use
Base Charges
Declared Value Charge
Other 1
Other 2
Total Charges

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FORMAT #014
014
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Thank you for your assistance. We will be calling the Department shortly to address any comments the Department may have on this issue.

Sincerely,

Jerry L. Williams

Jerry L. Williams
Director
Environmental

JLW/ams/DD115.DOC

cc: Clair Fancy, FDER (w/enc.) ✓
Steve Smallwood, FDER (w/enc.)
Seminole Electric Cooperative
TECO Power Services

HARDEE POWER STATION SCR O&M ANALYSIS

Attached are the analyses for the SCR alternative (Attachment 1). The indirect annual costs have been discussed in a previous document titled "Hardee Power Station Economic Analysis". This discussion pertains to the direct annual costs. The direct annual costs have been itemized as:

- Differential O&M Cost
- Ammonia Cost
- Energy Costs
  - Heat Rate Penalty
  - SCR Power Consumption
- Lost Generation Capacity

Each of these items is discussed below.

Differential O&M Cost

This cost includes the capital cost of the replacement catalyst, freight, installation labor, span gasses for calibration, and emission control system maintenance. The major component of this cost is the capital cost of the replacement catalysts. We continue to show a two year replacement of these catalysts. Black & Veatch has verified that three year warranties are available. These warranties are limited in their nature. If performance falls off prior to the three year period, the manufacturer will provide the material for replacement. This still entails cost to the project for the freight, installation, downtime, and plant overhead. We are not yet convinced that the SCR experience to date will preclude some replacement prior to the three year period. In addition, the expressed warranties are for the first three year period. Once a manufacturer is chosen, they must continue to be used due to physical restraints or with economic penalty due to modifications. The competitive nature of the replacement is restricted. This may increase replacement costs and premiums for additional warranties. We intend to continue to research the database of SCR experience. However, for comparison purposes we have prepared analyses utilizing a 3 year replacement (See Attachment 2). The following discusses these analyses.

Black & Veatch has estimated a SCR capital replacement cost per Heat Recovery Steam Generator (HRSG). This estimate is based on discussions with and budgetary estimates from major SCR suppliers (e.g., Mitsubishi, Henry Vogt, Nooter Erickson, Intech, and Hitachi). We have added a factor for contingency and overhead. The estimated cost is $1,390,000 per HRSG. The levelized annual cost of these dollars for replacement of each catalyst is $537,000. The total annual capital cost for replacing the six catalysts every three years is $3,220,000. The levelized annual cost for the freight, installation labor, emission control system maintenance and calibration gasses is $270,000. Thus, the total differential O&M annual cost is $3,490,000 utilizing a three year replacement.

Utilizing this cost in our analysis shows a cost effectiveness of over $4000 per ton of NOx removed in all fuel splits except the case of 100% natural gas. In this case the cost effectiveness is $3950/ton for a 90% capacity factor and $3656/ton for 100% capacity factor. Therefore, even with the three year catalyst replacement, the SCR alternative does not result in a reasonable cost per ton of NOx removal.

<u>Ammonia Cost</u>
Black & Veatch has estimated our ammonia cost using a stoichiometric ratio of 1.2 at 59 pounds per hour at full load on natural gas. Their cost estimate utilizes $250 per ton in 1990 dollars. This represents a first year cost of $388,000. The levelized annual cost for ammonia is $600,000.

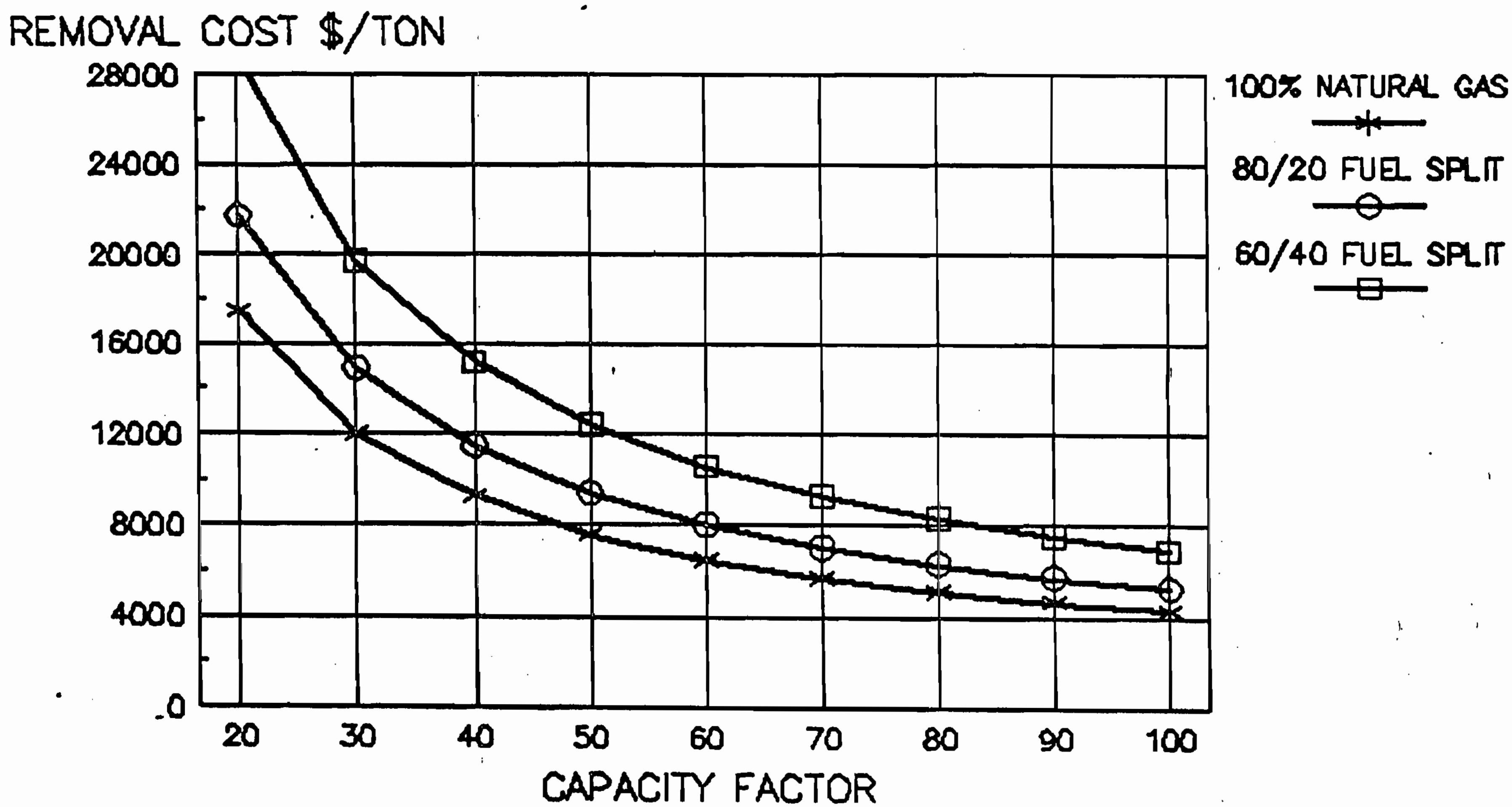
<u>Energy Costs - Heat Rate Penalty</u>
The heat rate penalty is due to the additional backpressure placed on the combustion turbines. This backpressure results in less energy output for a given amount of fuel input. Or, in other words, more fuel is required per kw output. Black & Veatch has calculated the penalty as 20 Btu(LHV)/kwhr per combined cycle unit utilizing a 0.42% heat rate penalty per combustion turbine on natural gas at full load. These heat rate penalties were calculated utilizing the lower heating value (LHV) heat rate guarantees. Since fuel costs are forecasted utilizing the higher heating values, the penalty was multiplied by the ratio of higher heating value to lower heating value ratio. Utilizing Tampa Electric Company's current levelized fuel cost of $11.68/MBtu for natural gas this represents an annual penalty of $1,711,000 for the additional fuel at 100% capacity factor.

<u>Energy Costs - SCR Power Consumption</u>
Black & Veatch has estimated the additional power consumption for the dilution air fans, additional pumps, and the ammonia vaporizers as 200kw per SCR at full load. For all six SCRs this results in 1200kw. Utilizing an energy cost of $99.98/MWhr (based on Tampa Electric Company's current levelized fuel cost for natural gas), this represents an annual penalty of $1,047,000 for the additional fuel at 100% capacity factor.

Lost Generation Capacity

Two components affect the total generating capacity available: the reduced generation due to the pressure drop and the reduced generation due to the additional power consumption by the dilution air fans, additional pumps, and the ammonia vaporizers. Black & Veatch has estimated this reduction as 4488 kw for the full 660MW. An incremental levelized demand charge of $81.64/kW/yr was applied based on project specific parameters. This represents an annual cost of $370,000 for this lost generation.

ATTACHMENT 1
NOX REMOVAL COSTS
SCR



TECO Power Services - Hardee Power Station
SCR

Capacity factor	20	30	40	50	60	70	80	90	100
% Natural Gas firing	100	100	100	100	100	100	100	100	100
% No. 2 Fuel Oil firing	0	0	0	0	0	0	0	0	0
Annual Costs, $X1000									
Direct Annual Cost									
Differential O&M Cost (2)	5,630	5,630	5,630	5,630	5,630	5,630	5,630	5,630	5,630
Ammonia (3)	120	180	240	300	360	420	480	540	600
Energy (4)									
Heat Rate Penalty	342	513	685	856	1,027	1,198	1,369	1,540	1,711
SCR Power Consumption	209	314	419	524	628	733	838	942	1,047
Lost Generation Capacity (5)	370	370	370	370	370	370	370	370	370
Total Direct Annual Cost	6,672	7,008	7,343	7,679	8,015	8,351	8,687	9,023	9,359
Indirect Annual Cost									
Capital Recovery (1)	4,268	4,268	4,268	4,268	4,268	4,268	4,268	4,268	4,268
Admin, Property Taxes, and Insurance	598	598	598	598	598	598	598	598	598
Total Indirect Annual Cost	4,866	4,866	4,866	4,866	4,866	4,866	4,866	4,866	4,866
Total Annual Cost	11,538	11,874	12,210	12,545	12,881	13,217	13,553	13,889	14,225
NOx Emissions									
42ppm natural gas, tpy	841	1,262	1,682	2,103	2,523	2,944	3,364	3,785	4,205
9ppm natural gas, tpy	180	270	360	450	540	630	720	810	900
Removed, tpy	661	992	1,322	1,653	1,983	2,314	2,644	2,975	3,305
Cost Effectiveness, $/ton	17,455	11,976	9,236	7,592	6,496	5,713	5,126	4,669	4,304

TECO Power Services - Hardee Power Station

SCR

Capacity factor	20	30	40	50	60	70	80	90	100
% Natural Gas firing	80	80	80	80	80	80	80	80	80
% No. 2 Fuel Oil firing	20	20	20	20	20	20	20	20	20
Annual Costs, $X1000									
Direct Annual Cost									
Differential O&M Cost (2)	5,630	5,630	5,630	5,630	5,630	5,630	5,630	5,630	5,630
Ammonia (3)	96	144	192	240	288	336	384	432	480
Energy (4)									
Heat Rate Penalty	359	538	717	896	1,076	1,255	1,434	1,614	1,793
SCR Power Consumption	168	251	335	419	503	586	670	754	838
Lost Generation Capacity (5)	370	370	370	370	370	370	370	370	370
Total Direct Annual Cost	6,622	6,933	7,244	7,555	7,866	8,177	8,488	8,799	9,111
Indirect Annual Cost									
Capital Recovery (1)	4,268	4,268	4,268	4,268	4,268	4,268	4,268	4,268	4,268
Admin, Property Taxes, and Insurance	598	598	598	598	598	598	598	598	598
Total Indirect Annual Cost	4,866	4,866	4,866	4,866	4,866	4,866	4,866	4,866	4,866
Total Annual Cost	11,488	11,799	12,110	12,421	12,732	13,044	13,355	13,666	13,977
NOx Emissions									
42ppm natural gas, tpy	673	1,009	1,346	1,682	2,018	2,355	2,691	3,028	3,364
9ppm natural gas, tpy	144	216	288	360	432	504	576	648	720
Removed, tpy	529	793	1,058	1,322	1,586	1,851	2,115	2,380	2,644
Cost Effectiveness, $/ton	21,725	14,876	11,451	9,396	8,026	7,048	6,314	5,743	5,286

SCR

Capacity factor	20	30	40	50	60	70	80	90	100
% Natural Gas firing	60	60	60	60	60	60	60	60	60
% No. 2 Fuel Oil firing	40	40	40	40	40	40	40	40	40
Annual Costs, $X1000									
Direct Annual Cost									
Differential O&M Cost (2)	5,630	5,630	5,630	5,630	5,630	5,630	5,630	5,630	5,630
Ammonia (3)	72	108	144	180	216	252	288	324	360
Energy (4)									
Heat Rate Penalty	375	562	750	937	1,125	1,312	1,499	1,687	1,874
SCR Power Consumption	126	188	251	314	377	440	503	565	628
Lost Generation Capacity (5)	370	370	370	370	370	370	370	370	370
Total Direct Annual Cost	6,573	6,859	7,145	7,431	7,718	8,004	8,290	8,576	8,863
Indirect Annual Cost									
Capital Recovery (1)	4,268	4,268	4,268	4,268	4,268	4,268	4,268	4,268	4,268
Admin, Property Taxes, and Insurance	598	598	598	598	598	598	598	598	598
Total Indirect Annual Cost	4,866	4,866	4,866	4,866	4,866	4,866	4,866	4,866	4,866
Total Annual Cost	11,439	11,725	12,011	12,297	12,584	12,870	13,156	13,442	13,729
NOx Emissions									
42ppm natural gas, tpy	505	757	1,009	1,262	1,514	1,766	2,018	2,271	2,523
9ppm natural gas, tpy	108	162	216	270	324	378	432	486	540
Removed, tpy	397	595	793	992	1,190	1,388	1,586	1,785	1,983
Cost Effectiveness, $/ton	28,842	19,709	15,143	12,403	10,576	9,272	8,293	7,532	6,923

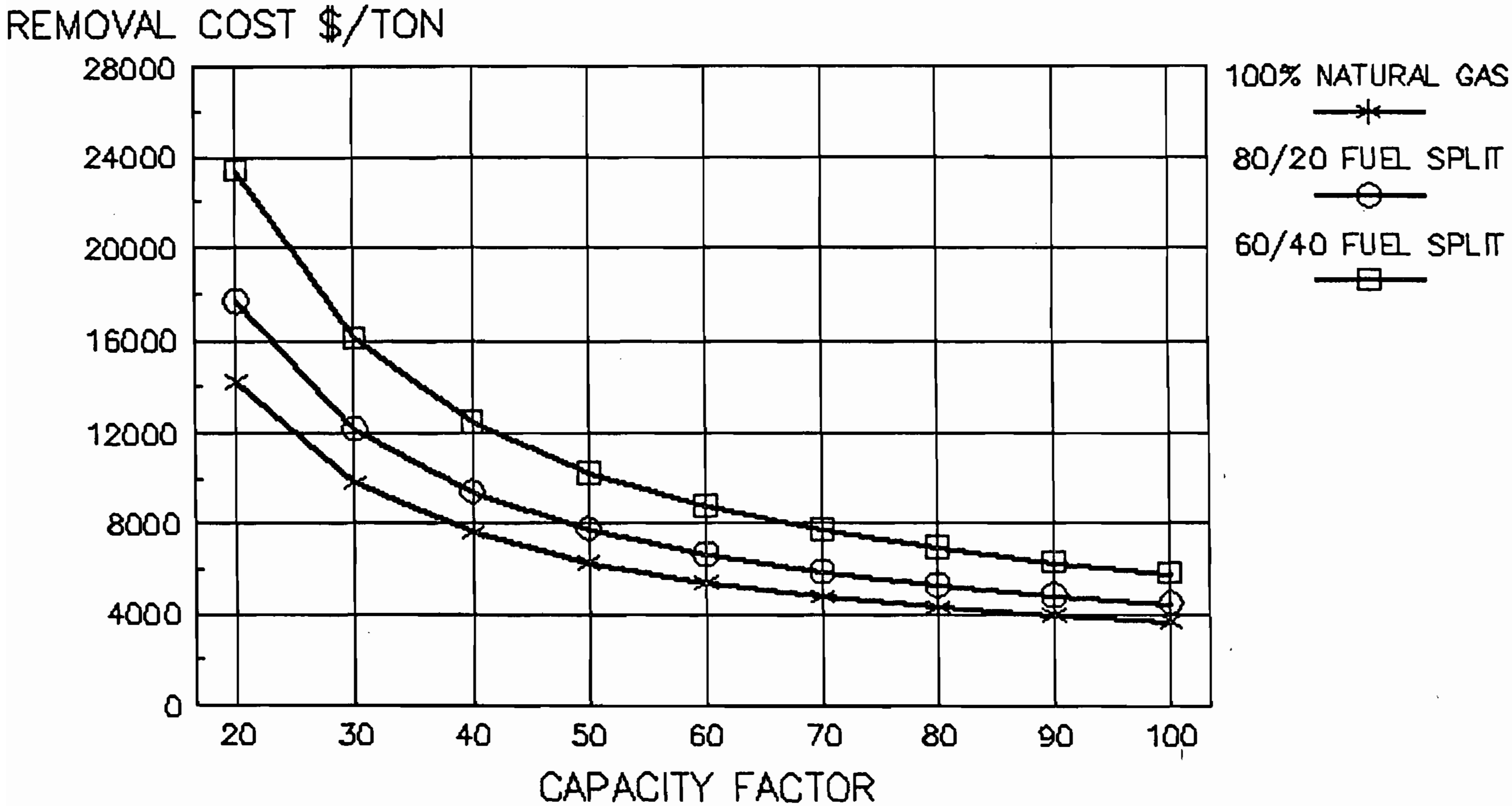
NOTE:

1. Based on a Total Capital Investment of $27,680,000 with a project specific capital recovery factor of 15.42%. Administrative costs, property taxes, and insurance utilize a factor of 2.16% of Total Capital Investment. The sum of these two factors represent the project specific fixed charge rate of 17.58%.
2. Differential O&M includes maintenance & labor and catalyst replacement. Complete replacement after 2 years.
3. Ammonia cost is based on $250/ton and a stoichmetric ratio of 1.2.
4. Energy includes auxiliary power for the SCR as well as a 0.42% CT heat rate penalty for the SCR. The additional fuel cost associated with heat rate penalty utilizes Tampa Electric Company's (TEC) current levelized fuel cost forecast of $11.68/MBtu for natural gas and $14.49 for oil. Increased BOP power consumption is charged at $99.98/MWh. This latter factor also utilized the TEC fuel cost forecast.
5. The SCR lost generation capacity is based on an 0.42% penalty. An incremental levelized demand charge of $81.64/kW/yr was utilized based on project specific parameters.

TECO Power Services - Hardee Power Station
SCR CAPITAL COSTS ($X1000)

SCR Reactor	12,750
SCR Auxilliaries and Ammonia Storage	1,500
SCR Erection	2,625
Foundations, Ammonia System Erection & BOP Equipment	450
Contingency (10%)	1,733
Subtotal	19,058
Sales Tax (6%)	1,143
Indirect costs (14.5%)	2,763
Subtotal	22,964
Escalation (4.7%)	1,620
Total Escalated Cost	24,584
Interest During Construction	3,095
Total Capital Investment	27,679

ATTACHMENT 2
NOX REMOVAL COSTS
SCR – 3 YEAR REPLACEMENT OF CATALYST



FOR COMPARISON PURPOSES ONLY

SCR - THREE YEAR CATALYST REPLACEMENT (FOR COMPARISON PURPOSES ONLY)

Capacity factor	20	30	40	50	60	70	80	90	100
% Natural Gas firing	100	100	100	100	100	100	100	100	100
% No. 2 Fuel Oil firing	0	0	0	0	0	0	0	0	0
Annual Costs, $X1000									
Direct Annual Cost									
Differential O&M Cost (2)	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490
Ammonia (3)	120	180	240	300	360	420	480	540	600
Energy (4)									
Heat Rate Penalty	342	513	685	856	1,027	1,198	1,369	1,540	1,711
SCR Power Consumption	209	314	419	524	628	733	838	942	1,047
Lost Generation Capacity (5)	370	370	370	370	370	370	370	370	370
Total Direct Annual Cost	4,532	4,868	5,203	5,539	5,875	6,211	6,547	6,883	7,219
Indirect Annual Cost									
Capital Recovery (1)	4,268	4,268	4,268	4,268	4,268	4,268	4,268	4,268	4,268
Admin, Property Taxes, and Insurance	598	598	598	598	598	598	598	598	598
Total Indirect Annual Cost	4,866	4,866	4,866	4,866	4,866	4,866	4,866	4,866	4,866
Total Annual Cost	9,398	9,734	10,070	10,405	10,741	11,077	11,413	11,749	12,085
NOx Emissions									
42ppm natural gas, tpy	841	1,262	1,682	2,103	2,523	2,944	3,364	3,785	4,205
9ppm natural gas, tpy	180	270	360	450	540	630	720	810	900
Removed, tpy	661	992	1,322	1,653	1,983	2,314	2,644	2,975	3,305
Cost Effectiveness, $/ton	14,218	9,817	7,617	6,297	5,417	4,788	4,317	3,950	3,656

SCR - THREE YEAR CATALYST REPLACEMENT (FOR COMPARISON PURPOSES ONLY)

Capacity factor	20	30	40	50	60	70	80	90	100
% Natural Gas firing	80	80	80	80	80	80	80	80	80
% No. 2 Fuel Oil firing	20	20	20	20	20	20	20	20	20
Annual Costs, $X1000									
====================									
Direct Annual Cost									
Differential O&M Cost (2)	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490
Ammonia (3)	96	144	192	240	288	336	384	432	480
Energy (4)									
Heat Rate Penalty	359	538	717	896	1,076	1,255	1,434	1,614	1,793
SCR Power Consumption	168	251	335	419	503	586	670	754	838
Lost Generation Capacity (5)	370	370	370	370	370	370	370	370	370
	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Direct Annual Cost	4,482	4,793	5,104	5,415	5,726	6,037	6,348	6,659	6,971
Indirect Annual Cost									
Capital Recovery (1)	4,268	4,268	4,268	4,268	4,268	4,268	4,268	4,268	4,268
Admin, Property Taxes, and Insurance	598	598	598	598	598	598	598	598	598
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Total Indirect Annual Cost	4,866	4,866	4,866	4,866	4,866	4,866	4,866	4,866	4,866
Total Annual Cost	9,348	9,659	9,970	10,281	10,592	10,904	11,215	11,526	11,837
NOx Emissions									
=============									
42ppm natural gas, tpy	673	1,009	1,346	1,682	2,018	2,355	2,691	3,028	3,364
9ppm natural gas, tpy	144	216	288	360	432	504	576	648	720
	-----	-----	-----	-----	-----	-----	-----	-----	-----
Removed, tpy	529	793	1,058	1,322	1,586	1,851	2,115	2,380	2,644
Cost Effectiveness, $/ton	17,678	12,178	9,427	7,777	6,677	5,891	5,302	4,844	4,477

SCR - THREE YEAR CATALYST REPLACEMENT (FOR COMPARISON PURPOSES ONLY)

Capacity factor	20	30	40	50	60	70	80	90	100
% Natural Gas firing	60	60	60	60	60	60	60	60	60
% No. 2 Fuel Oil firing	40	40	40	40	40	40	40	40	40
Annual Costs, $X1000									
Direct Annual Cost									
Differential O&M Cost (2)	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490
Ammonia (3)	72	108	144	180	216	252	288	324	360
Energy (4)									
Heat Rate Penalty	375	562	750	937	1,125	1,312	1,499	1,687	1,874
SCR Power Consumption	126	188	251	314	377	440	503	565	628
Lost Generation Capacity (5)	370	370	370	370	370	370	370	370	370
Total Direct Annual Cost	4,433	4,719	5,005	5,291	5,578	5,864	6,150	6,436	6,723
Indirect Annual Cost									
Capital Recovery (1)	4,268	4,268	4,268	4,268	4,268	4,268	4,268	4,268	4,268
Admin, Property Taxes, and Insurance	598	598	598	598	598	598	598	598	598
Total Indirect Annual Cost	4,866	4,866	4,866	4,866	4,866	4,866	4,866	4,866	4,866
Total Annual Cost	9,299	9,585	9,871	10,157	10,444	10,730	11,016	11,302	11,589
NOx Emissions									
42ppm natural gas, tpy	505	757	1,009	1,262	1,514	1,766	2,018	2,271	2,523
9ppm natural gas, tpy	108	162	216	270	324	378	432	486	540
Removed, tpy	397	595	793	992	1,190	1,388	1,586	1,785	1,983
Cost Effectiveness, $/ton	23,446	16,112	12,445	10,245	8,778	7,730	6,944	6,333	5,844

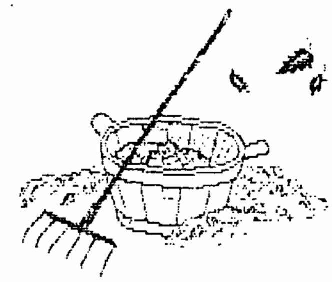
NOTE:

1. Based on a Total Capital Investment of $27,680,000 with a project specific capital recovery factor of 15.42%. Administrative costs, property taxes, and insurance utilize a factor of 2.16% of Total Capital Investment. The sum of these two factors represent the project specific fixed charge rate of 17.58%.
2. Differential O&M includes maintenance & labor and catalyst replacement. Complete replacement after 3 years.
3. Ammonia cost is based on $250/ton and a stoichmetric ratio of 1.2.
4. Energy includes auxilliary power for the SCR as well as a 0.42% CT heat rate penalty for the SCR. The additional fuel cost associated with heat rate penalty utilizes Tampa Electric Company's (TEC) current levelized fuel cost forecast of $11.68/MBtu for natural gas and $14.49 for oil.
   Increased BOP power consumption is charged at $99.98/MWh. This latter factor also utilized the TEC fuel cost forecast.
5. The SCR lost generation capacity is based on an 0.42% penalty. An incremental levelized demand charge of $81.64/kW/yr was utilized based on project specific parameters.

DARM

Work Assignment # NA

(See DARM Operations Plan for Instructions)



TO: Clair Fancy

Assigned 1/3/91

Review __/__/__

Due ASAP

THRU:

FROM: Steve Smallwood

SUBJ: 1st DCA Opinion on Hardee Power Station PSD Permit PC-140

MODULE: Air Permitting

ASSIGNMENT:

Please arrange the discussions need to resolve this issue.

COMMENT(S):

Office of the Director
DARM FORM: ADM 92-101di
June 1991

CHECK ONE: [ ]Assignee(s) [ ]Originator [ ]File Copy

DARM

Work Assignment

(Back Page)

To: Clair Fancy,P.E.

From: R.T.Donelan, Assistant General Counsel RTD

Re: Hardee Power Station PSD permit, PSD FL-140

Date: 30 December 1991

By an opinion dated December 20, 1991, the First District Court of Appeal invalidated the PSD permit we issued for the Hardee Power Station project of TECO. A copy of the opinion is attached. In short, the court requires an exact correspondence between the conditions of certification and the PSD construction permit for a facility certified under the PPSA.

The court's order directs the Department to "issue a permit which conforms to the conditions of certification attached to the final order. . . ." This should be done ASAP. Please have Barry or one of his staff prepare a revised permit in accordance with the court's order.

The upshot of TECO's "victory" in this case is not wholly clear, but it is likely to cause more problems for them than they think. Obviously, EPA Region IV will find the "revised" PSD permit federally unenforceable; an EPA lawyer stated this to me last January. A possibility exists that EPA will decide to assume PSD permitting for PPSA facilities; they have never liked the PPSA anyway. The court's order gives the final say in PSD permitting to the Siting Board. We need to discuss the situation with EPA as soon as possible.

The court decision is without prejudice to our ability to seek to modify the certification to require NOX control. We need to pursue this option--which we have already started--or EPA may decide to find us in violation of our SIP.

I suggest that we schedule a teleconference with Region IV at our earliest convenience to discuss this matter.

cc: Buck Oven
Dana Minerva
Steve Smallwood

IN THE DISTRICT COURT OF APPEAL

FIRST DISTRICT, STATE OF FLORIDA

TECO POWER SERVICES CORP., Appellant, vs. DEPARTMENT OF ENVIRONMENTAL REGULATION, Appellee.	NOT FINAL UNTIL TIME EXPIRES TO FILE REHEARING MOTION AND DISPOSITION THEREOF IF FILED CASE NO. 91-300

Opinion filed December 20, 1991.

An Appeal from an Order of the Department of Environmental Regulation.

Michael L. Rosen and Lawrence N. Curtin, of Holland & Knight, Tallahassee, for Appellant.

Richard T. Donelan, Jr., Assistant General Counsel, Department of Environmental Regulation, Tallahassee, for Appellee.

SHIVERS, Judge.

This appeal is from the Department of Environmental Regulation's issuance of a construction permit revising a condition of certification adopted and incorporated in the Siting Board's final order. We reverse.

In 1989 Teco Power Services Corporation (TPS) filed an application for certification of a power plant site in Hardee

County. A land use hearing was held in the area and a recommended order was issued which recommended approval. On August 14, 1990, the Governor and Cabinet sitting as the Siting Board approved the recommended order.

A certification hearing was held pursuant to section 403.508(3), Florida Statutes (Supp. 1990). One of the parties to that proceeding was the Department of Environmental Regulation (DER). A recommended order was issued on October 15, 1990, which contained detailed findings of fact with respect to procedural matters, the physical construction and operation of the power plant, and the environmental and social impacts of the project.

The hearing officer recommended certification of the project subject to certain conditions of certification, which were contained in an appendix to the recommended order. Based on a stipulation by the parties, one of the conditions of certification was a 'best available control technology' (BACT) limitation for nitrogen oxide air emissions. This condition required annual reports, and should the reports demonstrate a cumulative lifetime average capacity exceeding sixty percent for the power plant, the permittee must install nitrogen oxide control technology. The matter was then submitted to the Siting Board. On November 27, 1990, the Board entered a final order adopting the recommended order in toto. The final order states, "The Siting Board finds that the proposed Hardee Power Station should be certified subject to the conditions of certification included in the Recommended Order and attached hereto."

On December 5, 1990, the order and related materials were submitted to the United States Environmental Protection Agency (EPA) for review. On December 21 EPA responded, "The issues raised in this letter are sufficient to preclude the issuance of a construction permit to [TPS]. In order to prevent additional action by EPA, we strongly advise that you not issue this construction permit until the following issues are resolved." (emphasis in original). One of the issues to be resolved was that the sixty percent lifetime average capacity criteria was "not acceptable." Based on other previously issued permits in Key West and the Carolinas, EPA recommended a twenty five percent capacity factor. EPA's recommendation was duplicative of a recommendation it sent to DER on August 20, 1989. Based on EPA's recommendation, DER originally sought a twenty five percent capacity limitation. However, DER later stipulated to a sixty percent capacity limitation at the hearing without objection.

EPA's recommendation--if followed--would greatly increase the likelihood that TPS would have to install nitrogen oxide control technology, which costs substantial sums to install and operate. TPS wished to be treated as a 'peaking unit', which would practically exempt it from having to install the control technology. The Board's final order treated TPS's project as a peaking unit by virtue of its sixty percent lifetime average capacity criteria.

DER issued a construction permit which revised the BACT requirements in conformity with EPA's recommendation. The permit requires quarterly reports and directed the installation of BACT for nitrogen oxide should the plant's capacity factor exceed twenty five percent. The permit constituted final agency action according to subsection 403.509(5), Florida Statutes (Supp. 1990). DER was authorized to issue the permit under the federal Prevention of Significant Deterioration program.

TPS petitioned this court for a writ of mandamus to compel DER to issue a permit consistent with the conditions of certification approved in the Siting Board's final order. This court ruled the petition should be treated as a notice of appeal, and the parties filed briefs.

TPS argues there is little need for certification proceedings if DER--a party to the proceedings--can unilaterally modify the conditions of certification after the Siting Board's action on the application. DER answers that if it had not modified the BACT conditions, TPS would possess a federally unenforceable construction permit. TPS replies it should be of no concern to DER that EPA may seek injunctive relief against TPS, which welcomes the opportunity to contest EPA's authority to pursue a civil enforcement action if DER issues a permit without modification of the BACT conditions.

This is a case of first impression in Florida. DER concedes that if its modification of the BACT conditions violates subsection 403.509(3), Florida Statutes (Supp. 1990), reversal is required. The subsection states in part, "Simultaneously with the board's action on the application, the department shall issue or deny any license required pursuant to any federally delegated or approved permit program. The department's decision to issue or deny the license shall be based upon the record and recommended order of the certification hearing."

Section 403.516, Florida Statutes (Supp. 1990), lists the four ways certification may be modified. Subsection 403.503(17), Florida Statutes (Supp. 1990), states, "'Modification' means any change in the certification order after issuance, including a change in the conditions of certification."

We hold that subsection 403.509(3) does not confer upon DER the discretion to unilaterally change the conditions of certification after the board's action on the application. DER cannot modify the conditions of certification without complying with section 403.516.

We therefore reverse and remand this case to DER with directions to issue a permit which conforms to the conditions of certification attached to the final order and included in the recommended order. This case is reversed without prejudice to DER's right to pursue modification pursuant to section 403.516.

REVERSED and REMANDED.

WIGGINTON, J., CONCURS. ERVIN, J., CONCURS IN RESULT.

Patty -
who has this one?
Cleo

Barry,
I've never seen this request - have you?
Patty

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

For Routing To Other Than The Addressee
To: Clair Fancy Location:
To: Location:
To: Location:
From: Date:

Interoffice Memorandum

TO: Richard T. Donelan, Jr.
Assistant General Counsel

FROM: Steve Smallwood, Director
Division of Air Resources Management

DATE: July 11, 1991

SUBJ: Hardee Power Station PSD Permit Transfer

Richard, I have referred the application for transfer of permit received from TECO Power Services concerning the Hardee Power Station, PSD permit FL-140, to Clair Fancy for processing.

However, he cannot make the required completeness determination or recommend final action to the Secretary on the disposition of the request until he receives your advise as to whether the response provided in Larry Curtin's letter of July 1, 1991, adequately responds to my letter of June 20, 1991, concerning the transfer of the permit.

Please advise Clair within the next five working days as to whether Larry Curtin's response is adequate. If it is not, draft a second letter for my signature asking for any additional information that we need. If you conclude the remaining questions are a matter of policy and not a legal issue, please frame that policy issue for me and explain to me why it is not a legal issue.

I don't know what your comments in the second paragraph in your memo are about. Anytime you feel that I have erred in how I have handled a case we are working on, you should come and talk to me in confidence about that--not write me obtuse notes that suggest I have somehow undercut your strategy. If there is a matter of trust involved, it is a matter of whether I trust you to give me good legal advise, to keep me informed as to what you are doing, and to represent me in the way that I have asked you to. It appears that Larry Curtin's comment in his letter has pushed one of your buttons. I think you need to come and tell me what its about.

SS:jr

cc: Carol Forthman
Buck Oven
Clair Fancy